



APICA 2025

第11届亚太解剖学大会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

暨中国解剖学会第39届（2025年）学术年会

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)



2025年8月8-11日

GUANGZHOU, CHINA AUGUST 8-11, 2025

论文汇编

Abstract Collection





Contents

Symposium

326679	Grow Baby Grow: Preliminary Longitudinal Investigations Into Muscle Growth And Motor Development In Infants Born At Term, Preterm -----	mirjal1	1
318170	Title: Do key measurement parameters derived from specific cervical vertebral segments differ between lordotic and non-lordotic cervical spine alignments? A study of asymptomatic young adults. -----	Lee Daffin	1
334603	Imaging Variable Combinations of Carpal Anatomy -----	Quentin Fogg	2
318214	Combining updated surface anatomy and ultrasound to mitigate iatrogenic injury of the spinal accessory nerve in primary care -----	s.barfoot34, Ali Mirjalili	3
324738	Restoring the regenerative potential of mouse retina by blocking PROX1 transfer -----	Jin Woo, Eun Jung Lee, Museong Kim	3
328425	Mitotic bookmarking in brain development -----	Yan Song	4
327585	Control of Astrocyte Migration in the Developing Cerebral Cortex -----	NAKAJIMA, Kazunori	4
330662	Essential role of RNA metabolism in oligodendrocyte development -----	Hirohide Takebayashi, Norihisa Bizen	5
327370	Therapeutic Potential of Cannabidiol for Chronic Stress: Evidence from an Animal Model of Anxiety -----	Sutisa Nudmamud-Thanoi, Wanfrutkon Waehama, Playifah Janthueng etc.	6
327376	Anti-Inflammatory Potential of Cannabidiol-enriched Hemp Extract: Evidence from Preclinical Animal Model -----	Samur Thanoi, Ittipon Phoungpetchara, Paweena Kaewman etc.	7
327037	Indigenous Herbal Medicines for Sleep and Memory: Insights into Neuroprotection and Cognitive Enhancement -----	Peeraporn Varinthra, Mubashir Raza, Shu-Ching Shih etc.	7
327266	Neuroanatomical Insights into Natural Compound-Based Neuroprotection: A C. elegans Model Approach -----	Krai Meemon, Sukrit Promtang, Salinthip Thongdechsi etc.	8
327449	A role for ultrasound in exploring muscle architecture of the deep posterior leg muscles. -----	Natasha Flack, Moji Dolodolotawake, Rebecca Bird etc.	9
327447	The validity and reliability of two ultrasound techniques for assessing hamstring muscle architecture: A cadaver and healthy participant study -----	Stephanie Woodley, Harry Ayris, Ryan Timmins etc.	9
327154	Why does everyone feel pain differently? An anatomical exploration of cortical brain dynamics and refining neuromodulation targets in knee osteoarthritis -----	Jerin Mathew, Divya Bharatkumar Adhia, Dirk De Ridder etc.	10
327456	The Role of Virtual Reality Surgical Simulation in Assessing Morphological Understanding of Slipped Capital Femoral Epiphysis -----	Phil Blyth	11



318254	Understanding the Challenges that Students Encounter during Cadaveric Dissection-----	Helen Nicholson,Natasha Flack,Shanmugapriya Aravazhi etc.	11
326267	Leveraging Cognitive Load Theory in Gross Anatomy Teaching Within the Spices Curriculum-----	Siti Nurma Hanim Hadie,Shamsi Amalina Shamsuddin,Nur Atiqah Sa'hari etc.	12
318011	Public Perceptions of Human Fetal and Embryological Collections: An Ethical Analysis-----	Joyce El Haddad	13
318106	Is technology the next frontier to enhance gross anatomy education and improve life-long learning?-----	Awais Babri,Amy H Chan	13
322020	Integrating Surface Anatomy into Clinical Practice: An Elective Course Experience for Medical Students-----	Cagatay Barut	14
322013	Anatomical and Histological Bone Modelling with 3D Pen: Istanbul Health and Technology University Elective Course Experience-----	Gkionoul Nteli Chatzioglou,Şinasi Bayram,Ayhan Parmaksız etc.	15
322016	The Role of the Mastoid Foramen in Neurosurgery: Evaluation of Connection with the Groove for Sigmoid Sinus on Dry Bones-----	Emine Nas,Gkionoul Nteli Chatzioglou,Ayşin Kale etc.	16
321918	Anatomical Diversity and Dimensional Assessment of Dural Venous Sinuses within the Cranial Cavity -----	Eren OGUT,Cagatay BARUT	16
326493	Pushing the frontier: Transforming Anatomy Education with AI and Emerging Technologies at LKS Faculty of Medicine,HKU -----	Jian Yang	17
325327	Revolutionizing Anatomy Education: 3D Digital Specimens and AI-Powered Metaverse Learning -----	Florence Mei Kuen Mei Kuen Tang,Kenneth Chung Hin Lai,Cheuk Hang Siu etc.	18
327443	Enhancing Medical Students' Awareness of Anatomical Variations: A Student-Created Digital Repository-----	Jada Chia Di Lee,Tomasz Stanislaw Cecot,Guilherme Fonseca etc.	18
328107	Active engagement in learning: a flipped classroom and blended learning approach -----	Benson,Wui-Man LAU,Joy,Chung-Man LAU	19
324458	Does Gender Influence Learning,Perceptions and Retention in Regional Anatomy Dissection Courses? -----	Veronica Antipova,Martin Siwetz,Franz A. Fellner etc.	20
327211	Should Mesoscopic Anatomy be included in human structure courses?-----	Zhang Ming	21
327415	Cinematic Rendering in Virtual Anatomy Education: Findings,Ongoing Studies, and Educational Impact-----	Julian F Niedermair,Niels Hammer,Veronica Antipova etc.	21
323854	Anatomy at the Frontier: Pioneering Medical Training in the Era of Surgical Specialization-----	niels.hammer@medunigraz.at	22
317992	Is There Any Novel Insert Points both Benefit for Anatomy and Biomechanical Part in Treating Humeral GT (Liu-Gang type I & II) Fracture-----	GANG-LIU,Pasuk Mahakkanukrauh	23
317976	The Foot Core System and its Role in Musculoskeletal Rehabilitation: From Clinics to Laboratory-----	Chich-Haung Richard Yang,Tunpisith Jeamsupakorn,Pasuk Mahakkanukrauh etc.	23
317989	Musculoskeletal Anatomy and Advancements in Ultrasound-Guided Interventions-----	YNakanishi	24
317991	Advancing Forensic Osteology Research: The Transformative Role of Artificial Intelligence-----	Pasuk Mahakkanukrauh	24



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

327021	Maternal Socioeconomic Status and Placental Changes in Preterm Births in Kazakhstan-----	Gulmira Zhurabekova,Oralkhan Zhibek,Berdalinova Akzhenis etc.	25
326675	Single-Cell Lineage Tracing in Cancer Study -----	Kai Miao	25
326778	Mechanisms and Interventions in Gastrointestinal Aging: from Triggers to Strategies-----	Tingyi Sun	26
326673	Mechanoresponsive Periosteal Stem Cells Drive Bone Regeneration during Distraction Osteogenesis -----	Rongjie Wu,Sien Lin	26
334607	The distinct top-down and bottom-up role of mPFC-claustrum interconnectivity in the encoding and retrieval of methamphetamine reward memory-----	Xiaowei Guan	27
341737	Neural circuits mechanism of withdrawal memory retrieval -----	Xinli Guo,Yu Yuan,Ke Xu etc.	28
329874	The Role of Nucleus Basalis of Meynert Cholinergic Neurons in Sleep-Wake Regulation-----	张凯莹	28
318834	Interactive Connections between the Claustrum and Lateral Parabrachial Nucleus Participate in the Regulation of Nociceptive Information and Accompanying Negative Emotions-----	Qiu xintong	29
340854	Probing Neuroglia Function Through An Integrative Neuroscience Approach-----	Ai Peng Tan	30
330494	"Oligodendrocyte-encoded Lactate Dehydrogenase A Couples Glycolysis to (Re)myelination via Protein Lactylation"-----	Yuan Zhang	30
333364	The functional role of Sept7 in OPC differentiation and remyelination -----	Jianmei Ma,Cong Du	31
330619	Deficiency of Microglial-Derived Secreted Phosphoprotein 1 Accelerates Brain Aging via Compromising Oxidative Phosphorylation-----	Lilu,Meiling Wang,Yumin Chang etc.	31
328065	Navigating Anatomy's Digital Frontier: The Role of Digital Competency -----	Nur Atiqah Sa'hari Ramli,Shamsi Amalina Shamsuddin,Fazlina Kasim etc.	32
326471	Seeing Beyond Dissection: Integrating Radiology for a Smarter Anatomy Education -----	ASPALILAH ALIAS,Arofi Kurniawan,Madihah Rushaidhi etc.	33
327477	Cultural Tapestry in Anatomy: Weaving Global Competence into Healthcare Education -----	Madihah Rushaidhi,Nurul Uyun Abdul Aziz,Nor Alia Mohamad	33
343194	Visualization and Simulation of Ultra-High-Resolution 3D Anatomical Models for Advanced Morphological Analysis -----	IL KIM	34
343195	Vision-Language Model (VLM) for Medical Domain -----	Donghun Yang	35
343196	Development of Foundational Data Infrastructure for Human Digital Twin -----	Kwangnam Choi	35
343198	Implementation of an Interactive Clinical Simulator Based on Facial Anatomy: An Enhanced Model for Injection Training -----	Ji-Young Son,Hyeong-Seok Choi,Sang-su Park etc.	36
327575	Morphological Changes of the Mandibular Condyle in Response to Subtle Overload: Investigating a Mechanical Origin of Condyle Hyperplasia -----	Viviana Toro-Ibacaache,Sonja Buvinic,Julián Balanta-Melo etc.	37
326677	Dynamic Studies Of The Human Thoracic Duct And Lymphovenous Junction Using Heavily Weighted T2 Magnetic Resonance Imaging: A Pilot Study (Oral Presentation) -----	Ali Mirjalili	38
327295	FEA-Based Stability Evaluation of External Fixators for Type C1.3a Pelvic Injury -----	Annika Meuser,Petr Henys,Daniel Haspinger etc.	38
324351	Comparison of Orthotics and Exercise Training on Hallux Valgus: A Biomechanical Study Based on Muscle Synergies and Kinematic Synergies -----	Lei Qian,Jun Ouyang	39



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

326734	Chorioallantoic Membrane – alternative Model for Biomaterial Testing-----	Eva Petrovova, Lenka Luptakova, Zuzana Tirpakova etc.	40
328527	New concept of hybrid Breast reconstruction. Anatomical approach.-----	Ilya Kazantsev	40
326686	Cardiology Pearls: What Time Does to the Heart and How Could We Time-Proof It?-----	Suwanna	41
325429	Cross-scale Monitoring Anatomical Structures and Dynamic Changes in Living Organisms-----	陈俊	42
327472	Living Lessons: Enhancing Anatomy Education with Soft-Body Cadavers and Silent Mentors-----	Madihah Rushaidhi, Sakina Ghauth	42
325539	Our First Patients: The Silent Mentor Programme in Anatomy Education-----	George W Yip	43
327448	The Enduring Gift of Body Donors in Anatomy Education-----	Stephanie Woodley	43
327205	Cadaver-based research remains an irreplaceable component of medical education and clinical practice-----	Zhang Ming	44

Abstract

● 亚太 A1. Anatomical Variations

318072

Anatomy and Cartilaginous Variations of the Carina:

A Cadaveric Study ----- Chung Yoh Kim, Kristen Rizzuto, Daniel Tahan etc. 45

亚太 A1-129-0002

改良 kidner 手术联合距下关节松解术治疗青少年 2 型软扁平足

副舟骨疼痛的疗效观察 ----- 宁可, 李玉飞, 文捷 等 46

亚太 A1-129-0006

Identification of Plasma Biomarkers associated with Osteoporosis by

Proteome Analysis ----- Li Chunyan Liu Fan 46

亚太 A1-129-0011

新疆阿克苏地区维吾尔族成年人握力水平及其与体成分、

人体测量学指标的关联性分析 ----- 黄婷, 温有锋 47

亚太 A1-129-0013

NEK7 mediates neuroinflammation and cognitive impairment in Alzheimer's disease via

NLRP3/Caspase-1/IL-1 β signaling path ----- Lin Wang, Jiaqi Liu, Chuanhua Ge etc. 47

亚太 A1-129-0023

Molecular Network Analysis of the Association Between Anxiety and

the Anterior Cingulate Cortex ----- Yi Zheng, Liulin Xiong 48

亚太 A1-129-0024

Integrated Network Pharmacology Analysis of Molecular Mechanisms and

Core Targets Linking Anxiety and the Prefrontal Cor----- Zhang Jing, Xiong Liulin 49

亚太 A1-129-0025

焦虑与蓝斑核关联的分子机制及网络药理学研究 ----- 高伟忠, 廖宇奉, 熊柳林 50



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

320636

Langer's arch crossing superficially over the axillary neurovascular bundle:

a case report----- Hongtae Kim,Mi-Sun Hur 50

亚太 A1-129-0010

颅底-鼻腔联合入路小型猪与小鼠咽鼓管的取材和比较观察 ----- 李瑞,方璇,刘怀存 等 51

亚太 A1-129-0022

有氧运动通过脑-肠轴对共病性失眠小鼠 Vlp0 区神经元的保护作用 -----赵鹏,赵奕儒 51

亚太 A1-129-0015

The neck movement morphology of?Mamenchisaurus?was inferred based on

a comparative analysis of ostrich cervical ribs----- Fayi Chen,Chenchen Zhou,Zixi Fan etc. 52

亚太 A1-129-0016

骨骼肌纤维 NLRP3 炎症小体激活、亚细胞定位及 3D 重建 ----- 厉洋洋,菅晓婷,黄静雯 等 52

亚太 A1-129-0017

Anomalous Left Hepatic Artery and Splenic Artery Variation with Absence of

the Celiac Trunk: A Case Report. ----- Zhu Junyao,Li Wenquan,Lv Huanmei etc. 53

亚太 A1-129-0018

生长抑素能神经元影响成年海马神经发生参与小鼠疼痛

相关认知功能障碍 ----- 孟庆胜,张雨冰,段嘉宾 等 54

亚太 A1-129-0019

广西壮族成年女性腹主动脉数字化解剖学研究 ----- 李迎熙,甘恬,唐成 等 55

亚太 A1-129-0020

An updated Review of Rhinoplasty Techniques in East Asian Populations:

A Comparative Analysis of East vs. West Approache----- Feven Birara 55

亚太 A1-129-0026

Network Pharmacology-Based Study on Molecular Interaction Mechanisms

Between Anxiety and the Bed Nucleus of the Stria Te-----Cao Xinya1,Xiong Liulin2 56

● 亚太 A2. Clinical Anatomy (Surgical and Non-surgical)

311727

Some Empirical Evidence of Non-Local Knee Pain Anatomy-----Abdurachman 57

318126

Systematically Reviewing the Anatomy of the Thoracic Duct,

Cisterna Chyli and Lymphovenous Junction -----Seyed Ali Mirjalili,Lomani O'Hagan,Sara Moazzam 57

318185

Craniometric Analysis for Sex Determination from Dry Skulls in

a Thai Population-----Zhaokang Du,Pagorn Navic,Apichat Sinthubua etc. 58

318190

Do We Understand the Physiology of Flow and Pressure in the Thoracic Duct?

A Systematic Review -----Sara Moazzam,Lomani A. O'Hagan,S. Ali Mirjalili 59

318371

Cerebellar Patterning and Volume Changes in Health and Disease -----Hassan Marzban 59



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

318373	Anatomical Re-evaluation in the Costoclavicular Ligament----- Kenji Emura,Ryo Nitta,Takamitsu Arakawa	60
318468	Morphology of the Costochondral Cartilage in Comparison to the Radial Head and Glenoid Fossa and Their Suitability for Autologous Chondroplasty-----Phil Blyth,Luke Orange,Hrvoje Vidakovic	61
318731	TAC in the Management of Localized Facial Fibrosis: Regression and Efficacy Post-Growth Factor Injections ----- Jiaqi Kou,Yueming Wang,Yuanqi Qi etc.	61
329607	Neuroprotective Role of Intermittent Fasting in Chronic Stress-Induced Brain Damage: A Narrative Review--- Nurathifah Mohd Zaki,Dr. Mohd Asnizam Asari,Muhammad Syakiron Abdullah	62
335598	Protective Effect of Intermittent Fasting on The Thymic Response to Chronic Stress-Induced Inflammation In Rats: A Narrative Review-----Muhammad Syakiron Abdullah,Mohd Asnizam Asari	63
340506	Anatomical Basis and Clinical Significance of Needle Knife for Trigger Finger -----Yuanxun Lin,Weixing Zhong,Yikai Li	63
亚太 A2-129-0001	A study on the influence of tissue compliance changes in the cranio-cervical junction on cerebrospinal fluid dynamics ----- Qing Shao,Lu Zhang,Xue Song etc.	64
亚太 A2-129-0002	Preliminary Investigation Treatment into Localized Tissue Fibrosis Induced by Growth Factor Injections----- Jiaqi Kou,Yueming Wang,Yuanqi Qi etc.	65
亚太 A2-129-0007	Pain-Free Survival After Endoscopic Rhizotomy Versus Radiofrequency for Lumbar Facet joint Pain: A Real-World Comparison -----Tao Du,Guang Lu,Bing Ni etc.	65
亚太 A2-129-0009	Key Anatomical Points and Clinical Applications of Facial Rejuvenation ----- Qi Xiangdon	66
亚太 A2-129-0014	Protection mechanism of scutellarin on retinal ganglion cells in diabetic retinopathy -----Xin-Hui Tang,Bao-Lei Zhang,Md Miftahul Mithu etc.	67
亚太 A2-129-0017	Molecular Network investigation of BBR's Protection on RGCs in Diabetic retinopathy-----NaLi,JilinChen,Tinghua Wang	68
亚太 A2-129-0018	The Impact of Acupuncture at Acupoint Qihuan (Umbilical Ring) on Intestinal Microbiota, Serum Neurological Related Cytok -----Huina Ma,Dr Tang Kok Hong,Dr Tanima Bhattacharya etc.	69



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

318194	Pancreatic fatty degeneration: A retrospective histopathological study in cadaver specimens -----	Shuang-Qin Yi,Ting Yang,Ke Ren etc.	70
318222	Convolutional neural network for sex determination using ventral pubis in a Thai population -----	Pagorn Navic,Patison Palee,Pasuk Mahakkanukrauh	70
318255	Morphology of the deep leg flexor muscles – a dissection study.-----	Natasha Flack,Katie Frost,Charlie Humphrey etc.	71
320106	Ultrasound-guided Non-standard Lateral Decubitus Low-Thoracic Epidural Puncture and Catheterization: A Randomized Controlled and Non-inferiority Trial -----	Yuxin Huang,Tingting Li,Fang Gao etc.	72
320241	Morphological Alterations of the Trigeminal Nerve in Trigeminal Neuralgia -----	Lifeng Yu,Han Meng,Wenli Wang etc.	72
320676	Detailed Anatomical Study of the Quadratus Lumborum Muscle for Optimizing Injection Sites -----	Anna Jeon, Ji-Young Son,Hong-San Kim etc.	73
321180	Implantation of Bone Marrow-Mesenchymal Stem Cells on Osteocalcin (OCN) Expression Post Tooth Extraction in Experimental Rats-----	Gusti Revilla,Henny Mulyani,Andries Pascawinata	74
327440	Role of Neurogenesis in the Basal Forebrain of Rats in Cholinergic Neuron Injury Models-----	li	74
亚太 A2-129-0004	Role of aquaporin 9 serine 292 phosphorylation in metabolic dysfunction-associated steatotic liver disease -----	Quancheng Cheng,Xuan Fang,Man Li etc.	75
亚太 A2-129-0003	Transcriptomic analysis of skin,dorsal root ganglia,spinal dorsal horn, and cortex after plantar incision in rat -----	Bi-Hua Xie,Bao-Lei Zhang,Ting-Ting Li etc.	76
亚太 A2-129-0005	The positional relationship of the external pudendal vein, superficial epigastric vein and spermatic vein -----	Yanshu Shao,Wenjing Han,Xianfeng Sun etc.	77
亚太 A2-129-0008	Acetaminophen versus Ibuprofen for Pain Management in Pediatric Tonsillectomy: A Randomized Clinical Trial.-----	Feng-Ting Ma,Fei Liu	77
亚太 A2-129-0010	A randomized controlled study of high and low frequency transcranial magnetic stimulation in the treatment of Alzheimer' -----	Ting Hou,Junting Huang	78



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 A2-129-0011

Network Pharmacology Analysis of Exercise (Swimming,Running) for
Depression----- Ze-Yong Zou,Qi-Yu chen 79

亚太 A2-129-0012

Incidence of Deep Venous Thrombosis in Posterior Cruciate
Ligament Avulsion Fractures with Low Molecular Weight
Heparin -Md Miftahul Mithu (MBBS,MD),ZhuoYuan Chen (MD,PhD),Ting-Hua Wang (MD,PhD) etc. 79

亚太 A2-129-0016

Transcriptomic analysis of skin,dorsal root ganglia,spinal dorsal horn,
and cortex in rats subjected to plantar incisi ----- Bi-Hua Xie,Bao-Lei Zhang,Ting-Ting Li etc. 80

● 亚太 A3. Radiological Anatomy and Imaging

318288

Multi-Class Deep Learning Segmentation of Periodontal Tissue
Ultrasound Images----- PiaoJiongZhen,Kyung-Seok Hu,Hee-Jin Kim 81

318347

Mapping and Modeling Individual-level Morphometric Similarity Network
Deviations in Autism ----- Makliya Mamat,Yiyong Chen,Lin Li 82

318574

Multiclass Segmentation and Intelligent T-staging of Prostate Cancer MRI Images
Using Deep Learning----- Rutao Fan,Shanshan Xu 83

320126

A Comprehensive Classification of The Thyrocervical Trunk:
A CTA 3D Study-----Ruiyang Wang,Bingqi Xu,Han Meng etc. 83

340503

Radiographic Observation of Cervical Immature
Epiphyseal Ring -----Xie Siyuan,Lin Yuanxun,Zhang Yunaolong etc. 84

亚太 A3-129-0002

Development of a Model for Measuring Sagittal Plane Parameters in 10 - 18-year Old
Adolescents with Idiopathic Scoliosis B -----Zhijie Kang,Guopeng Shi,Haiyan Wang etc. 84

亚太 A3-129-0003

Real-Time and Rapid Quantitative Measurement of Female Anal
Sphincter Complex in ultrasound images based on deep learn ----- 许杉杉, 樊汝涛, 宫庆防 等 85

亚太 A3-129-0004

Aging Pattern of the Brainstem Based on Volumetric Measurement and Optimized
Surface Shape Analysis -----Hu Minqi,Xu Feifei,Liu Shizhou etc. 86

亚太 A3-129-0009

Intelligent Segmentation and Visualization of Hippocampal FORMATION ----- Shuwei Liu,He Bai 86

318268

Cortical Morphometric Network Reorganization Across the Adult Lifespan:
A Gene-Expression Informed Study ----- cheniyiyong,Lin Li,Yizhi Zuo 87



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会
11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS
39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 A3-129-0006

Cortical Morphometric Network Reorganization Across the Adult Lifespan:

A Gene-Expression Informed Study ----- Yiyong Chen, Lin Li, Yizhi Zuo 88

亚太 A3-129-0001

The optimal slice to quantify the volumes of subcutaneous adipose tissue and

skeletal muscle on chest CT as imaging mark ----- Linlin Lang, Liping Zuo, Kai Dou etc. 89

亚太 A3-129-0008

Application of automated measurements to the assessment of ventricular

volumes of the brain ----- Xue Zhang, Xiaotong Yu, Xiu Zhang etc. 89

● 亚太 A4. Anatomy in Arts and Sports

317411

What Did the Historical Chinese Beauties Look Like? An Analysis of Portrait

and Biography of 100 Beauties (1792) ----- Kun Hwang, Sang Su Park, Seung-Ho Han 90

亚太 A4-129-0000

Anatomical analysis of motor functions of vocalization and pronunciation ----- Hongyu Liu 91

亚太 A4-129-0001

In Vivo Dynamic Monitoring of the Musculoskeletal System's Anatomy

and Functional Assessment by SWIR Luminescence Imagin ----- Jun Chen 92

亚太 A4-129-0002

The Art and Beauty of Anatomy in Plastic Surgery ----- Qi Xiangdong 92

● 亚太 A5. Sectional Anatomy and Plastination

317474

Meningeal Architecture of Meckel's Cave and its Surgical Implications:

A Study Using Epoxy Sheet Plastination and Three-dimensional

Reconstruction ----- Xuliu, Xuzhaoyang 93

318341

Three-Dimensional Anatomy of the Trigeminal Motor Root: A Plastinated

Sectional Study ----- Sheng Cheng, 徐柳, 徐朝阳 94

318410

"Exploring the three-dimensional mesoscopic structure of the Tectorial Membrane:

Epoxy Sheet Plastination and Multi-Photon Confocal Microscopy study" ----- Megan Papp 94

亚太 A5-129-0003

The Sectional Imaging Anatomy and Three-dimensional Visualization of the

Hypoglossal Nerve ----- Haiyan Tang 95



● 亚太 B1. Neural Circuits for Behaviors and Diseases

318345	Amyloid- β Detoxification and Proteostasis Modulation by <i>Holothuria Leucospilota</i> Extract in <i>Caenorhabditis elegans</i> Model of Alzheimer's Disease -----	Salinthip Thongdechsri, Chanathip Kamonnat, Nakorn Niamnont etc.	96
318372	Effective Connectivity between Brain Networks can Impact Pain Interference and Physical Function in Painful Knee Osteoarthritis, a Neuroimaging Investigation -----	Luke Bialostocki, Divya Bharatkumar Adhia, Dirk De Ridder etc.	97
320115	Top-down Neural Mechanisms of Feeding Regulation -----	Yu Fu	97
320364	The Role of Peripheral ApoE in Alzheimer's Disease -----	Chen Feng, Fu Yuan	98
亚太 B1-129-0003	Beta-amyloid protein deposition in cerebral amyloid angiopathy and its neuropathological relationship with Alzheimer's d -----	Ting Jiang ,Xuechao Fei, Naili Wang etc.	99
亚太 B1-129-0004	The Role of Nucleus Basalis of Meynert Cholinergic Neurons in Sleep-Wake Regulation-----	张凯莹, 杨沅君, 刘一诺 等	99
亚太 B1-129-0005	The distinct top-down and bottom-up role of mPFC-claustrum interconnectivity in the encoding and retrieval of methamphet -----	Xiaowei Guan	100
亚太 B1-129-0010	Voluntary Exercise as a Therapeutic Intervention for Traumatic Brain Injury-----	Faisal Yaqoob, Wu Hanxi, Hu Xiaoxuan etc.	101
亚太 B1-129-0011	Modulation of comorbid depression of neuropathic pain by dopamine input from VTA to the ventral hippocampus -----	Yuanyuan Ji, Juan Shi, Jinlian Li	101
亚太 B1-129-0012	The study of the S1BF-Sp5C descending circuit for orofacial hyperalgesia modulation in trigeminal neuralgia rat model -----	Wang Yiqian, Liao Xinyue, Wang Feng etc.	102
亚太 B1-129-0023	Medial preoptic CCKAR mediates anxiety and aggression induced by chronic emotional stress in male mice -----	Meng-Yu Tang, Yan-Yi Zhang, Lin Lin etc.	103
亚太 B1-129-0024	Investigation of the Neuroprotective Mechanisms and Therapeutic Potential of Innovative INDD in an ALS Model -----	Ni Wang, Ruiyun Guo, Jun Ma etc.	103
亚太 B1-129-0026	Bioinformation Analysis of Mechanisms for abnormalities of the the Anterior Cingulate Cortex and Depression-----	Yang Yihui, Xiong Liulin	104



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

317357	Multimodal Regulation of Motor Neuron Plasticity Post-Spinal Cord Injury: Mechanistic Insights into the NYAP1-POU6F1-JNK/c-Jun Signaling Axis ----- Yi Li, Shu-Ying Wang, Jin-Ying Hu etc.	105
317358	Therapeutic Potential of Retrograde POU6F1 Transport in SCI Recovery ----- Shu-Ying Wang, Yi Li, Wen-Yuan Li etc.	105
318279	FABP3 Regulates Inhibitory Synapse Formation and GABAergic Signaling in the Medial Prefrontal Cortex ----- Yui Yamamoto, Yuji Owada	106
318448	Dysregulation of Low Density Lipoprotein Receptor Associated with Skeletal Muscle Atrophy in ALS ----- Sien Yan	107
320587	A candidate of the center for body fluid homeostasis in a novel model fish mudskipper: Comparative anatomy of the OVLT in vertebrates. ----- Mukuda Takao, Matsuda Risa, Hamasaki Sawako etc.	107
320619	The role of angiotensin II and its type 1 receptors on the hippocampal neurogenesis promoted by short-term heat exposure. ----- Yuka Koyama, Takao Mukuda, Sawako Hamasaki etc.	108
320630	The role of receptor tyrosine kinase ErbB4 in intestinal epithelial lesions of ulcerative colitis ----- 彭琳茜	109
亚太 B1-129-0006	Comparative study on the distribution of Pacinian corpuscles in the pancreas ----- Ke Ren, Xiangquan Chen, Ting Yang etc.	109
亚太 B1-129-0008	Mechanism of CRHergic pathway from CeA to vIPAG participating in the regulation of itch ----- Xinyi Zhu, Hui Li	110
亚太 B1-129-0013	SAAAs play dual roles in organizing behaviors across different timescales ----- Jing Huo, Tianqi Xu, Mahiber Polat etc.	111
亚太 B1-129-0014	Substance P protects against intestinal barrier disruption and anxiety-like behavior in ulcerative colitis ----- Jing Lan, Jiaqi Wang, Chenyu Li etc.	111
亚太 B1-129-0017	Dysregulation of Low Density Lipoprotein Receptor Associated with Skeletal Muscle Atrophy in ALS ----- SiEn Yan, YiHui Sun, HaoYun Zhang etc.	112



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 B1-129-0018

Disease- and Sex-Specific Changes in Hypothalamic Oxytocin and Vasopressin in Bipolar Disorder:
A Postmortem Study-----Hong Tan,Yu-Ting Hu,Alyssa Goudswaard etc. 113

亚太 B1-129-0022

Pinprick stimulation causes sleep disturbances via activation of
insular cortex ----- LanCao,Boyu-Jiao,Junting-Huang 113

亚太 B1-129-0001

Multimodal Regulation of Motor Neuron Plasticity Post-Spinal Cord Injury:
Mechanistic Insights into the NYAP1-POU6F1-JNK----- Yi Li,Shu-Ying Wang,Jin-Ying Hu etc. 114

亚太 B1-129-0002

Therapeutic Potential of Retrograde POU6F1 Transport in SCI
Recovery -----Shu-Ying Wang,Yi Li,Zhi-Gang Li etc. 115

亚太 B1-129-0007

The Changes of GAD67 and MOR receptor in thalamus reticular nucleus
after thalamus hemorrhage in rats ----- Wang Wei,Shi Suqin,ZhipingCai etc. 116

亚太 B1-129-0020

Acute sleep deprivation induces pain via activation of pyramidal
neurons in the ACC ----- Yanhan Wu,Junting Huang,Yuting Wang etc. 116

亚太 B1-129-0021

PVN 神经元编码检索胃炎免疫反应 ----- 刘娥 117

亚太 B1-129-0025

The projection relationship between the motor cortex M1,M2 regions
and the hippocampus. ----- Shiwen-Xue,Qiyu-Chen,Yongmin-Niu etc. 117

● 亚太 B2. Sensory and Motor System Anatomy

318739

Spatio-temporally Deciphering Peripheral Nerve Regeneration in
Vivo after Extracellular Vesicle Therapy under NIR-II fluorescence
Imaging ----- Wang Yueming,Sheng Huaixuan,Cong Meng etc. 118

318784

Metabolic Heterogeneity of Peripheral Nerve Injury in Different Anatomical
Sites Revealed by NIR-II Imaging----- Shao Kemeng,Peng Yu,Li Huizhu etc. 119

325810

Orexigenic Lateral Hypothalamus-anterior Cingulate Cortex Circuit
Alleviates Chronic Stress-induced Anxiety-like Behaviors. ----- Liu Danlei,Guo guoqing 119

亚太 B2-129-0003

Acid sensing ion channels alleviate ischemic brain injury by promoting
collateral circulation----- Jian-Fei Lu,Xin Qi,Yu-Wen Sun etc. 120

亚太 B2-129-0004

The role of receptor tyrosine kinase ErbB4 in dorsal root ganglion in
inflammatory pain ----- Ying Fu,Zhongxin Guo,Qingyun Huang etc. 120



318321

Neurotransmitter Analysis for Diagnosing Diabetic Cardiac Autonomic Neuropathy
in Rodents: A Systematic Review of Biomarkers and Disease

Correlation ----- Razif Abas, Mohd Amir Kamaruzzaman, Shamala Devi Subramaniam etc. 121

亚太 B2-129-0001

Genetic Variants Underlying Differences in Facial Morphology in Chinese Healthy
People and Alzheimer's disease Patients ----- Zhengda Lu, Xinghua Zhang, Yuling Zhang etc. 122

亚太 B2-129-0002

Distribution of the nerves of the hepatic vein with special reference to innervation
of its sphincter: Whole mount immun ----- Ke Ren, Xiangquan Chen, Ting Yang etc. 123

亚太 B2-129-0006

Acupoint galvanic stimulation enhances RhoGDI- α -mediated axonal
regeneration? and promotes sensory function recovery in s----- Qiu-Xia Xiao, Lu-Lu Xue, Yang Xu etc. 123

● 亚太 B3. Synapse, Neuron and Glia

320143

Running Exercise Alleviates Chronic Social Defeat Stress-induced
Depression-like Behaviors via H3K18 Lactylation of GCH1 in the
Microglia in Mice ----- wangnan, Shanshan Zhu, Shuyang Chen etc. 124

320164

Isoliquiritigenin exhibits neuroprotective effects in a mouse model of
chronic corticosterone administration-induced mood disorders. ---- Wang Hao, Zhu Jing, Shao Shuijin 125

320602

P-Y705-STAT3 Mediates the Polarization of Intestinal Microglia to
M1 in the Distal Colonic Myenteric Plexus of Rats with
Opioid-induced Constipation ----- Yuqiong Zhao, Xiaojie Ren, Junping Li 125

亚太 B3-129-0014

Interactions of Inhalational Anesthetics and A β on CA1 Dendritic
Spines and Astrocytes ----- Xingxing Wang 126

亚太 B3-129-0017

Microglial PCGF1 alleviates neuroinflammation associated depressive behavior in
adolescent mice ----- Naigang Li, Jingyi Du, Ying Yang etc. 127

亚太 B3-129-0026

Mechanisms contributing to inhibition of retinal ganglion cell apoptosis
by AMPK in experimental glaucoma ----- Zhaolin Gao, Haiyang Yu, Tianqi Duan etc. 127

亚太 B3-129-0027

Phyhip-Targeted Delivery of bFGF Platform with Dual Modulation for
Enhancing Neurovascular Repair in Traumatic Brain Inj ----- Weihong Nie, Chunying Shi 128

亚太 B3-129-0028

C1q is essential for myelination in the central nervous
system (CNS) ----- Qiang Yu, Ye Song, Jiasong Guo etc. 129



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 B3-129-0030

PACAP-PAC1 receptor regulates Excitation/Inhibition balance and

PTZ-Induced Seizure Susceptibility -----Haoran Zhang,Di Zhu,Jing Wen etc. 129

亚太 B3-129-0033

PDE1A Downregulation Disrupts Oligodendrocyte Myelination and

Promotes Neuropsychiatric-like Behaviors in a Rodent Model ----- Yanxi Chen,Linya You 130

318444

Neuroprotective effect of hydrogen in ALS mice by inhibiting NLRP3

inflammasome activation ----- YihuiSun 131

318801

Microglial Fc-epsilon-receptor I gamma of the Spinal Dorsal Horn

Mediates Neuropathic Pain -----Fan Liu,Xiang-sha Yin,Xue Wang etc. 131

亚太 B3-129-0003

Microglial Fc-epsilon-receptor I gamma of the Spinal Dorsal Horn

Mediates Neuropathic Pain -----Fan Liu,Xiang-sha Yin,Xue Wang etc. 132

亚太 B3-129-0009

Gastrodin Mitigates the Ferroptosis of Microglia in Ischemic

Stroke ----- Shi Jinsha,Yang Shuhan,Zhang Xinglin etc. 133

亚太 B3-129-0010

Neuroprotective effect of hydrogen treatment in ALS mice by inhibiting

NLRP3 inflammasome activation ----- YiHui Sun,SiEn Yan,QiuPeng Yan etc. 133

亚太 B3-129-0015

Presence of microplastics in Alzheimer Disease brains from

Brain Bank Donors -----付仁奎,陈震,马超 134

亚太 B3-129-0016

Grape seed proanthocyanidins ameliorate astrocyte injury in progeny

under stress during pregnancy through NF-kB pathway ---- XiaoDan Zhou,Mengci Wang,Siyu Zhang 135

亚太 B3-129-0020

Demethylase FTO regulates m6A modification affecting microglia

activation in ALS ----- HangYu Le, HangYu Le, YiHui Sun etc. 136

亚太 B3-129-0021

The role and mechanism of CTSD in regulating cholesterol metabolism

in motor neuron Degeneration of ALS -----Chenchen Wang,Xuemei Wang,Xue Bai etc. 137

亚太 B3-129-0023

Fluoxetine rescues psychological behaviors in a murine

PTSD model by alleviating excessive myelin formation -----Chenrui Yin,Kefei Luo,Xinyue Zhu etc. 137

亚太 B3-129-0025

Remyelination-oriented clemastine treatment attenuates

neuropathies of optic nerve and retina in glaucoma----- Kun Liu,Yujian Yang,Zhonghao Wu etc. 138



亚太 B3-129-0029	Neuroprotective Effects of Glial cell line-derived neurotrophic factor in Neonatal Encephalopathy ----- Xiao-Xing Cai,Ya-Qi Yang,Jing-Juan Li etc. 139
亚太 B3-129-0032	Vitamin D Supplementation Attenuating Chronic Pain Through Suppression of Glial-mediated Neuroinflammation----- Shihong Li,Song Cao 139
亚太 B3-129-0002	Mitochondrial Modification with P-selectin Binding Peptide: Effects on Mitochondrial Repair after Cerebral Ischemia-Repe ----- Tong Li,Bensi Zhang,Chun Shi 140
亚太 B3-129-0004	Exosome-derived miR-124 enhances the neuroprotective effect against hypoxic-ischemic brain injury in rats by inhibiting ----- 朱俊德 141
亚太 B3-129-0005	Nociceptive neuron mitochondrial VDAC1 mediate neuropathic pain via transducing ATP to cytoplasm. ----- Fengrun Sun,Ning Yu,Bo Yuan etc. 142
亚太 B3-129-0006	Differential Microglial Activation in Human Brain Tissues Associates with Alzheimer's Disease Pathology----- Xue Wang,Yakun Cao,Wei Wu etc. 143
亚太 B3-129-0007	p53 Lysine-lactylated Modification Contributes to Lipopolysaccharide-induced Proinflammatory Activation in BV2 Cell Unde-----Xuechao Fei,Chao Ma 143
亚太 B3-129-0008	Hormone Withdrawal Induced PPD in Mice: Behavioral and Molecular Insights from mPFC c-Fos and RNA-seq analysis----- Xiaojiao H,Ruxuan D,Bingqing CH etc. 144
亚太 B3-129-0011	Cannabidiol improves traumatic brain injury by activating autophagy through the PI3K/AKT/mTOR signaling pathway-----Yan Cao,Xinyuan Luo,Aiping Yin etc. 145
亚太 B3-129-0012	Sestrin2/GPX4-mediated ferroptosis suppression in traumatic brain injury recovery----- Yitong Li,Sujuan Liu,Heng Shao 146
亚太 B3-129-0013	Deficient epoxyeicosatrienoic acids (EETs) signaling in the LHb contributes to microglia activation and alcohol withdraw----- Jiawei Hou,Tianhao Liu,Zhengzhong Yan etc. 146
亚太 B3-129-0018	Cannabidiol inhibits ferroptosis after traumatic brain injury via the Nrf2-GPX4 signaling pathway ----- Li Hengxi,Cao Yan,Jiang Hongyan etc. 147
亚太 B3-129-0019	CBD Attenuates Methamphetamine-Induced Neurotoxicity via Modulation of the PI3K/AKT/mTOR Signaling Pathway----- Aiping Yin ,Yan Cao ,Hengxi Li etc. 148



亚太 B3-129-0031

Chronic pain induces neuronal injury in locus coeruleus associated with
microglia derived neuroinflammation----- Renyan Liu,Song Cao 149

● 亚太 B4. Neurodevelopment

318244

Investigation into the Drainage Route of Cerebrospinal Fluid in Teleost Fish ----- Chen Yitong 150

320080

Changes of Cerebellar Cortex in a Valproic Acid-induced Rat Model of
Autism----- Asst. Professor Meltem Alpay,Professor Dr. Ferruh Yücel 150

320621

Mossy Fiber Expression of α SMA in Human Hippocampus and its
Relevance to Brain Evolution and Neuronal Development -----Zhongping Sun,Xiao-Lu Cai,Tian Tu 151

亚太 B4-129-0001

Neuroprotective effects of cordycepin in the aluminium chloride
induced neurodevelopmental toxicity and locomotor
disord----- Hongmei Hua,Guanghua Xiong,Fasheng Liua etc. 152

亚太 B4-129-0002

Neuroprotective Mechanisms of Cannabidiol in Traumatic Brain Injury:
Targeting CaMKK2-Mediated Oxidative Stress and Mito ----- Hongyan Jiang,Hengxi Li,Yan Cao etc. 153

320243

The Evolution of Trigeminal Ganglion in Adults: A High-Resolution
MRI Study ----- Wenli Wang,Xinyu Du,Lifeng Yu etc. 153

亚太 B4-129-0004

Effect and Mechanism of Peripheral Immune Cells on Anti-aging of
Macaques during Running Training ----- Yongmin Niu,Lulu Xue,Liren Huangfu etc. 154

亚太 B4-129-0005

Single-Cell Transcriptomic Analysis Reveals Molecular Associations Between
Neural Repair After Traumatic Brain Injury an ----- Ya-Qi Yang,Xiao-Xing Cai,Jin-Juan Li etc. 155

亚太 B4-129-0003

Accumulation of GSK-3 β in interneurons impairs adult hippocampal neurogenesis
by inhibiting GABAergic transmission----- Fei Liu,Jiu-Jing Cui,Xiao-Lin Li etc. 156

● 亚太 C1. Stem Cell & Development

318262

Oxidized SOD1 is a causal factor in cellular senescence
and biological aging----- Jiming Kong,Teng Guan,Ying Guo 157

318617

Umbilical cord mesenchymal stem cells were used to treat end-stage to
early cirrhosis in methionine-deficient rats by modulating the
WNT pathway -----yanxuan wen,wang lan,jiaxing li etc. 157



320137	The molecular mechanism of SLC25A10 regulates human adipose-derived stem cells-osteoclasts communication by regulating the dynamic changes of mitochondria-----Liu Jiaxuan,Fan Tingyu,Shi Yulian etc.	158
320689	Single-cell transcriptomics Reveals Oncostatin M-Dependent Spermatogonial Maintenance in Neonatal Testis-----W Jia	159
321182	Cell Therapy for Parkinson's Disease----- Hossein Baharvand	159
321185	Generating Expandable Cardiac Progenitor Cells from Human Pluripotent Stem Cells for In-Vitro as well as Preclinical Studies ----- Sara Pahlavan,Siamak Rezaeiani,Fatemeh Etezadi etc.	160
亚太 C1-129-0001	Mechanoresponsive Periosteal Stem Cells Drive Bone Regeneration in Distraction Osteogenesis-----Rongjie Wu,Zhixian Zong,Gang Li etc.	161
亚太 C1-129-0009	Exosomes derived from microRNA-540-3p overexpressing bone marrow mesenchymal stem cells promote immune tolerance via the ----- Jigang He,Xinxin Wu,Si Li etc.	162
亚太 C1-129-0010	BMSC-derived exosome overexpressing GATA-4 suppresses H/R-induced cardiomyocyte ferroptosis trough miR-330-3p regulates ----- Zhiyuan Xiao,Si Li,Xinxin Wu etc.	163
亚太 C1-129-0011	Glial Cell Line Derived Neurotrophic Factor-Induced Directional Migration of Enteric Neural Crest-Derived Cells ----- Yee Lam LI,Seong Wang CHOI,Martin CHEUNG etc.	164
亚太 C1-129-0013	Therapeutic Effects of Cerium Oxide Nanozyme Armed Neural Stem Cell for the Treatment of Spinal Cord Injury in Mice ----- Zewei Fu,Baofeng Feng,Jun Ma etc.	165
亚太 C1-129-0014	Safety and Efficacy of Combined Transplantation of hiPSC-NSCs and hMSCs in the Treatment of Alzheimer's Disease -----Yue Yang,Zijing Zhou,Ruiyun Guo etc.	166
亚太 C1-129-0015	The Mechanistic Study of PCL Membrane Combined with Mesenchymal Stem Cells in Promoting Lymphocyte Proliferation during ----- Bao-Lei Zhang,Xin-Hui Tang,Ting-Hua Wang	166
亚太 C1-129-0016	Single-Cell Trajectory Mapping of hNECs Following Intracerebral Transplantation Using Laser Capture Microdissection and-----Wenlong Zhu,Xiaoxing Cai,Liulin Xiong etc.	167
318430	Harderian and lacrimal gland development and degeneration in the Fgf10-deficient heterozygous mouse -----Hideyo Ohuchi,Shiori Ikeda,Keita Sato etc.	168



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

- 318686
Tumor suppressor FRMD3 controls mammary epithelial cell fate determination via notch signaling pathway ----- Ma J, Sun X, Gong Y 169
- 320684
WTAP Regulates RNA m6A Methylation and Cell Fate Transition in Spermatogonial stem cells ----- W Jia 169
- 327979
Effects of Thinner Exposure During Pregnancy on CYP19 Expression, Oxidative Stress, Testosterone Levels, and Fetal Growth in Wistar Rats ----- Arni Amir, Saka Abeiasa 170
- 亚太 C1-129-0002
L-borneol Regulates rno-miR-127/ PODXL2 to Promote Hair Follicle Stem Cells to Repair Skin Wounds ----- Zike Liu, Baolin Ye, Haoxiang Ye etc. 171
- 亚太 C1-129-0003
Leptin attenuates Hypoxia injury in NSCs by reducing oxidative stress and regulating mitochondrial homeostasis via Nrf2 ----- Ihtisham Ul Haq, Wang Xinyi, Hu xiaoxuan etc. 171
- 亚太 C1-129-0006
Kindlin-2 in myoepithelium controls luminal progenitor commitment to alveoli in mouse mammary gland ----- Zhenbin Wang, Lei Zhang, Bing Li etc. 172
- 亚太 C1-129-0007
M2 macrophage-migrasomes promote fracture healing ----- Mengci Wang, Siyu Zhang, Abudurexiti Kutibiding etc. 173
- 亚太 C1-129-0012
Single-cell transcriptomic analysis reveals heterogeneity of human induced pluripotent stem cell-derived Schwann cell pr ----- Zhining LI, Tangxi XIAO, Tak Keung PANG etc. 174
- 亚太 C1-129-0004
The Mechanism and Therapeutic Efficacy of Melanin Nanoparticles in the Treatment of Skeletal Muscle Injury ----- Xiong Wei, Cao Yuanqi, Niu Yanmei etc. 175
- 亚太 C1-129-0008
MSC derived small extracellular vesicles suppress cardiomyocyte apoptosis through miR-490-3p/RN7SL1 axis via RN7SL1 with ----- Ling Wang, Yujie Yang, Yang Zhou etc. 176
- 亚太 C2. Cell Biology
- 312648
Targeting VGLL4 Maintains Extracellular Matrix Homeostasis and Mitigates Osteoarthritis ----- Jinlong Suo, Duo Wang, Xianyou Zheng etc. 177
- 318305
SUMOylation of PKM2 Promotes Ferroptosis of Chondrocytes in Diabetic Osteoarthritis ----- Qin Zhong, Xiyan Ouyang, Zike Liu etc. 178
- 332424
Differential Microglial Activation in Human Brain Tissues Associates with Alzheimer's Disease Pathology ----- Xue Wang, Yakun Cao, Wei Wu etc. 178



亚太 C2-129-0004	Syncytin-1 deficiency disrupts trophoblast-endothelial crosstalk in preeclampsia via RAS and PI3K/Akt/eNOS pathways -----	Xue-ling Chen,Ya-nan Wang,Ju Yang etc. 179
亚太 C2-129-0009	Dendrobine and Erianin alleviate inflammation-induced depressive-like behaviors by targeting phosphodiesterase 4B in ado -----	Jiaming Shi,Jiacheng Wang,Haoran Cao etc. 180
亚太 C2-129-0010	The Role of Gut Microbiota in the Pathogenesis of Glaucoma: Evidence from Bibliometric Analysis and Comprehensive Review -----	Zakir Ullah,Yuanyuan Tao,Amina Mehmood etc. 181
亚太 C2-129-0013	Testosterone delays bone microstructural destruction via osteoblast-AR-mediated upregulation of tenascin-C -----	Yong Xie,Meng Pan,Zeyuan Zhang etc. 182
亚太 C2-129-0014	Identification and verification of lysosome related biomarkers in Alzheimer's disease -----	Mingyu Li,Hai Tang,Huaqiao Wang etc. 183
亚太 C2-129-0015	Oxidized SOD1 impairs MDV formation and accelerates cellular senescence-----	Ying Guo,Teng Guan,Qiang Yu etc. 183
亚太 C2-129-0016	ATP5D-mediated B cell senescence across the aging spectrum from youth to Alzheimer's disease -----	Lu-Lu Xue,Liu-Lin Xiong,Ting-Hua Wang 184
320038	Mechanism of royal jelly peptides attenuating oxidative stress and inflammatory response after myocardial ischemia-reperfusion via Nrf2/Hmox1/HO-1 pathway-----	Cai Hao,Jia Fengjing,Zuo Tao etc. 185
320089	PRAG1 Condensation Drives Cell Contraction Under Stress-----	Peiwu Ye 185
320680	The Role and Mechanism of SIRT3-Regulated Mitochondrial Fission and Autophagy in Ameliorating Chemotherapy-Induced Granulosa Cell Apoptosis-----	Hanping 186
320686	Mechanism of STAT3 in Regulating Oocyte Meiosis and Fertility via Spindle Assembly in Mice-----	YipingLei 187
亚太 C2-129-0007	Study on the Functional and Molecular Mechanisms of Epigenetic Regulatory protein BRD4 in Spermatogenesis. -----	Xie Mingyang,Lin Weican,Lin Zhenghan etc. 187
亚太 C2-129-0008	Asporin Mediates Muscle Inflammation and Myorepair via TGF- β Signaling Dependent-Myogenesis and M1 Polarization -----	Jingwen Huang,Qisen Wang, Xiaoting Jian etc. 188



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 C2-129-0011

PRAG1 Condensation Drives Cell Contraction

Under Stress----- Peiwu Ye ,Peiran Jiang ,Luyu Ye etc. 189

亚太 C2-129-0012

Mechanistic insights into the protective effects of icariin against testicular aging:

an integrated study of network pha ----- Jiandong Sun,Chengyu Lv,Zihang Lin etc. 190

亚太 C2-129-0001

Neuroprotective effects of gastrodin mitigate neuronal ferroptosis in hypoxic-ischemic

brain damage through Nrf2 pathway ----- Guo Tao,Kuang Xianfeng,Zuo Hanjun etc. 190

亚太 C2-129-0002

Molecular mechanism of IRF8 regulating CTSS to promote macrophage M2 to

M1 polarization leading to renal allograft loss----- Yihan Chen,Jiazhou Xu,Junxi Wu etc. 191

亚太 C2-129-0006

Shenrong Guben Huanshao Pill regulates the LDHB-lactate-NDUFV2 axis to improve mitochondrial

function and exert anti-agi ----- Xiaohui Hu,Yanan Guo,Yixiao Tian etc. 192

● 亚太 C3. Oncology

亚太 C3-129-0009

Metabolic Programming of Tumor-Associated Macrophages Promotes T Cell Exhaustion

in Uveal Melanoma ----- Haiyang Yu,Min Li,Shuangyan He etc. 193

318103

FABP5 in tumor-associated macrophages drives tumor growth and angiogenesis in

a colorectal cancer mouse model. ----- Yang Dandan 193

318576

PSA and p53 as Diagnostic Markers in Prostate Pre-malignancy: The Down-regulating Ability

of Uvaria chamae Root Extract in Cadmium Chloride-Induced

Pre-malignancy in Male Wistar Rats ----- Gabriel D. Edem,Christopher L. Sakpa,Vitalis C. Ezeuko 194

亚太 C3-129-0003

Pan-Cancer Analysis of SLC4A4: Expression Heterogeneity,Prognostic Value,

and Immunotherapeutic Potential ----- Cheng Yang,Xuanzhi Wang,Yi Zhao etc. 195

亚太 C3-129-0004

Research on the Expression of SLC4A4 in the Development of Gastric

Carcinoma and Impact on the Proliferation and Migrati ----- Di Wu,Yi Zhao,Xiaofen Xie etc. 196

亚太 C3-129-0005

基于巨噬细胞膜仿生修饰的载药菌影系统靶向重编程肺癌相关巨噬细胞

及抗肿瘤效应研究 ----- 林瑞婷, 吴晓丹, 叶森 等 196

亚太 C3-129-0006

FAP α -Responsive Dual-Targeting Nanoplatform Synergizes Chemotherapy-Antiangiogenic to

Enhance Immunogenic Cell Death in ----- Weihong Nie,Chunying Shi 197



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 C3-129-0001

The mechanism of IDO1 regulation of TMEM100 through IL-6-STAT3 pathway to promote glioblastoma ----- Laibing Liu,Xiangbin Yang,Zijiang Yu etc. 198

亚太 C3-129-0007

Gliomas as allies: A novel cancer-for-neuroscience perspective on neural repair and regeneration in the CNS ----- Issam AbuQeis,Ying-Chun Ba,ZHU Youbao etc. 199

亚太 C3-129-0008

Prediction of anti-lung cancer mechanism of Notoginsenoside R1 based on network pharmacology ----- Jing-Juan Li,Ya-Qi Yang,Xiao-Xing Cai etc. 199

● 亚太 C4. Histology

318290

Hemp Seed Fiber Reduces Liver Fibrosis in Aging Mice via TGF- β 1/Smad Pathway ----- jinhanjie 201

318404

Multi-cellular clusters of uterine NK cells and infertility: from histology,through recurrent pregnancy loss to clinical perspectives ----- Ivan Varga,Lenka Lapides,Kristina Visnyaiova,etc 201

320040

A zebrafish model of chronic heart failure caused by the protein aggregation in heart valves ----- Yitong LI,Shingo Maegawa,Ryo Kimura etc. 202

320639

Microscopics Appearance of Ovarian Follicles and the Estrous Cycle of Rat Models with Early- and Late-stage of Cisplatin-induced Premature Ovarian Insufficiency Treated with Platelet-rich Plasma ----- Roza Silvia,Ahmad Aulia Jusuf,Mila Maidarti etc. 203

321172

Effects of Virgin Coconut Oil Compared to Amnion on Dermal Tissue Regeneration: An Anatomical and Immunohistochemical Approach -----Tuti Lestari,Sumaryati Syukurc,Gusti Revillab etc. 203

亚太 C4-129-0001

Autografted hair follicles with dermal papilla removed promote wound repair and regeneration in Bama mini-pigs -----Wenzi Liang,Changmin Lin 204

亚太 C4-129-0002

Metformin ameliorates thymus degeneration of mice by regulating mitochondrial function----- Wenlan Fang,Shuping Yang,Yun sun etc. 205

亚太 C4-129-0006

SIRT6 modulates lesion microenvironment in LPC induced demyelination by targeting astrocytic CHI3L1 ----- Jingyi Du,Yue Yin,Dong Wu etc. 206

亚太 C4-129-0007

The optimized design and application research of targeted delivery peptides for acute kidney injury----- Kai yan Su,Chun ying Shi 206



亚太 C4-129-0008

Quercetin Alleviates Endothelial Dysfunction in Preeclampsia
by Inhibiting Ferroptosis and Inflammation

through EGFR Bin-----Meiting Shi,Yao Shen,Ruiman Li etc. 207

亚太 C4-129-0009

Study on the Improvement of Pericyte Damage in Diabetic Retinopathy

by Berberine through Regulating Vof16 -----Jilin Chen,Ting-Hua Wang 208

318402

Dynamic hydrogel induces differentiation of human vascular
organoids into arterioles and promotes neovascularization in
myocardial infarction-----

Budi Dharmono Tulaka,David Pakaya,Nilawati etc. 208

亚太 C4-129-0004

Cardiac Organoid Model Inspired Micro-Robot Smart Patch

to Treat Myocardial Infarction ----- Su Jinyu,Zhang Gaoyuan,Zhang Mohan 209

亚太 C4-129-0005

miR-21 promotes the repair of sciatic nerve injuries
in rats by regulating the differentiation of bone marrow
stromal cells -----

Chenyu Li,Jing Lan,Jiaqi Wang etc. 210

● 亚太 C5. Organoid & Tissue Engineering

320105

Fabrication and Evaluation of 3D Printed PLGA/nHA/GO Scaffold

for Bone Tissue Engineering ----- Dayu Sun,Feiyang Zheng,Guanyuan Yang etc. 211

320117

Esculin-porous starch hydrogel facilitates the regeneration

of sciatic nerve injury in mice----- Fangfang Wang,Zilu Xu,Feiyang Zheng etc. 212

320666

Expectations of First Year Undergraduate Medical Students

towards Human Cadaveric Dissection: Reflective Writing as an Effective Tool ----- 魏财鸿 212

亚太 C5-129-0001

Artificial Intelligence-generated Chest X-rays as an
Educational Tool for Medical Students: an Efficacy

Evaluation -----Xiaohe Li,Ling Tong,Guopeng Shi etc. 213

亚太 C5-129-0004

Design and Development of a Virtual Reality for Spatial Learning

of Pelvis and Perineum ----- Yang Yu,Wo Yan 214

320486

The Effectiveness of the Integrated OBE and STAD Teaching

Approaches in the Oral Anatomy and Physiology

Course ----- Zuzana Demcisakova,Lenka Luptakova,Liesbeth Couck,etc 215



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 C5-129-0003

Gi Tract Clay: Anatomical Carving as Alternative Modality in

Human Anatomy Teaching ----- Haoman Chen,Fanxuan Chen,Xinyu Chen etc. 216

亚太 C5-129-0005

Mapping Core Anatomy Competencies for

Clinical Skill Development in Undergraduate Dental

Education: A Scoping Review in Progress ----- Wenyi Huang,Yu Yan,Hui Li etc. 217

● 亚太 D. Anatomical Education

318391

Exploration and Practice of a Triadic Teacher-Student-Machine

Pedagogical Model in Anatomy Education

Integrating AI ----- Sandip Shah,Sarun Koirala,Vijay Khanal etc. 218

318440

Macroscopic Study of the Facial Suture Closure –

A Total Sum Score for Age Estimation in a

Thai Population ----- Yigeng Li,Ritvik Sivananda,Saad Ashraf etc. 219

320092

Risk Factors of Intracranial Aneurysm Recurrence

after Endovascular Embolization

Treatment ----- Lau Chin Haeng,Rajendran Kanagasuntheram,Krishnan Jayabharathi etc. 219

320618

Study of Fingerprint phenotype and genotype in

Han adults----- Shuang Xia,Tingting Chen,Xuechao Jing etc. 220

320700

EDMA-based studies of craniofacial phenotypes in Igfb3

and Usp40 double knockout mice----- Oski Illiandri 221

328763

Schematics and comics in a regional anatomy

book----- Evelyn Jerusha Edward,Khan NLA,Zul Izhar Mohd Ismail,etc 221

亚太 D-129-0003

Research Trends and Key Areas in Virus and Gastrointestinal Mucosal Immunity:

A Bibliometric Study Spanning Four Decades ----- Zhong-xin Guo,Xue-chao Jing,Shuang Xia etc. 222

320649

Image Analysis Approach for Sex Determination Using Lumbar Vertebrae

in a Thai Population: A Pilot Study ----- Seung-Ho Han,Deog-Im Kim,Sang Su Park etc. 223

亚太 D-129-0002

Creation and Usage of Innovative Methodologies to Create 3D

Models for Anatomy Teaching and Learning ----- Liang Jie,Xu Xiangliang,Wang Diancan etc. 224



亚太 D-129-0001

Integrating 3D Printing and Multimodal AI in Anatomical Education: A Paradigm Shift
through Intelligent System Development-----Zhang Xun,Zhan Suyang,Liu Man etc. 225

● 亚太 E. Bioanthropology

318173

Visualizing spatiotemporal pattern of vascularization by
SWIR fluorescence imaging of perforator
flap transplantation-----Siriwat Thunyacharoen,Pasuk Mahakkanukrauh. 226

320702

Application of augmented reality technology in skull base
and cerebrovascular surgery -----Lei Zhao,Si-xian Lin,Wen-wu Yang etc. 226

亚太 E-129-0001

The mechanism of mitochondrial transfer in immune B cells
to regulate Alzheimer's disease.-----Xilu Hu,Xiaotong Yu,Xiu Zhang etc. 227

亚太 E-129-0003

Effect of Glasgow Coma Scale Score in Patients with Acute
Respiratory Distress Syndrome -----JieLi,Fu Ren 228

318182

汉族人脸三维数字化测量及表型特征研究 ----- Ke Ren,Xiangquan Chen 228

亚太 E-129-0002

中国健康人群和阿尔兹海默病患者头面部表型差异下
潜在的遗传变异 -----Xiuhui Ma,Hua Ma,Mengyi Yang etc. 229

亚太 E-129-0004

中国西北地区 12 个族群 Heath-Carter 法体型特征 -----Namuna Rousitmu,Youfeng Wen 230

亚太 E-129-0005

藏汉青少年人群血压与肠道菌群及代谢组相关分析 ----- Ting Lan,Youfeng Wen,Xin Li etc. 230

● 亚太 F1. Applied Anatomy: Innovation and Convergence

311550

高原藏族全基因组线粒体分析：进一步探索母系遗传结构 -----Min Suk Chung 231

317890

甘肃藏族成人的超重与肥胖 -----YU CAI,Jingqi Liu 232

318169

不同站姿与坐姿腰椎间盘负荷的有限
元分析 -----Nur Mujaddidah Mochtar,Patison Palee,Phruksachat Singsowan etc. 232

317994

膝关节精细模型构建及常见关节镜手术入路解剖结构的三维展示 -----Kewalee Pichetpan 233

亚太 F1-129-0001

数字人四链融合协同推进智慧化虚拟解剖教学范式创建 ----- Yu Cai,Jingqi Liu,Ou Sha etc. 234



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

亚太 F1-129-0002

转录组测序揭示枕下肌应对损伤的解剖生理学机制 ----- 马爱荣 235

● 亚太 F2. Innovative Techniques for Anatomical Science

318307

基于有限元分析方法对 6 岁儿童颈椎神经弓中心软骨联合

及其相关结构的力学研究 ----- Suresh Selvaraj, Tarek Abdelkader 235

320470 1~12 岁

儿童骶椎神经弓中心软骨联合形态发育解剖学研究 ----- Xiaotong Li, Airong Ma, Yan Wo 236

亚太 F2-129-0001

肌硬膜桥样结构对硬骨鱼脑脊液循环动力作用的数字解剖学研究 ----- 冯思嘉 237

亚太 F2-129-0002

高清数字人颞区筋膜和筋膜间隙的精细分割和

三维重建 ----- GUO Yi-ding, ZHANG Pei-hai, YANG Xue-jun etc. 237

亚太 F2-129-0003

基于 DTI 技术在视觉传导通路纤维束追踪成像特征的

分析研究 ----- Ting-Hua Wang, Ning Bi, Lu-Lu Xue etc. 238

亚太 F3-129-0001

成人与猕猴颈椎关节突有限元力学对比分析研究 ----- Qimei Wei, Guanghui Xiu 239

● 中 A-人类学

中 A-129-0007

基于 CiteSpace 和 VOSviewer 的解剖学领域研究热点与趋势分析 ----- 乔辉 谭婧泽 240

中 A-129-0009

肾丛神经消融的应用解剖 ----- 卢政达, 张兴华, 张玉岭等 240

中 A-129-0013

引体向上·仰卧起坐与中学生近视的相关性研究 ----- 李兆航, 韩瑗, 希露格 241

中 A-129-0019

家长的运动习惯与中学生身体素质的相关性研究 ----- 靳子冲, 毛亚琪, 胡烨等 241

中 C-129-0004

普拉提训练改善青少年特发性脊柱侧弯的效果研究 ----- 李欣, 温有锋 242

中 C-129-0005

妊娠期浮肿指数与年龄及体成分相关性的横断面研究 ----- 白静雅, 海向军, 马斌等 242

中 A-129-0011

Exercise activity promotes social interaction behavior and

ameliorates anxiety or depressive levels in mouse models. ----- 马秀慧, 马华, 杨梦怡等 243

中 A-129-0002

《运动解剖学》课程"学、讲、赛、评"四维一体教学模式的实践研究 ----- 吕婧祎, 肖瑶, 宇克莉等 243

中 A-129-0003

短波红外活体成像技术动态监测运动系统的解剖结构与功能评估 ----- 张兴华, 卢政达, 于淼等 244



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 A-129-0004

疲劳状态下羽毛球爱好者优势侧与非优势侧下肢单腿落地过程踝关节的生物力学特征 -----肖瑶,岩坎翁,宇克莉等 244

中 A-129-0005

"数字化赋能运动医学新技术"——三维重建探究 ACL 重建位点对

膝关节屈伸的影响 -----杜抱朴,刘丽,景朋等 245

中 A-129-0006

主动活动促进健康的活性组织模型 -----何佳欣,温有锋 245

中 A-129-0008

髌股关节痛人群坐站转移过程中神经肌肉调控特征分析:

基于肌肉协同与脊髓映射视角 -----刘梦菡,温有锋 246

中 A-129-0010

从骨正筋柔的因果辩证浅议下腰痛的诊治思路 -----李咏兰,韩媛,张兴华等 246

中 A-129-0012

九禽戏对超重/肥胖青少年抑郁情绪影响的肠脑轴机制 -----李兆航,韩媛,希露格等 247

中 A-129-0014

运动解剖学研究的学科方向和创新领域 -----王晶晶,韩媛,希露格等 247

中 A-129-0015

小儿 II 型副舟骨疼痛切除后胫后腱重建的改良方法 -----罗 睿,蓝婕,梁秋燕 247

中 A-129-0017

The Study of the Anatomical Relationship between

the Myodural Bridge and the Fengfu Acupoint -----玉洪荣,黄丽仟,韦灿桑等 248

中 A-129-0018

尺骨冠突桡骨骺板间长度比例在孟氏骨折肘关节稳定性中的影响 -----马斌,欧阳思维,白静雅等 248

中 A-129-0020

肌硬膜桥与风府穴解剖学位置及功能的研究 -----李泽东,于晓童 249

中 A-129-0021

55-84 岁正常人群髌臼临床解剖三维数字化研究 -----钟华,温有锋 249

中 C-129-0002

下尺桡关节解剖对应关系改变在尺骨撞击综合征治疗中的观察 -----张斐然,温有锋 250

中 C-129-0006

颈椎钩突与椎动脉间的临床应用解剖学研究 -----欧阳思维,海向军,马斌等 250

● 中 B- 人体解剖学与数字解剖学

中 B-129-0001

肩胛上动脉解剖变异类型及临床意义 -----牛升波,高捷,杜习起等 251

中 B-129-0004

基于深度学习和 X 线构建颈椎曲度参数的智能测量软件与模型验证 -----胡玉,闫帅,巩洁等 251

中 B-129-0005

不同骨盆截骨手术对髌臼中心和骨盆形态的影响 -----刘文荟,丁大伟,李辰等 252



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 B-129-0006

脊柱压缩性骨折术后疼痛解剖学基础与诊疗 ----- 张璐,马威,隋鸿锦 等 252

中 B-129-0008

二甲双胍通过抑制铁死亡与细胞凋亡双通路改善骨关节炎软骨退变的机制 -- 申晓科,张少杰,尹兆正 等 253

中 B-129-0009

药膳"续断然铜酒"对骨整合形成作用的影响 ----- 李磊,任小燕,张少杰 253

中 B-129-0010

青少年腰椎间盘突出腰椎小关节角三维数字解剖学研究及临床意义 ----- 陈程,郑楠,隋鸿锦 254

中 B-129-0012

慢性社交挫败应激诱导小鼠骨代谢功能障碍的中枢神经调控机制研究 ----- 张若琳,许瑞,刘宇微 等 254

中 B-129-0014

0-6 岁儿童枕-寰-枢复合体区发育特征的影像解剖学研究 ----- 杨洋,李琨,王星 等 255

中 B-129-0015

关节镜下腕管松解术与传统的腕管松解术治疗腕管综合征的

临床疗效对比分析 ----- 郝韵腾,张德洲,王思敏 等 255

中 B-129-0017

上肢综合感觉刺激康复方案脑卒中应用研究 ----- 罗紫艺,江艳玲,朱金凤 256

中 B-129-0002

接触性内镜在神经外科中的应用 ----- 刘明瑞,罗林聪,林涛 等 256

中 B-129-0007

胸大肌解剖指导精细化隆乳的临床实践与效果分析 ----- 张健清,徐明伟,高森宇 等 257

中 B-129-0011

不同游离皮瓣修复在手指软组织缺损的美学效果及对手指功能恢复的影响 ----- 王维兵 257

中 B-129-0013

面部注射的分层解剖与美学设计 ----- 朱凯丹,孙德鹏,严志文 等 258

中 B-129-0016

不同注射美容材料在眶周注射应用中的解剖学思考 ----- 王常安,李芊一,曹润德 等 258

● 中 C- 体质调查

中 C-129-0003

不同部位、方向及深度的面部裂伤与面神经损伤的研究体会 ----- 潘昌霖,郭金萍,乔梁 等 259

中 C-129-0007

全腹壁整形术缩小腰围的案例分享 ----- 郭鹏 259

中 C-129-0008

假体隆臀并发症的解剖学因素探讨 ----- 郭鹏 260

中 C-129-0010

隐蔽皮肤切口修复单侧微型唇裂的鼻部形态学观察 ----- 谭旭阳,汪东明 260

中 C-129-0013

面部层次解剖新视角 ----- 黄彬彬,黎芳采,韦琳钰 等 261

亚太 A1-129-0012

面部年轻化关键解剖要点及临床应用 ----- Haojie Tang,Hanjie Jin ,Zhikun Bai etc. 261



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 C-129-0001

基于乳房解剖基础上的自体脂肪移植层次探讨 ----- 张兴华,卢政达,吕婧祎 等 262

中 C-129-0009

颅面交通支的显微解剖学研究及临床应用进展 ----- 黄津容,杨渊,唐觅 262

中 C-129-0011

鼻中隔软骨-耳软骨联合移植与鼻中隔软骨移植做

鼻尖延伸移植在中国人鼻整形中鼻尖突出度的美学及稳定性比较的回顾性研究 ----- 于明扬,温有锋 263

中 C-129-0012

Mazor 脊柱机器人辅助改良经皮椎体成形术治疗腰 椎骨质疏松性骨折的疗效分析 ----- 张秋曦 263

● 中 D-运动解剖学

中 D-129-0001

福尔马林致痛早期大鼠脑屏状核的可视化激活 ----- Yan Zhibo, Sun Jinhao 264

中 D-129-0002

基于腹部增强 CT 定量评估南通地区健康人群胃周静脉正常内径范围 ----- 王文龙,庞俊华,张明靖 等 264

中 D-129-0003

基于数字人高清晰断层与 MRI 的海马结构亚区分割及辨识系统建立 ----- 陈俊 265

中 D-129-0014

基于数字人高清腕部断层与 MRI 的辨识系统建立 ----- 黄治官,谢中浩 265

中 D-129-0020

特发性脊柱侧弯患者胸廓及肋椎关节形态学研究 ----- 詹美智,陈骏杰,李正南 等 266

中 D-129-0021

不同级别的整合效应 ----- 刘承宜 266

中 D-129-0024

AI 赋能数字人 STEM-开启高效教学新模式 ----- 李磊,柳璇,刘晔 267

中 D-129-0027

基于数字影像融合与虚拟应用技术,实现数字标本补充 ----- 刘鹏 267

中 D-129-0030

基于增强 RAG 技术在医学教学问答系统中应用 ----- 张明军,张宗国 267

中 D-129-0031

物理仿真下的解剖模拟 ----- 刘鸿宇 268

中 D-129-0028

虚拟解剖手册赋能数字化解剖教学设计 ----- 索海洋,姚瑶,熊柳林 268

中 D-129-0029

3D 打印技术（膝关节半月板损伤精细仿真模拟训练器）在关节外科的辅助作用 ----- 郭瑶 269

中 D-129-0004

高精度手部精细结构重建对解剖学的重要作用 ----- 高迪,刘晔 269

中 D-129-0005

基于 3D 打印技术的心脏疾病类体系构建与产品研发 ----- 李人杰,黄治官 270

中 D-129-0006

3D 打印与多模态 AI 融合驱动的解剖学教育革新 ----- 刘建,刘坤祥 270



中 D-129-0007

基于网络药理学与多组学整合分析的杏仁核调控焦虑分子机制研究 ----- 荣雪涵,陈明杨,刘晔 271

中 D-129-0008

基于纤维束测量的对比学习精神分裂症亚型识别 ----- 陈淼 271

中 D-129-0009

绘制早期大脑成熟地图：新生儿皮层连接转变的解剖学基础 ----- 陈博思 272

中 D-129-0012

基于结构 MRI 的恒河猴大脑表面自动重建流程 ----- 吴星昱,梁慧婷,黄治官 272

中 D-129-0015

单细胞转录组学揭示非综合征性唇腭裂胎儿颞上平面的氧化磷酸化和氧化应激 ----- 史晓伟,龙丽娟 273

中 D-129-0017

焦虑与腹侧被盖区关联的分子机制分析 ----- 李旭明,梁慧婷,黄治官 273

中 D-129-0023

抑郁导致大脑海马病变的潜在靶点及机制分析 ----- 李康,李晨,刘晔 274

中 D-129-0026

Transcriptomic and functional genomic insights reveal WNT3 as a
critical modulator of human speech processing ----- 郑鸿漩,李磊,柳璇 等 274

中 D-129-0010

两种银染方法在人脑组织病理评估中的应用 ----- 王丹 275

中 D-129-0011

人脑微动脉形态学特征的数学模型构建 ----- 王丹 275

中 D-129-0016

基于脑库脑淀粉样病理改变分析 ----- 龙丽娟,史晓伟 275

中 D-129-0019

精神分裂症 21 例大脑神经病理学分析 ----- 谈纪同,刘永 276

中 D-129-0025

人脑组织库免疫组化实验流程的优化 ----- 喻羽佳 276

● 中 E1-临床解剖学

亚太 A1-129-0001

河北医科大学脑库宣传体系建设的实践与探索 ----- 刘粲,李玉飞,文捷 等 277

亚太 A1-129-0004

运动干预焦虑的潜在靶点及机制分析 ----- 姬冠佳,赖华勋,孙溢彤 等 277

中 E1-129-0001

运动和杏仁核的靶点生物信息分析 ----- 易杨非,李玉飞,文捷 等 278

中 E1-129-0002

Effectiveness Test of Black Cumin Seed Extract (*Nigella sativa*)
on the Neutrophil-to-Lymphocyte Ratio and granuloma formatin
in liver of Rats Model Infected with *Schistosoma japonicum* ----- 姬冠佳,赖华勋,孙溢彤 等 278



中 E1-129-0005

IGF-1 regulates gap junction remodeling of gastric smooth
muscle cells in diabetes gastroparesis rats through AMPK pathw----- 胡忆涵,王振宇,史国鹏 等 279

中 E1-129-0006

Poria cocos polysaccharide ameliorates colitis and
linked anxiety-like behavior through microbiota-gut-brain axis ----- 李征,吴文溢,秦晓彬 等 279

中 E1-129-0008

Impact of In Ovo and Ex Ovo Incubation Conditions on the
Morphology of the Chicken Chorioallantoic Membrane ----- 邵鹏远,史君,李琨 等 280

中 E1-129-0009

MAIS: an in-vitro sandbox enables adaptive neuromodulation
via scalable neural interfaces ----- 肖晨曦,周浩瑞,郑心彤 等 280

中 E1-129-0010

A Study on the Promotion of Rat Pressure Injury Healing by
Luteolin/Polyvinyl Alcohol/Sodium Alginate Hydrogel ----- 王星,王思敏,史君 等 281

中 E1-129-0003

Development of three-dimensional anatomy education contents:
using extended reality,automatic organ segmentation
and metaverse platform----- 沈筠恬,张晨,魏丽 等 281

中 E1-129-0004

Application of a virtual simulation dissection platform in
assisting dissection courses on the deep region of the latera ----- 孙烨,秦向征 281

中 E1-129-0007

Comparative study on the distribution of Pacinian corpuscles
in the pancreas----- 吴俊橄,樊锐,杨波 等 282

● 中 E2-骨科解剖学

中 E2-129-0001

Association of SHBG Gene Polymorphism with Body Compositions
in a Northern Population of China----- 丁一通,李玉飞,文捷 等 282

中 E2-129-0003

Sex determination of medial clavicle using histomorphology
with Artificial Intelligence in a Thai population ----- 赵庆豪,黎庆初 283

中 E2-129-0005

利手在中国北方人群中的分布特征及其 Meta 分析----- 贾祥,樊佳欣,崔永萍 等 283

中 E2-129-0006

掌骨干骨折固定方式在手指运动中的生物力学评估: 有限元研究 ----- 张智钧,杨苜梓,徐红 等 284

中 E2-129-0007

一次性力竭运动致 SD 大鼠肾脏结构损伤的时程效应研究—
基于光镜观察的病理学分析 ----- 常屹华,李筱贺 284



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 E2-129-0011

矫形鞋垫对扁平足患者下肢生物力学指标的影响 ----- 赵文君,路宇馨,董玉琳 285

中 E2-129-0013

跑步的不同训练方式对大鼠肌纤维类型损伤的影响 ----- 赵海岩,杨洋,郝韵腾 等 285

中 E2-129-0002

注意焦点变化对下肢落地缓冲动作的生物力学特征分析 ----- 左衍海,肖首允,周新初 等 286

中 E2-129-0008

以肌群训练为核心的运动解剖学教学模式应用 ----- 史国鹏,高升,王海燕 286

中 E2-129-0010

不同鞋垫对拇外翻患者跑步前后改善效果的比较 ----- 何英芄,张莹,何乐冉 287

中 E2-129-0012

被动助力外骨骼对搬运行走过程中的下肢生物力学研究 ----- 赵锦辉,郑龙坡 287

中 E2-129-0014

运动解剖学课程思政案例教学研究 ----- 刘阳 288

中 E2-129-0009

骨盆手法对骨盆旋移综合征患者疗效和足底压力即刻影响 ----- 张若帆,李筱贺 288

● 中 E3- 临床神经解剖学

中 E3-129-0002

不同方式一次性拉伸对半腱肌腱划的影响 ----- 周勇,张政,黄建新 289

中 E3-129-0008

足弓高度与刚度的性别差异及相关性分析 ----- 董银凤,邹冬冬,王旭阳 289

中 E3-129-0004

猪股骨外侧髁骨瓣的血管解剖和切取方法 ----- 孙建政,郑强,宋丽梅等 290

中 E3-129-0005

基于三维骨折地图技术的桡骨骨折线分布研究 ----- 王小峰 290

中 E3-129-0001

柯里拉京通过抑制 JNK 介导的糖酵解途径缓解 MSU 晶体诱导的
关节软骨损伤 ----- 周子璇,应奇,马鹏 291

中 E3-129-0007

温和热疗在早期通过动态调控 iNOS/Arg1 平衡促进骨修复 ----- 曹欣娅,熊柳林 291

● 中 E4-神经外科解剖学

中 E4-129-0001

3D 打印腰椎技术助力脊柱外科从经验医学迈向数字医学 ----- 邓学云 292

中 E4-129-0002

首次急性脑梗死合并高血压和糖尿病患者的梗死灶发病部位对
再复发的影响 ----- 杨建华,申杰,潘俊吉 等 292



● 中 E6-整形美容解剖学

中 E6-129-0001

术中 B 超引导功能区胶质瘤手术后患者生活质量影响的应用 ----- 秦海燕,张连波,孙湄杨 293

中 E6-129-0002

Exploration and practice of systematic anatomy

teaching empowered by DeepSeek+AI ----- 欧阳四民,赵景峰,冯光 等 293

中 E6-129-0004

The relationship between fat distribution and osteoporosis,

sarcopenia, and osteosarcopenia in adults in Xinjiang, China ----- 杨芷 293

中 E6-129-0005

Body composition phenotypes and bone mineral density

in plateau populations: A cluster analysis ----- 张吉 294

中 E6-129-0006

Research Trends and Key Areas in Virus and Gastrointestinal

Mucosal Immunity: A Bibliometric Study Spanning Four Decades ----- 刘振楠 294

中 E6-129-0008

Comparative Analysis of Acupoint Locations Between Humans

and Rats: Bridging Traditional Chinese Medicine with Modern Ex ----- 蒋萱 295

中 E6-129-0009

黄衣佉族的身体组成成分 ----- 王国民 295

中 E6-129-0010

中国海洋民族—京族的体质特征及 16 年来的变化 ----- 宋涛 296

中 E6-129-0011

中国克木人的体质特征及 17 年来的变化 ----- 张明君 296

中 E6-129-0012

北京地区现代人群第一跖骨性别差异和侧别差异研究 ----- 齐向东 297

中 E6-129-0013

藏族肺活量与肌肉质量和力量的相关性研究 ----- 刘成胜 297

中 E6-129-0014

新疆乌孜别克族行为习惯特征的分析 ----- 齐向东 298

中 E6-129-0015

中国人群的身体形态指数、身体圆度指数及其地区分布特征 ----- Feven Birara,杨晓,齐向东 298

中 E6-129-0003

西北民族走廊 10 个民族成人的体部特征 ----- 孙湄杨 299

● 中 E7 机器人手术导航解剖学

中 E7-129-0001

西北地区 15 个族群的身体围度特征 ----- 郭松 299



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

● 中 F -断层影像解剖学

中 F-129-0001

广西在校女大学生体成分与握力的相关性研究 ----- 张瑶瑶,徐焱,万法萍 等 300

中 F-129-0003

广西南部平话汉族中老年女性体成分与骨密度的相关性研究 -----汪林,崔磊 300

中 F-129-0004

临夏地区成年人群骨密度异常分布特征及影响因素分析 -----巩洁,赵振美,闫帅等 301

中 F-129-0005

基于 EDMA 的 Lrp3 基因敲除小鼠颅骨表型研究 -----李佳桐,赵振美,张忠和 301

中 F-129-0006

新疆塔城地区汉族人群骨量减少影响因素的研究 -----李 晗,闻锦旭,曹磊 等 302

中 F-129-0002

新疆地区哈萨克族及汉族成年男性吸烟与体成分的相关性研究 -----周展羽,左立平,安悦铭 等 302

● 中 G- 功能解剖学

中 G-129-0001

甘肃三特有少数民族成人围度与体成分关系研究 -----刘承宜 303

● 中 J- 智慧解剖学

中 J-129-0001

发现胸骨后肌 1 例 -----孙海燕 303

中 J-129-0002

人体节段编组的自然演化计算 -----孙雅真 304

中 J-129-0003

数字化时代下数字人系统在人体解剖学实验教学中的应用 -----王成轩 304

中 J-129-0004

臂丛变异合并肌皮神经融入正中神经变异 1 例 -----李凤英 305

中 J-129-0005

Hemp Seed Fiber Alleviates Splenic Inflammation and

Apoptosis in Aged Mice via PI3K-Akt Pathway -----王玥 305

中 J-129-0008

中国云南镇康德昂族体质特征 -----李慧锦 306

中 J-129-0009

体育锻炼对老年人体质干预效果的 meta 分析 -----李慧锦 306

中 J-129-0010

达斡尔族、鄂伦春族和鄂温克族体部特征比较 -----刘阳 307

中 J-129-0011

西藏藏族骨量减少与骨骼肌的关系研究 -----李晓童,马爱荣,沃雁 307

中 J-129-0006

基于学习通平台图片在运动解剖学教学中的应用 -----刘真,李蕴峰,李昊 等 308



中 J-129-0007

基于生物信息学分析氧化应激相关基因的运动对近视的影响 ----- 王震,刘真,李振中 308

● 中 K- 脑网络组学

中 E3-129-0006

Sestrin2 保护心脏的作用研究 ----- 张静,熊柳林 309

中 K-129-0003

最大离心与向心运动所导致的肌肉疲劳差异 ----- 吴霞 309

中 K-129-0005

脊柱侧弯成年人坐站转移时的双侧下肢肌肉激活不对称性 ----- 李德莹,初从颖,樊令仲 310

中 K-129-0007

RIPK3 通过诱导线粒体稳态失衡介导失神经肌萎缩 ----- 韦亚辉,王海艳,程禄祺 等 310

中 K-129-0009

T8-T12 脊神经后支在椎间孔及背部穿出点的解剖学研究 ----- 方长乐,王秋琳,肖秋霞 等 310

中 K-129-0010

胫骨骨膜的神经支配及分布模式研究 ----- 郑羿,熊柳林 311

中 K-129-0011

Lenke1 型青少年特发性脊柱侧凸冠状面、矢状位面参数性别差异的数字化分析 ----- 杨义辉,熊柳林 311

中 K-129-0001

I 型神经纤维瘤病合并椎动脉动脉瘤及动静脉瘘病例汇报及文献回顾 ----- 王珣璠,程禄祺,李德莹 等 312

中 K-129-0002

下丘脑室旁核调控焦虑的分子机制及网络药理学研究 ----- 王凯凯,王亚平,樊令仲 312

中 K-129-0006

周围性面瘫个性化手术治疗效果分析 ----- 梁皓烙,初从颖,樊令仲 312

中 K-129-0008

前锯肌筋膜在隆乳术及乳房重建手术中的意义与价值探索 ----- 姚瑶,熊柳林 313

● 中 L-人脑库建设与应用

中 L-129-0001

人工智能(AI)在肝细胞肝癌 TACE 诊疗中的应用进展 ----- Zixian Wang, Yanxi Chen, Gaoyu Zu etc. 313

中 L-129-0002

智慧解剖学教学实验室的建设及管理 ----- 句文怡,徐园园,付颖 等 314

中 L-129-0003

智慧解剖学时代实体标本与数字资源相结合的实验室管理 ----- 袁圆,赵越,王素 等 314

中 L-129-0004

弓状束: 狨猴和人类的趋同演化 ----- 崔祖旗,叶梦瑶,周艺 等 315

中 L-129-0005

基于机器学习算法绘制人类小脑个体化功能网络图谱 ----- 竺可青 315

中 L-129-0006

追踪神经发育过程中局部脑活动的复杂度下降现象 ----- 吴娟利,方正,胡雨婷 等 315



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 L-129-0007

运动与睡眠关联的分子机制研究 ----- 杨倩,马敏,米世雄 等 316

● 中 M1- 神经生物学

中 M1-129-0001

制作海马结构教学模型体会 ----- 穆瑞民 317

中 M1-129-0002

己糖激酶 2 调节创伤后应激障碍中星形胶质细胞-神经元丝氨酸穿梭
和机体葡萄糖代谢 ----- 冷历歌 317

中 M1-129-0003

Disfunction of dorsal raphe nucleus-hippocampus serotonergic-HTR3
transmission results in anxiety phenotype of Neuroplas ----- Cheng Jie,Chen Ling,Zheng Yani etc. 318

中 M1-129-0004

小鼠岛叶向丘脑中央内侧核投射通路参与痛信息传递与调控的机制研究 ----- 任肖,张明明,李云庆 318

中 M1-129-0009

靶向抑制 NAT10 改善慢性应激和脂多糖所致小鼠抑郁样行为 ----- 杨靖雯,王萌,徐杨 等 319

中 M1-129-0010

揭秘神经-免疫的交互作用在骨癌痛的双相机制 ----- 王长明 319

中 M1-129-0011

VTA-CL-mPFC 神经通路在甲基苯丙胺奖赏效应中的作用机制 ----- 范宇,赵子恒,何钰红 等 320

中 M1-129-0014

海马神经元周围基质网在甲基苯丙胺诱导的成瘾行为中的作用 ----- 姚嘉燊,崔艳慧,李芳 等 320

中 M1-129-0018

天麻素通过促进 Alkbh5 核转位及 Gclm 的 m6A 去甲基化
减轻缺血性脑卒中神经死亡 ----- 石金沙,杨舒涵,张幸霖 等 321

中 M1-129-0019

Nrf2 调控的 Gm26550 在小鼠学习记忆中的作用及机制研究 ----- 王宏方,左冬悦,苏兆文 321

中 M1-129-0022

FMRP 通过 β -catenin 调控 NrCAM 对海马突触蛋白 PSD95
和树突棘以及孤独症样行为的影响 ----- 王钊,陈欢,牟宸羽 等 322

中 M1-129-0012

从解剖微环境视角剖析孤独症谱系障碍患者短链脂肪酸代谢紊乱：一项荟萃分析 ----- 杨朝名,侯晓晖 322

中 M1-129-0017

神经营养因子 Nrn1 对长时程增强(LTP)的作用研究 ----- 胡钰敏,黄青芸,程雪 等 323

中 M1-129-0006

TAF15 下调有助于运动改善老年小鼠空间工作
记忆相关的认知功能 ----- 何云,闫梦婷,黄廷杰 等 323

中 M1-129-0007

运动对 3xTg-AD 雄性小鼠海马 CA1 神经元树突棘和 A β 淀粉
样蛋白的影响 ----- 许本柯,黄廷杰,闫梦婷 等 324



中 M1-129-0008

运动改善 3XTg-AD 和衰老小鼠海马依赖的空间记忆能力 ----- 黄廷杰, 闫梦婷, 何云 等 324

中 M1-129-0013

早年生活负性应激损害前边缘皮层依赖的工作记忆机制研究 ----- 闫梦婷, 黄廷杰, 何云 等 325

中 M1-129-0020

Pitolisant 对酒精成瘾相关行为的影响及机制研究 ----- 付依昕, 陈炳青, 曹国馨 等 325

中 M1-129-0021

酒精戒断致负性情绪表达伴随 RMTg 至 DRN 环路功能亢进 ----- 陈炳青, 卢凯新, 丁汝璇 等 326

中 M1-129-0023

TET1 通过调节 microRNA-30b/Nav1.6 参与奥沙利铂诱导
的神经病理性疼痛 ----- 赵森, 张晶晶, 张萌雅 等 326

中 M1-129-0024

脚桥被盖核胆碱能神经元差异性调控慢性疼痛及
相关负性情绪的环路机制 ----- 张士强, 杨艺豪, 张晶晶 等 327

● 中 M2- 神经损伤和再生

中 M2-129-0004

经颅光遗传刺激通过激活 JAK/STAT 通路促进 CST
再生修复脊髓损伤的实验研究 ----- 马媛媛, 陈虹瑛, 位庆帅 等 327

中 M2-129-0005

环状 RNA DENND1B 通过跨细胞调节轴增强血脑屏障通透性引发阿尔茨海默病认知障碍 ----- 程智 328

中 M2-129-0006

ISRIB 在链脲佐菌素所致小鼠糖尿病认知障碍中的作用 ----- Tang pingping, Wang jiale, Niu lei etc. 328

中 M2-129-0007

外源性功能线粒体移植对新生鼠缺血缺氧性脑损伤的保护作用 ----- 宋林娜 328

中 M2-129-0008

ADSC-EVs 对谷氨酸刺激下视网膜节细胞钙离子失衡的调控 ----- 段天婧, 罗爱祥, 于海洋等 329

中 M2-129-0013

米诺环素调节小胶质细胞极化改善三叉神经痛大鼠的认知功能障碍 ----- 李君洁, 米晓娟, 刘娟 329

中 M2-129-0015

A1 型星形胶质细胞 ACSL1-CPT1A 脂代谢通路功能障碍
在缺血再灌注诱导的视网膜神经元脂毒性损伤中的作用 ----- 廖峻乐, 覃良师, 陈旦 330

中 M2-129-0017

基于内源神经干细胞募集和神经刺激调控脊髓再生修复
和功能重建的研究 ----- 徐静, 孙嘉伟, 林煜健 等 330

中 M2-129-0018

不同解剖部位周围神经损伤代谢异质性的近红外二区成像研究 ----- 邵珂萌, 彭羽, 李惠珠 等 331

中 M2-129-0019

基于干细胞的工程化细胞外囊泡联合神经递送系统治疗脊髓损伤的
再生策略研究 ----- 沈瑶, 范勇, 杨雪松 等 331



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 M2-129-0011	sEH 参与调节 APP/PS1 小鼠听力损伤的机制研究-----	曹碧青,郭祥葛,王旭萌 等	332
中 M2-129-0028	通过 fMRI 分析结合 VBM 和 DTI 研究侧脑室嗅从细胞移植 对大鼠缺血性脑梗塞的治疗效果-----	秦皓玥,李靖,王廷华 等	332
中 M2-129-0001	YTHDF1-Tlr4-NF- κ B 信号轴对糖尿病合并脊髓损伤后免疫 炎症的调控作用及机制研究-----	官镇洁,于雨晴,苍叙同 等	333
中 M2-129-0002	FXR1 在糖尿病脊髓损伤大鼠模型轴突再生的作用和调控机制-----	孟鑫鑫,申颖颖,郭芷含等	333
中 M2-129-0003	LncRNA OIP5-AS1/miR-153-3p/KLF7 信号通路对周围神经损伤施 万细胞的调控机制研究-----	辛广智,孟祥云,宋润琦 等	334
中 M2-129-0009	3,6'-二芥子酰基蔗糖 (DISS) 调控 Kalirin7-BDNF 通路治疗 抑郁小鼠的机制研究-----	陈泰霖,周艳平,韦淑萍 等	334
中 M2-129-0010	海藻酸锌原位自组装水凝胶用于改善脊髓损伤微环境和促进神经再生-----	王超,张卫光	335
中 M2-129-0014	SKP-SC-EVs 通过促进施万细胞功能修复糖尿病周围神经病变的研究-----	喻妙梅,周佳艺,宋刘畅 等	335
中 M2-129-0016	神经肌肉接头对周围神经损伤修复作用的研究进展-----	王月明,邵珂萌,小仓心吾 等	336
中 M2-129-0020	miRNA-592 调控 H ₂ O ₂ 诱导的星形胶质细胞氧化应激的机制研究-----	朱益伟,李恒希,曹 艳 等	336
中 M2-129-0021	大麻二酚调控线粒体自噬改善乌头碱急性中毒致中枢神经损伤的机制研究-----	罗心园,曹艳,蒋鸿雁 等	337
中 M2-129-0022	大麻二酚对创伤性脑损伤后嗅球损伤的改善作用-----	杨楠 杨雨鹭 蒋鸿雁 等	337
中 M2-129-0023	多肽 OM-LV20 通过 FPR2/PI3K/AKT 通路减轻 TBI 诱导的小鼠 神经炎症发挥神经保护作用的研究-----	习杨彦彬,章意坚,刘丽娜 等	338
中 M2-129-0024	3D Gel 支架负载 ADSCs/Exo 修复脊髓损伤的实验研究-----	龙慧	338
中 M2-129-0025	VDAC2 介导的 BCL2 线粒体凋亡途径影响神经元钙信号调控远隔缺血后 适应脑保护的作用机制研究-----	赵文玉,马微,赵庆娥 等	339
中 M2-129-0026	新生儿缺血缺氧性脑损伤后 Pea15a 对神经的保护作用-----	甘宗晋,王廷华,熊柳林	339
中 M2-129-0027	转录组学结合网络药理学揭示 LPS 脓毒血症脑损伤新机制-----	林庚,刘雅博,苏敬阳 等	340



中 M2-129-0029

褪黑素通过调控铁蛋白自噬对慢性吗啡成瘾

小鼠多巴胺神经元保护作用的机制研究 ----- 殷露玮,谭庆围,苗雨生 等 340

中 M2-129-0030

大鼠坐骨神经损伤后 P2X7 蛋白在背根神经节

的表达变化及其在神经再生中的作用 ----- 焦玲玲,张全鹏 341

中 M2-129-0031

GelMA-HAMA 水凝胶包裹人脐带间充质干细

促进脊髓损伤功能修复与机制初探 ----- 姜基理,鲁颖,王廷华 341

中 M2-129-0032

Targeting NLRP12 to Modulate PANoptosis During

Cerebral Ischemia/Reperfusion Injury ----- Junhua Hu,Lingling Li,Xiaoyi Dun etc. 342

● 中 M3 -神经胶质

中 M3-129-0002

胆碱转运体调控少突胶质细胞分化和髓鞘形成的作用机制 ----- 刘明晨,于彬,雷琦敬 等 342

中 M3-129-0006

脱髓鞘触发的适应性髓鞘形成促进髓鞘修复和功能恢复 ----- 刘志禹,王斐,梅峰 343

中 M3-129-0008

奥培米芬促进髓鞘形成及改善中枢神经系统损

伤所致功能障碍的作用研究 ----- 刘薇,王斐,梅峰 343

中 M3-129-0013

小胶质细胞依赖 TREM2 介导的胞葬作

用调控应激小鼠神经发生 ----- 游自立,吴梓强 344

中 M3-129-0014

胶质细胞中组胺受体在缺血性脑损伤中的特异性调控作用及机制研究 ----- 蒋磊,胡薇薇,陈忠 344

中 M3-129-0005

星形胶质细胞尼古丁受体介导体感皮层痛觉感知 ----- 滕藤,李红丽,张宽 345

中 M3-129-0007

视神经中少突胶质细胞更新不足导致视神经相关轴突缺失和视力缺陷 ----- 吴双伶,直俊杰,吴昊芊 345

中 M3-129-0009

海马 CA1 区 BChE 通过星形胶质细胞与神经元的

糖代谢"交谈"调控社交隔离诱发的社会攻击行为 ----- 曾越腾,吴沙,黎正杨 等 346

中 M3-129-0001

高尿素下调 BDNF 促进少突胶质前体细胞异常增殖诱导

慢性肾病伴发焦虑症的机制研究中 ----- 张萌,胡骏逸,刘言呈 等 346

中 M3-129-0003

3D 打印在神经胶质瘤手术治疗中的应用展望 ----- 杨阳,丁兆习 347

中 M3-129-0004

组蛋白 H3K18 乳酸化修饰对高原缺氧下小胶质细胞

Nogo 受体 1 表达的影响 ----- 王子元,方金玉,程全成 等 347



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 M3-129-0011

单细胞测序结合孟德尔随机化分析揭示了少突胶质细胞与免疫失

衡相关的 ALS 机制-----刘玉谦,郭瑞云,王妮 等 348

中 M3-129-0012

Th22 细胞调控 Müller 细胞炎症反应参与糖尿病视网膜病变的机制-----王禹霏; 刘文强; 左中夫; 等 348

● 中 M4 -神经系统病变

中 M4-129-0004

老年骶段脊髓"谭氏体"和 Megaloneurite 的神经解剖学研究 -----李银花,贾云格,侯维 等 349

中 M4-129-0007

BRD7 在癫痫中的作用机制及研究 -----李语佳,陈婕,谢佳玲 等 349

中 M4-129-0011

Integration of MRI and transcriptomic profiling reveals neuroanatomical and molecular signatures in the ASD mouse model -----Ding-Ding Yang,Xuxia Wang,Funchun Lin etc. 350

中 M4-129-0012

香紫苏醇靶向 UBE2D3 减轻帕金森病小鼠模型中

小胶质细胞介导的神经炎症 -----李蔓,程全成,陈春花 等 350

中 M4-129-0014

Bmp6 介导的成纤维细胞与星形胶质细胞相互作用在帕金森

病神经炎症中的作用及机制研究 -----苏兆文,王宏方,左冬悦 351

中 M4-129-0020

过表达 Syt12 对 ALS 运动神经元的保护作用及机制研究-----张雪,赵建涛,白雪 等 351

中 M4-129-0022

Mettl3 介导 Fzd3 m6A 修饰在 ALS 运动神经元退变中的作用-----刘金梦,管英俊,陈燕春 等 352

中 M4-129-0030

远隔缺血后适应减轻缺血性脑卒中再灌注损伤的神经保护机制 -----马微,李春艳,罗懿 等 352

中 M4-129-0033

B7 家族相关分子 ERMAP 乳酸化修饰机制及其促进 M2 巨噬

细胞极化改善 EAE 的研究-----何可可,苏敏 353

中 M4-129-0035

元宝枫改善 D-半乳糖 (D-gal) 诱导的阿尔茨海默病 (AD) 模型小鼠

学习记忆障碍的物质基础及作用机制 -----高伟忠 高伟嘉 熊柳林 354

中 M4-129-0003

运动和粪菌移植对孤独症样大鼠行为及 HPA 轴的影响-----陈雪梅,侯晓晖 354

中 M4-129-0010

丘脑中央内侧核内痛痒特异性神经元的形态学及功能学研究 -----窦雪瑛,彭霏,董玉琳 355

中 M4-129-0013

Resolvin D1 联合运动康复通过 BDNF/TrkB/PI3K/AKT 通

路缓解颅内出血小鼠神经损伤 -----吕晓宇,张自有,石纯 等 355

中 M4-129-0016

小胶质细胞 TFE3 介导的吞噬功能在帕金森病中的作用及机制研究 -----王宏方,刘清,苏兆文 356



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 M4-129-0034	基于网络药理学探讨黑芝麻活性成分对 SAMP8 小鼠认知功能的改善作用 -- 谢秋梅,李育霖,柯思因 等	356
中 M4-129-0001	MPTP 诱导的 PD 模型小鼠脑尿素循环改变的病理机制研究 ----- 张盛尧,万果然,张萌 等	357
中 M4-129-0002	大鼠弓状核 Kisspeptin 神经元调控围绝经期内脏脂肪增多的机制研究----- 白钰,王文娟,孙艳荣 等	357
中 M4-129-0005	国家发育和功能人脑组织资源库中肌萎缩侧索硬化症病例的神经病理学特征 -- 代丰秋,王乃利,张迪 等	358
中 M4-129-0006	嗅球巨噬细胞在阿尔茨海默病进展中的作用研究 -----余亮,何淼	358
中 M4-129-0008	外周非伤害性感觉神经元参与神经病理性疼痛调控的研究 ----- 田小芬; 尹湘莎; 孙宝飞; 等	359
中 M4-129-0009	运动训练激活 Wnt/ β -catenin 通路改善 APOE- ϵ 4 介导的 AD 血脑屏障损伤与认知缺陷 -----杨运杰,牟连伟	359
中 M4-129-0015	间歇性低压低氧预适应通过 HIF-1 α -GADD45 α -NF- κ B 通路改善神经 炎症的机制研究 ----- 李子昂,李蔓,龚琳力 等	360
中 M4-129-0017	APOE4 介导动脉粥样硬化及帕金森病大脑黑质 tau 病理的机制研究-----丁九阳,孙宝飞	360
中 M4-129-0018	Alox12 抑制剂 ML355 改善小鼠脑缺血再灌注损伤 ----- 王涛,和祯泉,牛鹏程 等	361
中 M4-129-0019	SNAP25 在肌萎缩侧索硬化症脊髓运动神经元退变中的作用 ----- 白雪,高学帅,张雪 等	361
中 M4-129-0021	TFB2M 通过改善线粒体功能对 ALS 神经元的保护作用 -----陈晓素,管英俊,陈燕春 等	362
中 M4-129-0023	RNF122 通过泛素-蛋白酶体途径调控 ALS 中 SOD1 蛋白清除 ----- 侯羽	362
中 M4-129-0024	美洲大蠊提取物对 5 $\times$ FAD 小鼠学习记忆功能的影响及其机制研究 -----朱建华,王婷,张丽桐	363
中 M4-129-0025	血管紧张素(1-7)通过激活 Mas 受体减轻心肺复苏后脑损伤的机制研究 -----朱丽,王润	363
中 M4-129-0026	经鼻高流量氧疗对全身麻醉术后患者脑氧饱和度的影响的研究 ----- 龚雪,林敏,谢莹 等	364
中 M4-129-0027	SIRT1 通过调控 Nav1.3 介导脊髓 CaMKII α 阳性神经元的 兴奋性参与神经病理性疼痛 ----- 王源增,张义丹,马楠 等	364
中 M4-129-0028	硫酸乙酰肝素蛋白聚糖在 tau 蛋白中的研究进展 -----吴怡瞳,付源	365
中 M4-129-0029	基于纳米金刚石的 miR-7 递送系统对多巴胺能神经元的保护作用 ----- 韩玉萍	365



中 M4-129-0031

短期空间训练改善 APP/PS1 小鼠的 A β 病理和神经炎症 -----黄灿, 366

中 M4-129-0032

睡眠剥夺通过激活食欲肽信号通路促进阿尔茨海默病 Tau 病理进展-----郭茜,李宏莲 366

● 中 N- 组织学和胚胎学

中 N-129-0003

基于 GARS 基因沉默后的蛋白质组学变化解析肌萎缩的机制 -----陈鹏,杨胜波,王猛 367

中 N-129-0009

GHR（生长激素受体）阳性周细胞调节视网膜血管发育并参与 OIR

病变形成过程 -----张曦,戴宇鹏,高兴 等 367

中 N-129-0011

APOE 通过线粒体自噬影响甲状腺癌细胞凋亡的机制研究 -----孙思诺,周艳孟,王媛媛 368

中 N-129-0013

FTO 介导 Lnc RMRP m6A 去甲基化修饰在糖尿病性白内障线粒

体功能障碍中的作用及机制 -----宋沛蓉,陈鹏,谷雨 等 368

中 N-129-0014

Mitochondrial Energetic Deficiency in Corneal Epithelial Cells:

A Key Factor in Dry Eye Pathology. ----- Wenshuo Han,Fei Li,Yu Gu etc. 369

中 N-129-0017

DLEU2-ELAVL1-RCC2 轴对甲状腺乳头状癌细胞迁移侵袭的影响-----左素微,王媛媛,周艳孟 369

中 N-129-0006

IGF-1 通过 AMPK 途径调节糖尿病胃轻瘫大鼠胃平滑肌细胞

缝隙连接重构的实验研究 -----苏锦宇,张高源,张默函 370

中 N-129-0010

BACH1/ERMAP 信号轴调控胶质瘤免疫逃逸的机制与治疗意义 -----瞿勋茹,苏敏,汪祖利 370

中 N-129-0012

HSP70.1 通过抑制 PPP1CC 泛素化调控小鼠滋养外胚层发育 -----林子杭,王世鄂 371

中 N-129-0001

吴茱萸碱通过调控 TLR4-MyD88-NF- κ B 通路改善 D-gal 诱导

衰老中的炎症和肠道屏障损伤 -----万果然,张盛尧,张萌 等 371

中 N-129-0002

蛋白组学分析肌动蛋白丝组分变化以解析卒中后痉挛肌肌节变化的机制 -----杨胜波,何昀,刘光润 372

中 N-129-0004

松果体细胞通过合成内源性褪黑素降低 ROS 水平维持增殖活力 -----蓝倩云,宋军,张智广 等 372

中 N-129-0007

基于网络药理学探讨葛木芩连汤通过 cAMP-PKA-CREB 信号通路调控肠屏障和

巨噬细胞极化缓解溃疡性结肠炎的作用机制 -----张乐誉,解天俭,李姝融 等 373

中 N-129-0008

人胚胎眶上壁软骨和骨重叠发育过程的观察 -----李紫萌,孔祥攀,赵鹏 等 373



中 N-129-0015

Senolytics 对代谢综合征大鼠衰老肝细胞的清除作用研究----- 张大勇,李诚信,汪千红 等 374

中 N-129-0016

Syncytin-1 调节 CXCR4 信号通路对子痫前期滋养细胞迁移和
侵袭的影响 ----- 张海峰,王雅楠,陈雪玲 等 374

中 N-129-0018

不同染色方法对长期多聚甲醛固定组织免疫荧光染色效果的影响 ----- 皇甫李仁,熊柳林 375

● 中 O- 干细胞与发育生物学

中 O-129-0001

MSCs 联合 Atg7 介导的自噬促进骨骼肌损伤修复的机制研究 ----- 张琼尹,杨雪松,王广 375

中 O-129-0002

LDLR 通过 Wnt/ β -catenin 信号通路影响雌性小鼠骨骼
肌及骨微结构的研究 ----- 胡悦,刘慧玲,赵超越 等 376

中 O-129-0006

PDLIM2 通过 β -actin 激活 β -catenin 通路促进人脂肪干细胞化
学诱导和循环拉伸载荷成骨分化 ----- 石玉莲,樊庭宇,刘家瑄 等 376

中 O-129-0007

Zyxin/testin/ β -actin 复合物通过调控 YAP 蛋白核定位促进骨再生----- 樊庭宇,石玉莲,刘家瑄 等 377

中 O-129-0011

ADSCs 移植通过激活 PI3K/AKT/M-TOR 信号通路改善衰老睾丸
支持细胞功能的研究 ----- 江艳玲,张维炊,罗紫艺 等 377

中 O-129-0013

间充质干细胞外泌体通过 AMPK/FOXO3 信号通路抑制心肌铁
死亡改善缺血再灌注损伤 ----- 邱子雄,付泳霖,陈文杰 等 378

中 O-129-0003

携带 CHMP2B 突变的额颞叶痴呆患者来源 iPS 细胞系的建立 ----- 王佳轩,王旭萌,郭祥葛 等 378

中 O-129-0004

FAK/AKT 信号通路在幼龄大鼠颅骨生长发育
过程中的作用机制研究 ----- 张晓璐,王雷,邵国, 379

中 O-129-0005

硬脑膜中 FAK-Twist1 信号通路在幼龄大鼠颅骨生长发育中的作用机制研究 ----- 王雷,张晓璐,文平 等 379

中 O-129-0010

法洛四联症胎儿前额叶皮层神经发育异常及代偿
机制的解析 ----- 王秋林,方长乐,熊柳林 380

中 O-129-0008

过表达 CD47-APMAP 外泌体的免疫逃逸能力及其对 AD 小鼠的作用研究 ----- 刘新宇,王亚如,易西南 380

中 O-129-0009

鼻内注射干细胞/干细胞衍生物在缺血缺氧性脑损伤啮齿动物模型中的疗效:
系统回顾与 Meta 分析 ----- 吕飞 381



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 O-129-0012

人尿源性干细胞在 Muller 细胞的氧化应激损伤修复中的作用 -----王磊,王廷华 381

● 中 P -生殖生物学与生殖健康

中 P-129-0001

小鼠卵巢颗粒细胞中 PA1 在排卵和黄体生成中的作用和机制研究 ----- 胡玉暄,马君贤,李卫 等 382

中 P-129-0004

TRPV1 在隐睾小鼠生精细胞凋亡中的作用研究----- 魏金花,赵妍秋,程胖 等 382

中 P-129-0005

PA1 通过胆固醇代谢调控小鼠睾丸间质细胞睾酮合成的作用机制----- 马君贤,胡玉暄,李臻 383

中 P-129-0006

HASPIN N 端区域调控 AURKA 磷酸化及精母细胞减数分裂进程 ----- 司徒成昊,李豪杰,徐瑶婷 等 383

中 P-129-0008

脂肪干细胞调控 PERK-Nrf2 介导的信号通路改善睾丸间质细胞衰老的

作用研究 ----- 朱金凤,江艳玲,罗紫艺 等 384

中 P-129-0009

TRPS1 通过 Esrrg 调控小鼠植入前胚发育的机制研究 ----- 廖舒敏,林子杭,孙建东 等 384

中 P-129-0002

锌金属蛋白酶 ZMPSTE24 通过参与睾丸间质细胞分化和睾酮

合成影响精子发生过程 ----- 林维灿,严佳欣,韩晨阳 等 385

中 P-129-0003

锌金属蛋白酶 ZMPSTE24 对于维持正常精子发生的关键性和机制研究 ----- 林正涵,苏楠,严佳欣 等 385

中 P-129-0007

多组学解析雄性生殖衰老的免疫微环境重塑 ----- 姚嘉慧,谢云,蒋盛威 386

中 P-129-0010

睾丸支持细胞中 AMPK-ZHX2-IGF1 信号传导调控吞噬功能影响精子发生 ----- 金晓航,张胜,张煜星 等 386

● 中 Q- 肿瘤研究

中 Q-129-0001

POH1 通过稳定 Smad3 促进肺癌的侵袭转移 ----- 原旸,魏潇凡,张宏权 387

中 Q-129-0004

褪黑素通过调节树突状细胞功能改善脓毒血症 ----- 许振国,林楚欣,宋军 等 387

中 Q-129-0009

circEPB41L5 及其编码多肽 P260 通过自噬抑制胆管癌增殖的分子研究 ----- 王悦,张云山,陶陆阳 388

中 Q-129-0011

三氟甲基喹啉衍生物靶向 CTH 抗胶质母细胞瘤的活性和机制研究 ----- 罗智琼,孙宝飞,骆衡 388

中 Q-129-0012

循环肿瘤细胞异质性与乳腺癌临床相关性研究 ----- 伊曼,孙翠彬,梁敏杏 等 389

中 Q-129-0013

肿瘤抑制因子 FRMD8 缺失通过双重机制引起乳

腺肿瘤对他莫昔芬治疗耐药 ----- 武威杰,于淼,李前辰 等 389



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 Q-129-0016

PSMD10 通过上调 EMT 进程增强胰腺癌铁死亡敏感性

的作用及机制研究 ----- 张嘉敏,贾苗苗,陈文悦 等 389

亚太 A1-129-0008

基于肿瘤特异性代谢方式探究地榆皂苷 II 通过 HIF-1 α /糖

酵解轴抑制非小细胞肺癌机制的研究 ----- 张骏,卞云枫,方姿霞 等 390

中 Q-129-0002

PEA15 通过 NLRP3 介导细胞焦亡调控肝癌发展的机制研究 ----- 陈文悦,郝培培,贾苗苗 等 390

中 Q-129-0003

桑皮酮 A 通过泛素化降解 β -catenin 抑制黑色素瘤细胞增殖和迁移 ----- 张聪,张雷,邵素霞 391

中 Q-129-0006

胶质母细胞瘤单细胞分辨率解析: 内质网应激相关基因

特征与治疗预后相关性 ----- 杨雅淇,蔡小星,李静娟 等 391

中 Q-129-0017

MC1R 抑制铁死亡促进结直肠癌进展的机制研究 ----- 曾祥伟; 程清洲 392

中 Q-129-0005

褪黑素通过降低 ROS 促进 CD8⁺T 细胞活化 ----- Bi Qiaoyi,Song Jun,Zhang Zhiguang etc. 392

中 Q-129-0007

HCC 中的内质网应激生物标志物: 一种生物信息学和单细胞转录组学方法 ----- 蔡小星,杨雅淇,王廷华 393

中 Q-129-0008

肝内胆管癌中染色体外环状 DNA 的差异性表达分析及其潜在调控功能 ----- 张云山,王悦,陶陆阳 393

中 Q-129-0010

广西毛冬青根通过减轻血管损伤改善放射诱导下颌腺功能障碍 ----- 李婷,何改改,孔藿莎 等 394

中 Q-129-0014

N-亚油酰酪氨酸对宫颈癌细胞增殖和迁移的作用及其机制 ----- 张小庆,苏炳银,韩玉萍 等 394

中 Q-129-0015

敲低 FGF2 基因抑制胃肠道间质瘤 GIST-T1 细胞增殖,

迁移侵袭并促进细胞凋亡 ----- 赵庆娥,杨金伟,马微 等 394

中 Q-129-0018

PFDN2 耗竭可通过下调 UXT 激活坏死性凋亡抑制结直肠癌发生 ----- 杜若兰,薛璐璐,陈丽 等 395

中 Q-129-0019

基于 qPCR 技术的胃癌组织关键基因表达谱解析 ----- 陈国娇,王廷华 395

中 Q-129-0020

H3K27ac 调控 PTC 增殖的机制探讨 ----- 宋佳茵,左素微,孙思诺 等 396

● 中 R- 生物材料和组织工程

中 R-129-0001

RNA 甲基化转移酶 METTL3 通过 Drp1 的 m6A 修饰改善

心肌梗死的功能和机制研究 ----- 黄波月,朱楚洪,冉建华 396



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 R-129-0003

生物还原型骨小梁支架协同稀土金属钨-有机配体提高线粒体

功能促进骨修复 -----黄秀红,郑利钦,林梓凌 397

中 R-129-0005

体内合成可代谢降解的 π 共轭导电聚合物,实现无缝神经界面整合和

组织修复 -----秦银华,曲晓航,许有前 等 397

中 R-129-0008

基于 FRET 原理的 TDN 探针结合纳米流式分析用于单分泌体 miRNA 的

高灵敏检测 -----朱萍,王嘉玲 398

中 R-129-0002

pH 响应钼酸寡糖纳米制剂促进糖尿病创面愈合的研究 -----黄秀红,郑利钦,林梓凌 398

中 R-129-0004

工程化凋亡小体治疗骨关节炎 -----陈佳,王江林 399

中 R-129-0006

单细胞图谱视角下间充质干细胞来源小细胞外囊泡修复心脏缺血再灌注损伤的研究 -----王灵,王越 399

中 R-129-0007

释氧微球的制备及联合 BMSCs 促进皮肤损伤创面愈合的研究 -----许清,王倩倩,陈雪 400

● 中 S -生物组织保存与利用

中 S-129-0001

腹部脂肪纤维隔走向对吸脂术后皮肤回缩影响的超声影像预测 -----闫玉彤,樊星烨,刘姝彤 等 400

中 S-129-0002

基于 3D 面部扫描的鼻唇沟动态表情应力分布与填充剂位移相关性研究 -----于佳鑫,樊星烨,李菲菲 等 401

中 S-129-0003

全系膜食管癌切除术相关纵隔筋膜解剖学基础与临床应用研究 -----刘姝彤 401

中 S-129-0004

miR-21-5p 通过负调控 STAT3 抑制

小胶质细胞 M1 型极化缓解视网膜缺血再灌注损伤 -----覃良师,刘灿,史文佳 等 402

中 S-129-0005

脑桥网状脊髓束参与调控大鼠脑卒中后速度依赖性肌张力变化的实验研究 -----王志航,贾芳芳,杨胜波 402

中 S-129-0006

局部解剖学教学后材料塑化再利用 -----项婷娜,彭姬,孙德鹏 等 403

● 中 T- 中医形态学

中 T-129-0001

针刺合募配穴调控中央杏仁核 GABA 能神经元活性改善 CUMS 小鼠胃

功能障碍及抑郁样表型的机制研究 -----马宏坤,袁仪,王溪阳 等 403

中 T-129-0002

电针改善老龄麻醉术后认知障碍的机制 -----王兴兴 404

中 T-129-0003

1331 例云南高原地区感冒患者的中医临床证候演变分析 -----张乐誉,朱佳垚,李姝融 等 404



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 T-129-0004

基于网络药理学探讨 α -香树脂醇通过 PPAR γ -SCD/FABP3 信号轴改善糖脂

代谢紊乱治疗 T2DM 的作用机制 ----- 张乐誉,解天俭,李姝融 等 405

● 中 U- 教育教学研究

中 U-129-0001

即梦解剖学实验室：生成式人工智能驱动的视觉化学习与情感叙事 ----- 梁爽,胡霖霖,刘人静 等 405

中 U-129-0011

建构主义视域下 AI 赋能人体解剖学课程思政的创新实践与成效研究 ----- 蔡庆龙,范宇,常加松 等 406

中 U-129-0012

医工融合背景下人体解剖学教学探索与实践

——以智能医学工程专业校际联合培养为例 ----- 李莎,崔慧先 406

中 U-129-0013

小组成绩分工法教学 (STAD) 在人体解剖学实验教学中应用及评估 ----- 韦力,韦建辉,黄绍明 等 407

中 U-129-0015

基于执业医师考试形势下解剖学课程整合建设的探索 ----- 丁佳媛,阎文柱,单伟 等 407

中 U-129-0019

基于 WebGL 技术在医学教育中的应用 ----- 迟云强 408

中 U-129-0020

思政教育融入医学 PBL 教学的探索与实践 ----- 王富武,何秀全,张晓丽 等 408

中 U-129-0021

三融并行医学拔尖创新人才培养模式的探索与实践 ----- 唐炜,付元山,于胜波 等 408

中 U-129-0007

AI 技术在运动解剖学教学中的应用 ----- 姚远 409

中 U-129-0008

产学研协同创新在数字医学教育领域的实践与探索 ----- 姚卫艳,翟宏磊 409

中 U-129-0004

生成式人工智能在医学教育中应用的范围综述 ----- 张珣,占素扬,刘曼 等 410

中 U-129-0005

超声影像技术在局部解剖学教学中的应用与教学模式创新研究 ----- 孙烨,秦向征 410

中 U-129-0009

数字赋能下局部解剖学实践教学 TBL 模式研究 ----- 李剑 410

中 U-129-0010

XR 技术在人体解剖学教育教学中的应用与探索 ----- 王钰,谢仙燕,王惠国 411

中 U-129-0014

基于法医学本科生系统解剖学交叉知识点的案例撰写与归纳 ----- 杜鹃,崔慧先,张国忠 等 411

中 U-129-0016

人体解剖学在医学知识图谱中的建设与实践 ----- 王启明,何璐,闫景瑞 等 412

中 U-129-0017

社会科学性议题在系统解剖学中中枢神经系统教学中的实践与探索 ----- 杨倩,门泉仓,马敏 等 412



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

中 U-129-0018

医学院校中药学专业学生系统解剖学课程学习倦怠情况的调查分析 -----李泽东,于晓童 412

● 中 W 中国解剖学科史研究

中 W-129-0001

张岩著《人体系统解剖学》的成书研究-基于参考文献分析 -----潘 莹,崔慧先 413

● 中 X 科学普及

中 X-129-0002

小儿颅脑适应性生长 -----王羽,赵志军 413

中 X-129-0005

临床医学专业学生人体解剖学科普教育实践 -----孙德鹏,彭姬,高维 等 414

中 X-129-0006

中国短视频平台上自闭症相关视频的质量评估：一项横断面研究 -----杨瑞玲,张富深,黄菊芳 414

中 X-129-0001

内蒙古呼和浩特市中学生对青少年特发性脊柱侧凸知晓度调查与分析 -----李煜墨,于杨,赵彬 等 415

中 X-129-0003

IL-4 通过增加自噬通量和线粒体氧化应激,激活哮喘中的 ULK1/Atg9a/Rab9、NLRP3

炎症小体和高尔基体碎片 -----徐畅,陶陆阳,张云山 等 415

中 X-129-0004

人体科学馆开展基于"探究奥秘、重视健康"的青少年主题科普实践 -----王启明,何璐,杨慧 等 416

Postgraduate Forum

318289 Hemp Seed Fiber Alleviates Splenic Inflammation and Apoptosis in

Aged Mice via PI3K-Akt Pathway -----Haojie Tang 417

318461 Thiamet-G Ameliorates Parkinson Disease-associated Cognitive

Impairment via Increasing O-GlcNAcylation of STING

in Microglia-----Shuyang Chen,Shanshan Zhu,Nan Wang etc. 417

318852 Association of Socio-economic Status and Healthy Lifestyles

with NAFLD in US Adults: 1999-2014 National Health and

Nutrition Examination Survey ----- Ruoyu Gou,Danni Dou,Guanghua Li 418

320031 NIR-II Quantum Dot-Labeled Exosomes'Imaging in Treatment of

Ischemic Peripheral Nerve Injury-----Shingo Ogura,Ke-Meng Shao,Jun Chen etc. 419

320121 Sexual Dimorphic Accumulation and Propagation of

Tauopathies in Primary Age-Related Tauopathy and PS19 Mice -----Xinlu Chen 419

320357 Small Extracellular Vesicles Derived from Hair Follicle Neural

Crest Stem Cells Enhance Perineurial Cell Proliferation and

Migration via TGF- β /Smad-HAS2 Pathway-----Yiming Huo 420



320452	Mid-sagittal MRI Morphometric Study of Classical and Novel Parameters of the Corpus Callosum in the Tibetan Populations -----	Ke Zeng	421
320507	10 Hz rTMS Activated Motor Pathway and Regulated NNToid Response to Excitatory Neural Signals in Complete Spinal Cord Injury -----	Xujing	421
320530	Healthy Aging in the Longevity Village of Bama in China -----	yongxin kang,wei zhang,qingyun huang etc.	422
320573	Modified Taohong Siwu decoction promotes post-myocardial infarction repair via gut-heart axis-mediated efferocytosis enhancement in resident cardiac macrophages-----	Xiaoqi Guan,Xinxin Hou,Shuijin Shao etc.	423
320641	Near-Infrared Light Induces Neurogenesis and Modulates Anxiety-like Behavior -----	Xing Qi,Shuwei Liu,Xi Li	423
321260	Dendrobine and Erianin alleviate inflammation-induced depressive-like behaviors by targeting phosphodiesterase 4B in adolescent mice -----	Jiaming Shi	424
321420	Association Analysis the Intra-individual Structural Covariance Brain Network and Brain-gut axis Dysregulation in Individuals with Autism-----	Wangyu,Aihua Cao,Tianci Liu etc.	425
321424	The Role and Mechanism of Perineuronal Nets in the Medial Prefrontal Cortex in Methamphetamine-induced Conditioned Place Preference in Mice-----	Yao Jia-yu,Li Chang-Qi	425
321534	Melatonin Attenuates Sepsis by Modulating Dendritic Cell Function-----	zhenguo xu	426
323013	Establishment of Complete Vibrissae Paralysis via Transection of Marginal Mandibular and Buccal Branches of Facial Nerve in Rats: A Pilot Study -----	SUN QINGNING	427
325349	Plumbagin Promotes Ferritinophagy Mediated Ferroptosis in Nonfunctioning Pituitary Adenomas by Down-regulating the Nrf2/FTH1 Pathway -----	Dong Fan	427
341074	A randomized controlled study of high and low frequency transcranial magnetic stimulation in the treatment of Alzheimer's disease -----	Ting Hou,Junting Huang	428
318674	Mots-c Induced Macrophage Mitophagy via the AMPK/NLRX1 Signaling Pathway -----	Hang Liu,Siquan Wen,Yuanjie xie etc.	429
318853	Association of serum per- and polyfluoroalkyl substances and dietary live microbes with Anemia in adults: 2003-2018 NHANES -----	Ruoyu Gou,Danni Dou,Guanghua Li	429
318854	Association of multiple heavy metal exposure with hypertension: a cross-sectional study in Gongcheng County,China -----	Ruoyu Gou,Danni Dou,Guanghua Li	430
318855	Association of Dietary Intake of Saturated Fatty Acids with depression in U.S. Adults: 2005-2019 National Health and Nutrition Examination Survey -----	Ruoyu Gou,Danni Dou,Guanghua Li	431
318856	Association of dietary intake of saturated fatty acids with obstructive sleep apnea: mediating effects of Life's Crucial 9-----	Ruoyu Gou,Danni Dou,Guanghua Li	431
318859	Association of Social determinants of health and Life's Essential 8 with chronic kidney disease in US adults-----	Ruoyu Gou,Danni Dou,Guanghua Li	432



- 318860 Association between dietary patterns and metabolic syndrome
among middle-aged and elderly Yao people in Gongcheng
County, Guangxi----- Ruoyu Gou, Danni Dou, Guanghua Li 433
- 318861 Association of Life's Essential 8 with osteoarthritis in United States adults:
mediating effects of dietary Intake of Live Microbes----- Ruoyu Gou, Danni Dou, Guanghua Li 433
- 318947 Minocycline ameliorates cognitive impairment in rats with trigeminal neuralgia by
regulating microglial polarization ----- Junjie Li, Xiaojuan Mi, Juan Liu 434
- 318955 Dexras1: A Key Regulator of the Hippocampal-Hypothalamic Axis in
Stress-Related Behaviors ----- qiuyahong, zhulijuan 435
- 318964 A bibliometric and visualization analysis of electrochemical
biosensors for early diagnosis of eye diseases----- Fushen Zhang 435
- 318966 Identification and Validation of Oxidative Stress Signature Genes in the
Trabecular Meshwork of Glaucoma ----- Xu Weiye 436
- 320064 Mechanism of CRHergic pathway from CeA to vIPAG participating in the
regulation of itch ----- Xinyi Zhu, Hui Li 437
- 320124 Modulation of GABAergic neuronal activity in the central amygdala by
acupuncture improves gastric dysfunction and depressive-like phenotype in
CUMS mice ----- Hongkun Ma, Yi Yuan, XueYan Li, Xiyang Wang etc. 437
- 320401 Augmented Reality-Assisted Preoperative Planning for Basilar
Artery Aneurysm Surgery: Comparative Analysis of Subtemporal and
Orbito-Zygomatic Approaches ----- Guo Yiding, Zhao Bneqi, Zhang Peihai etc. 438
- 320549 Divergent GluA2-mediated regulation of myelination by ZCAN262:
beneficial in development but detrimental in
remyelination ----- Wu Zhonghao, Shen Yan, Jiang Zhuoxu etc. 439
- 321229 Achyranthes bidentata Blume-based medicinal and edible resources for
the prevention and treatment of ischemic stroke: A study based on
machine learning and molecular docking ----- WuDi, Lei Shen 439



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会
11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS
39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

Symposium



ID: 326679

Grow Baby Grow: Preliminary Longitudinal Investigations Into Muscle Growth And Motor Development In Infants Born At Term, Preterm

mirjal1*
University of Auckland

Children with cerebral palsy (CP) are not born with musculoskeletal impairments, but do show signs of delayed motor development, significant reductions in muscle volume and impaired musculoskeletal function through early childhood. Cross sectional studies in children with and without CP hint at a potential separation of muscle growth around 12-15 months of age. However, it is not known if impaired muscle growth through infancy is linked to delayed motor development or associated neurological injury (NI). Perhaps, instead, a delayed attainment of motor milestones, common in preterm infants, may be the cause of reduced muscle growth owing to reduced mechanical stimuli.

To quantify and compare in vivo lower limb muscle growth in typically developing term-born infants and preterm infants.

Infants born at full term (≥ 37 weeks gestational age, GA), preterm (< 36 weeks GA), or a risk of NI are completing assessments at 3, 6 and 12-months of age (corrected age if preterm), including: muscle volume (Magnetic Resonance Imaging of all muscles of the lower limb, three-dimensional ultrasound of the muscles of the triceps surae).

Twenty-four term infants have completed the study (median birth weight 3.25kg, 2.49-4.20kg, 37-42 weeks GA, 16 male).

This is the first longitudinal assessment of muscle growth with motor development through infancy, even in typically developing cohorts. Preliminary data indicate early reductions in the rate of muscle growth in our Preterm, with trajectories of motor development in accordance with their corrected age.

Keyword: Newborn, Premature, imaging, ultrasound, MRI

ID: 318170

Title: Do key measurement parameters derived from specific cervical vertebral segments differ between lordotic and non-lordotic cervical spine alignments? A study of asymptomatic young adults.

Lee Daffin
Murdoch University

Objectives Radiographic measurement parameters derived from cervical vertebral segments provide clinicians with information on cervical sagittal balance. For example, C2 slope can be used to guide pre- and post-surgical decision-making processes associated with the debilitating age-related changes of degenerative cervical myelopathy (DCM). However, in young asymptomatic adults it is unclear whether these measurement values change across the five cervical alignment subtypes and if any non-lordotic subtypes display values that are comparable to those reported for pre-surgery patients.



Methods Neutral lateral cervical radiographs of 150 asymptomatic participants (18–30 years) were taken. A multi-method protocol classified alignment as either lordotic or one of four non-lordotic subtypes. Independent samples t-tests compared key parameters - anterior translation of head measure (ATHM), C0–C2 angle, C2 and C7 slopes between lordotic and non-lordotic groups.

Results Alignment classification designated 34% lordotic (n=51) and 66% non-lordotic (n=99). There was a significant difference ($p \leq 0.0125$) between lordotic and non-lordotic groups for the C0–C2 angle, C2 and C7 slopes, with no difference for the ATHM. The global-kyphotic subtype exhibited the smallest mean C7 slope and the largest mean C2 slope and C0–C2 angle.

Conclusions The mean global-kyphotic C2-slope (23.2°) was similar to previously reported pre-operative DCM patient's mean C2-slope (22.1°). Future investigations are required to determine whether biomarkers (alignment / measurements) for spinal degenerative changes can be identified so early interventions can be enacted to limit the impact of DCM.

Keywords: C0–C2 angle, C2 and C7 slopes, Cervical sagittal alignment, Degenerative cervical myelopathy, Radiographic measurement parameters.

ID: 334603

Imaging Variable Combinations of Carpal Anatomy

Quentin Fogg
Melbourne

Objectives X-ray and CT imaging reveal a great deal of variability in carpal bone shape and arrangement. Most studies consider carpal anatomy as singular. The current study combines the data of an expanded sequence of studies to view collectively for the first time, demonstrating distinctly different carpal types. The intrinsically differing mechanics demand that treatment of these distinct types must also be different; failing to do so leads to predictable failures that match the surgical failure rates reported in the literature.

Methods Data were compiled from previous studies by the same lab. Imaging data (MRI = 30, CT = 65, X-ray = 110) from individual Body Donor wrists were reviewed and categorised into subgroups based on lunate type. Where available, data from dissection studies concurrent with given images were also evaluated.

Results Bone-based analysis led to three levels of categorisation: type 1 (single distal lunate facet), type 2 (two distal lunate facets), and type 3 (indeterminate distal lunate facet/s). The skeletal anatomy of type 1 and 2 wrists align well with the two pattern model of carpal motion. Soft tissue analyses suggest that this model also holds true anatomically, with more pronounced ligaments in type 3 wrists, and similar, yet less pronounced ligaments in some type 1 and 2 wrists.

Conclusion These data suggest that different extremes of anatomy can work in different ways to create the same global/visible motion patterns. The intrinsically differing mechanics implied demand that treatment of these distinct types must also be different; failing to do so leads to predictable failures that match the surgical failure rates reported in the literature.

Keyword: Carpal, wrist, lunate, ligament, motion



ID: 318214

Combining updated surface anatomy and ultrasound to mitigate iatrogenic injury of the spinal accessory nerve in primary care

s.barfoot34 Ali Mirjalili
University of Auckland

Objectives Using data from New Zealand's primary care treatment injury claims dataset, the spinal accessory nerve (SAN) was implicated as being at risk during minor surgical procedures in the posterior triangle of the neck, such as skin lesion removal or lymph node biopsy. The Objectives of this work are to identify the potential underlying causes for these injuries and provide advice and resources to mitigate them in the future

Methods 50 subjects underwent bilateral ultrasound of the posterior triangle of the neck. The depth, calibre and course of the SAN from where it entered the posterior triangle to where it pierced trapezius muscle was recorded and compared to the literature and common textbooks detailing its surface anatomy.

Results The SAN was visualised in all 50 patients bilaterally. The SAN's course was on average 3mm beneath the skin. Its course was either straight (56%) or tortuous (44%) and branching into 2-4 branches before entering trapezius was more common (58%) than not. Its entry into the posterior triangle and where it pierced trapezius showed a great range of variability compared to common surface anatomy resources.

Conclusion The variability in the surface anatomy and course of the SAN serves to potentially explain the incidence of iatrogenic injury. Ultrasound was demonstrated to be effective in visualising the nerve's course in all subjects and thus can be recommended for use ahead of procedures, if available. Further education on the updated surface anatomy of the nerve is also recommended to anticipate variability more effectively

Keyword: Education, Iatrogenic Injury, Surface Anatomy, Ultrasound, Variation

ID: 324738

Restoring the regenerative potential of mouse retina by blocking PROX1 transfer

Jin Woo^{1,2} Eun Jung Lee^{1,2} Museong Kim¹

1.Korea Advanced Institute of Science and Technology (KAIST)

2.Celliaz Inc.

Retinal neurons are generated during development and degenerate during lifetime. Degenerated cells can be replaced by new cells in many animal tissues that contain stem cells. Given the absence of residual retinal stem cells, degenerated retinal neurons cannot be regenerated in the retina, causing various retinal degenerative diseases. However, retinal neurons can be regenerated from Müller glia (MG) in cold-blooded vertebrates upon the injury, highlighting the incompetency of mammalian MG for retinal regeneration. We found that prospero-related homeobox (Prox1), which originates from neighboring retinal neurons via intercellular transfer, accumulated in MG and suppresses injury-induced MG reprogramming to retinal progenitor cells in mouse retinas. Based on this finding, we succeeded in inducing reprogramming of MG in the mouse retina by blocking the transfer of Prox1, consequently delaying vision loss in the retinitis pigmentosa disease model mice. Collectively, our study suggests that MG reprogramming and subsequent retinal neurogenesis in the injured mammalian retina can be recovered by blocking the transfer of PROX1 to MG.



Keyword: Retina, retinal degenerative diseases, retinal regeneration, PROX1, intercellular protein transfer

ID: 328425

Mitotic bookmarking in brain development

Yan Song^{*}
Peking University

In brain development, neural stem cells (NSCs) undergo asymmetric cell divisions to replicate themselves and meanwhile produce differentiating siblings. It remains obscure how NSCs preserve their self-renewing fate across mitosis. Even less is known how NSC-specific self-renewing fate memory is selectively erased in differentiating daughter cells. Mitotic bookmarking has been posited as an important strategy for cells to faithfully propagate their fate memory through cell generations. However, the physiological significance and regulatory mechanisms of mitotic bookmarking in brain development remain unexplored. By developing a new pipeline for enriching mitotic versus interphase cells in a drug synchronization-free manner, followed by low-input CUT&Tag-seq analysis, we recently identified TBP (TATA binding protein) as a crucial mitotic bookmarker for preserving fate memory of NSCs. Importantly, TBP achieves its mitotic retention through recruiting the chromatin remodeler EP400, which in turn increases local chromatin accessibility via depositing H2A.Z. In this talk, I will also share our unpublished work revealing, immediately after NSC asymmetric cell divisions, how cell fate memory is differentially propagated to sibling daughter cells adopting distinct cell fates. Together, our latest discoveries unveil fundamental principles underlying the preservation or erasure of cell fate memory in brain development.

Keyword: cell fate decision, cell fate memory, brain development, neural stem cell

ID: 327585

Control of Astrocyte Migration in the Developing Cerebral Cortex

NAKAJIMA, Kazunori^{*}
Keio University School of Medicine

Objective Astrocytes are one of the most abundant cell types in the mammalian brain. They play essential roles in synapse formation, maturation, and elimination. However, how astrocytes migrate into the gray matter to accomplish these processes is poorly understood. The objective of this study is to uncover how astrocytes are distributed in the developing cerebral cortex.

Methods in vitro and in vivo time-lapse observations, lineage traces, single-cell RNA-seq analyses, and flow cytometric analyses were performed.

Result Astrocyte progenitors move rapidly and irregularly within the developing cortex, which we named erratic migration. Astrocyte progenitors also adopt blood vessel-guided migration. These highly motile progenitors are generated in the restricted prenatal stages and differentiate into protoplasmic astrocytes in the gray matter, whereas postnatally generated progenitors do not move extensively and differentiate into fibrous astrocytes in the white matter. We found CXCR4/7 and



integrin are involved in regulating the blood vessel-guided migration, and their functional blocking disrupts their positioning. We are currently investigating how this integrin-dependent migration is induced and how astrocytes are distributed ubiquitously in the cortex.

Conclusion Astrocytes are distributed in the cerebral cortex using an integrin-dependent mechanism. This study provides insight into astrocyte development and may contribute to understanding the pathogenesis caused by their defects.

Keyword: astrocyte, blood vessel, integrin, migration

ID: 330662

Essential role of RNA metabolism in oligodendrocyte development

Hirohide Takebayashi^{1,2} Norihisa Bizen²

1.Center for Anatomical Studies, Graduate School of Medicine, Kyoto University, Kyoto, Japan

2.Division of Neurobiology and Anatomy, Graduate School of Medical and Dental Sciences, Niigata, Niigata University, Japan

Oligodendrocytes are glial cells that form myelin in the central nervous system (CNS) and play essential roles in supporting saltatory conduction and axon metabolism. Oligodendrocytes are generated as oligodendrocyte progenitor cells (OPCs) in the embryonic nervous system and undergo terminal differentiation in the postnatal stage. RNA regulation is thought to play an important role during oligodendrocyte development, but the detailed mechanisms remain unclear. To investigate the importance of RNA metabolism in oligodendrocyte development, we generated and analyzed genetically engineered mice with Ddx20 deletion in the CNS, a key factor in RNA metabolism, such as RNA splicing and microRNA (miRNA) generation. Ddx20 deletion resulted in massive neural stem cell and OPC cell death. RNA-sequencing analysis indicated that dysregulation of RNA splicing, including Mdm2, a regulator of p53 protein in the Ddx20 knockout spinal cord. We also indicated that activation of the p53 pathway contributes to cell death in the Ddx20 conditional knockout mice by mouse genetics experiments. Our study indicates that proper regulation of RNA metabolism via Ddx20 is essential to oligodendrocyte development.

Keyword: Ddx20, neural development, oligodendrocyte, RNA helicase



ID: 327370

Therapeutic Potential of Cannabidiol for Chronic Stress: Evidence from an Animal Model of Anxiety

Sutisa Nudmamud-Thanoi^{1,2} Wanfrutkon Waehama³ Playifah Janthueng³ Sawanya Charoenlappanit⁴ Sittiruk Roytrakul⁴ Prapapan Temkitthawon^{5,6} Paweena Kaewman^{1,2} Jureeporn Roboon^{1,2} Samur Thanoi⁷

1. Department of Anatomy, Faculty of Medical Science, Naresuan University, Phitsanulok, Thailand

2. Centre of Excellence in Medical Biotechnology, Naresuan University, Phitsanulok, Thailand

3. Medical Science Graduate Program, Faculty of Medical Science, Naresuan University, Phitsanulok, Thailand

4. National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency, Pathum Thani, Thailand

5. Faculty of Pharmaceutical Sciences, Naresuan University, Phitsanulok, Thailand

6. Center of Excellence in Cannabis Research, Faculty of Pharmaceutical Sciences and Center of Excellence for Innovation in Chemistry, Naresuan University, Phitsanulok, Thailand

7. School of Medical Sciences, University of Phayao, Phayao, Thailand

Objectives Anxiety disorders are among the most prevalent psychiatric conditions, arising from chronic stress accumulation. Cannabidiol (CBD) exhibits multiple pharmacological properties, including antioxidants, anti-inflammation, and anti-anxiety. This study investigated the effects of CBD on anxiety-like behaviors and recognition memory in a rat model of chronic unpredictable mild stress (CUMS)-induced anxiety.

Methods Male Sprague-Dawley rats were orally administered CBD while anxiety-like behaviors were induced by CUMS. Behavioral tests, including open field test (OFT), elevated plus maze test (EPM) and novel object recognition test (NOR), were performed. Proteomic analysis of rat brain tissues was subsequently conducted to characterize protein expression profiles.

Results The CUMS group exhibited increased closed arm entries in the EPM, indicating anxiety-like behavior. CBD administration in CUMS-induced rats reduced closed arm entries, indicating an anxiolytic effect. Additionally, CBD treatment improved the recognition index in the NOR test, indicating enhanced memory function. Proteomic analysis revealed differentially expressed proteins, and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway analysis showed that these proteins were primarily associated with neurotransmitter signaling, neurodegeneration, calcium signaling and neuroinflammation pathways.

Conclusion Our findings substantiate the therapeutic efficacy of CBD in anxiolytic effects and improving cognitive function in stressed subjects.

Keyword: Anxiety, Cannabidiol, Chronic unpredictable mild stress, Proteomic



ID: 327376

Anti-Inflammatory Potential of Cannabidiol-enriched Hemp Extract: Evidence from Preclinical Animal Model

Samur Thanoi¹ Ittipon Phoungpetchara^{2,3} Paweena Kaewman^{2,3} Sri-arun Iamjan⁴ Wanfrutkon Waehama^{3,5}
Plaiyafah Janthueng^{3,5} Prapapan Temkitthawon^{6,7} Sutisa Nudmamud-Thanoi^{2,3}

1.School of Medical Sciences, University of Phayao, Phayao, Thailand

2.Department of Anatomy, Faculty of Medical Science, Naresuan University, Phitsanulok, Thailand

3.Centre of Excellence in Medical Biotechnology, Naresuan University, Phitsanulok, Thailand

4.Department of Medical Sciences, Faculty of Allied Health Sciences, Burapha University, Chonburi, Thailand

5.Medical Science Graduate Program, Faculty of Medical Science, Naresuan University, Phitsanulok, Thailand

6.Faculty of Pharmaceutical Sciences, Naresuan University, Phitsanulok, Thailand

7.Center of Excellence in Cannabis Research, Faculty of Pharmaceutical Sciences and Center of Excellence for Innovation in Chemistry, Naresuan University, Phitsanulok, Thailand

Objectives Cannabidiol (CBD) has been reported to have anti-inflammatory properties. Consequently, CBD-enriched hemp extract (CHE) may effectively alleviate severe inflammatory responses. This study investigated the protective and therapeutic effects of CHE on sperm quality and organ histopathology in a rat model of lipopolysaccharide (LPS)-induced systemic inflammation.

Methods Male Sprague-Dawley rats were divided into two experimental groups to evaluate the protective and therapeutic effects of CHE. A single intraperitoneal injection of LPS (7.5 mg/kg) was administered to induce acute inflammation. For the protective experimental design, rats were orally administered CHE (containing 15 mg/kg CBD) once daily for 14 days before LPS injection. For the therapeutic experimental design, rats were administered CHE for 14 days after LPS injection. Semen was collected from the rats to assess sperm quality. The histopathology of the internal organs was examined using H&E staining and Masson's trichrome staining.

Results The results demonstrated that CHE improved both total sperm motility and concentration. Histopathological analysis revealed that CHE administration reduced tissue fibrosis and mitigated tissue damage in the liver, kidney, testis and heart.

Conclusion These findings provide evidence for the protective and therapeutic effects of CHE against LPS-induced systemic inflammation across multiple organ systems.

Keyword: Cannabidiol, Hemp, Inflammation, Lipopolysaccharide, Sperm quality

ID: 327037

Indigenous Herbal Medicines for Sleep and Memory: Insights into Neuroprotection and Cognitive Enhancement

Peeraporn Varintra¹ Mubashir Raza² Shu-Ching Shih² Li-Jen Chen³ Ingrid Y Liu¹

1.Institute of Medical Sciences, College of Medicine, Tzu Chi University, Hualien, 970374, Taiwan.

2.Department of Molecular Biology and Human Genetics, Tzu Chi University, Hualien, 970374, Taiwan.

3.College of Nursing, Divisions of Basic Medicine, Tzu Chi University, Hualien, 970374, Taiwan.

Objectives Sleep deprivation (SD) in middle-aged and elderly adults is associated with memory impairment and an increased risk of Alzheimer's disease (AD). Meanwhile, current treatments have limited success and notable side effects. TCU411 and TCU412 are indigenous herbal medicines with antioxidant properties that improve sleep quality, but their potential to prevent memory deficits remains unexplored.



Methods Six-month-old wild-type (WT) mice were assigned to four groups: 1) non-SD, 2) SD (4 hours/day for 5 days), 3) SD + 100 mg/kg TCU411, and 4) SD + 300 mg/kg TCU411, with TCU411 administered after SD induction. Similarly, six-month-old 3xTg-AD mice were divided into four groups: 1) untreated, 2) sham, 3) 10 mg/kg TCU412, and 4) 100 mg/kg TCU412, with TCU412 given as a 7-day pre-treatment and 3 hours before daily behavioral tests over 7 days. Behavioral assessments included the T-maze, open field, and Morris's water maze. Brain tissues were harvested, and protein extraction was performed to investigate the mechanisms of action.

Results TCU411 (300 mg/kg) reverses working memory deficits in SD mice by increasing PSD95 and decreasing GABABR1 overexpression in the hippocampus. We also found that TCU412 (100 mg/kg) improved working memory and spatial reversal learning deficits in 3xTg-AD mice via upregulating the TrkB/BDNF pathway and reducing hippocampal amyloid-beta oligomers.

Conclusion TCU411 and TCU412 could be promising natural remedies to prevent memory deficits in SD and AD.

Keyword: Alzheimer's Disease, Herbal medicine, Memory, Sleep Deprivation

ID: 327266

Neuroanatomical Insights into Natural Compound-Based Neuroprotection: A *C. elegans* Model Approach

Krai Meemon* Sukrit Promtang Salinthip Thongdechsri Chanathip Kamonnat Pawanrat Chalorak Tanatcha
Sanguanphun Prasert Sobhon
Mahidol University

Objectives Natural compounds are increasingly recognized for their neuroprotective potential due to diverse bioactivities and lower toxicity profiles. This study aimed to investigate the neuroprotective effects of marine-derived compounds on dopaminergic neurons in *Caenorhabditis elegans*, focusing on neuroanatomical preservation and underlying cellular and molecular mechanisms.

Methods A dopaminergic neurodegeneration model was established in *C. elegans* using 6-hydroxydopamine (6-OHDA). GFP-labeled dopaminergic neurons were used to evaluate neuronal integrity. Mitochondrial distribution, intracellular reactive oxygen species (ROS), and stress-response pathways were examined using fluorescence imaging, ROS assays, and transgenic reporters for DAF-16 and SKN-1 signaling.

Results The marine-derived compound significantly protected dopaminergic neurons from 6-OHDA-induced degeneration, improved dopamine-dependent behavior, and reduced ROS levels. It also supported mitochondrial stability and enhanced stress resistance. The nuclear translocation of DAF-16 and SKN-1 increased, along with upregulation of downstream antioxidant and detoxification genes, indicating activation of intrinsic protective pathways.

Conclusion This study demonstrates that the marine natural compound promotes structural and functional recovery of dopaminergic neurons through modulation of oxidative stress responses and cellular defense pathways. By integrating neuroanatomical analysis with molecular markers, this model provides a powerful platform to explore neuroprotective mechanisms and offers translational insights into therapeutic strategies for neurodegenerative disorders.

Keyword: *C. elegans*, dopaminergic neurons, neuroprotection, marine-derived compounds



ID: 327449

A role for ultrasound in exploring muscle architecture of the deep posterior leg muscles.

Natasha Flack* Moji Dolodolotawake Rebecca Bird Gerry Hill
University of Otago, Dunedin, New Zealand

Objectives Conservative treatment of medial arch tendinopathies requires an understanding of the anatomy of the tibialis posterior (TP), flexor digitorum longus (FDL), and flexor hallucis longus (FHL). Existing muscle data are limited to European and Asian populations. Anthropomorphically, Pasifika are larger than other ethnicities, therefore, muscle size may be too. This pilot study aimed to use ultrasound (US) to compare the volume and length of TP, FDL, and FHL between Pasifika and New Zealand (NZ) Europeans.

Methods Serial US transverse and longitudinal scans were taken along the posterior legs of five healthy Pasifika (mean age, 25.66 ± 5.9 years) and five age- and sex-matched NZ European participants. Muscle volume and length were determined using ImageJ. Means and standard deviations were calculated, and compared using a paired Student's t-test. Reliability of US scans was assessed using intra-class coefficient.

Results In comparison to NZ European data (TP: 89.1 ± 33.2 ; FDL: 26.6 ± 14.0 ; FHL: $49.6 \pm 9.4\text{cm}^3$), mean muscle volume Pasifika data were generally larger (TP: 142.1 ± 37.2 ; FDL: 35.3 ± 10.5 ; FHL: $61.6 \pm 11.7\text{cm}^3$) but only TP was statistically significant ($p=0.04$). Muscle lengths were similar. Reliability of US scans values was excellent ($0.74 - 0.99$).

Conclusion This novel study suggests there may be differences in muscle parameters specific to Pasifika, warranting further study. Ultrasound is a practical method for attainment of muscle dimension data in living individuals.

Keyword: deep posterior leg, muscle size, muscle volume, ultrasound.

ID: 327447

The validity and reliability of two ultrasound techniques for assessing hamstring muscle architecture: A cadaver and healthy participant study

Stephanie Woodley¹ Harry Ayris¹ Ryan Timmins² Natasha Flack¹
1.University of Otago, Dunedin, New Zealand
2.Australian Catholic University, Brisbane, Australia

Objectives Hamstring injuries, particularly involving biceps femoris long head (BFLh) are common in sport. Changes in muscle architecture following BFLh injury, which have implications for prognosis, can be assessed with ultrasound. The aim of this study was to assess the validity and reliability of standard static image (SI) and extended field of view (EFOV) ultrasound.

Methods Limbs from eight cadavers (5 male, 3 female; mean age 80.3 years) were used to assess BFLh architecture (muscle thickness [MT], pennation angle [PA], fascicle length [FL]), by comparing ultrasound measurements with dissection. Measurements acquired by each technique were also compared in 20 healthy participants (10 male, 9 female, 1 non-binary; mean age 19.2 years). Intra-rater reliability was assessed through repeated image analysis and repeated ultrasound scans.



Results At the femur midpoint, SI and EFOV ultrasound produced valid measurements of muscle architecture when compared to dissection (ICCs: 0.84–0.98), except for PA measured by EFOV (ICC: 0.73). EFOV demonstrated greater validity in measurements of FL than SI throughout the muscle length, but underestimated PA compared to dissection. In healthy participants high agreement was obtained for both ultrasound techniques for all architectural parameters (ICCs: 0.80–0.98). Both US techniques demonstrated acceptable intra-rater reliability (ICCs: 0.75–0.99), except for FL in repeated EFOV scans (ICC: 0.61).

Conclusion The findings highlight the strengths and weaknesses of both ultrasound techniques in assessing BFLh architecture, which require consideration when implementing this technology in clinical, sport and research settings

Keyword: anatomy, dissection, hamstring, ultrasound, validity

ID: 327154

Why does everyone feel pain differently? An anatomical exploration of cortical brain dynamics and refining neuromodulation targets in knee osteoarthritis

JerinMathew¹ Divya Bharatkumar Adhia² Dirk De Ridder² Ramakrishnan Mani³

1.Department of Anatomy, School of Biomedical Sciences, University of Otago

2.Department of Surgical Sciences, Dunedin School of Medicine, University of Otago

3.Center for Health, Activity and Rehabilitation Research (CHARR), School of Physiotherapy, University of Otago

Objectives Chronic painful knee osteoarthritis (OA) is not solely a peripheral joint disease but is increasingly associated with functional changes in the brain. This symposium presentation will discuss findings from two studies: a cross-sectional investigation exploring cortical abnormalities in individuals with knee OA, and an electroencephalography neurofeedback (EEG-NF) trial evaluating whether targeted modulation of these regions could improve clinical outcomes.

Methods In Study 1, adults with knee OA (n=37) and demographically matched healthy controls (n=39) underwent a 10-minute resting-state EEG recording (eyes closed). Source-localised EEG analyses targeted the somatosensory cortices (SSC), dorsal anterior cingulate cortex (dACC), and pregenual anterior cingulate cortex (pgACC)—regions implicated in pain processing and modulation. Relationships between cortical activity and clinical measures were explored. Study 2 involved a double-blind, sham-controlled feasibility trial in which adults with knee OA received a 3-week EEG-NF intervention across nine sessions. The protocol was designed to downregulate the infraslow activity in the SSC and dACC, and upregulate activity in the pgACC. Resting-state EEG and clinical outcomes were collected before and after the intervention to assess neurophysiological and symptomatic changes.

Results Study 1 revealed significant EEG alterations in sensory-discriminative, affective, and inhibitory brain regions, correlating with pain and function. Study 2 demonstrated that EEG-NF effectively modulated these regions, with associated clinical changes.

Conclusion These findings support a brain-based model of OA pain and suggest that EEG-NF targeting cortical dysfunction offers a promising non-invasive intervention.

Keyword: arthritis, brain-computer interface, brain networks, neurofeedback, neuromodulation, persistent pain



ID: 327456

The Role of Virtual Reality Surgical Simulation in Assessing Morphological Understanding of Slipped Capital Femoral Epiphysis

Phil Blyth*
University of Otago

Objectives Virtual reality (VR) surgical simulation represents an innovative tool for exploring how surgical trainees comprehend complex, clinically relevant anatomical morphology. Specifically, this technology provides a risk-free, immersive environment in which trainees can explore the impact of clinical conditions on the bone morphology and appreciate how this affects their clinical decisions. In the context of Slipped Capital Femoral Epiphysis (SCFE), VR simulation allows investigation of how effectively trainees recognize and respond to anatomical deformities, a skill critical to successful surgical intervention.

Methods To assess trainees' morphological understanding, a dedicated SCFE module was developed using high-resolution CT scans. This module accurately reconstructed the femoral head and neck, simulating the characteristic slippage seen in SCFE. Trainees were tasked with percutaneous placement of a single cannulated screw in the virtual operating theatre. The simulation recorded both the final accuracy of screw placement, and each prior pin placement.

Results Analysis of data from 41 orthopaedic trainees demonstrated that VR simulation was effective in differentiating individuals based on their level of training and prior surgical experience. Notably, more advanced trainees displayed a heightened ability to recognize subtle morphological changes and select anatomically appropriate interventions.

Conclusion This study highlights the significant potential of VR technology in orthopaedic education. By providing a realistic, interactive platform for practicing complex procedures, VR simulation can enhance trainees' morphological understanding and surgical decision-making skills. Ultimately, this approach promises to improve patient care by ensuring surgical interventions are guided by a thorough appreciation of clinically relevant anatomy.

Keyword: orthopaedic surgery, simulation, virtual reality

ID: 318254

Understanding the Challenges that Students Encounter during Cadaveric Dissection

Helen Nicholson Natasha Flack Shanmugapriya Aravazhi Kelby Smith-Han
University of Otago

Objectives Cadaveric dissection provides a way for students to learn anatomy, understand biological variation and approach the difficult topic of death and dying. However, some students can find dissection challenging. The objective of this study was to explore the difficulties students encounter when learning anatomy through dissection using a threshold concept (TC) framework.

Methods Online surveys and semi-structured interviews were employed to collect data from undergraduate medical, dental and science students on their experiences during dissection. Following general inductive analysis, themes which aligned with the TC framework and exhibited troublesome and transformative attributes were considered for their potential to be threshold concepts.



Results While students valued the cadaveric dissection experience, three main themes emerged: emotional, cognitive and cultural challenges, from which potential TCs were identified. How students navigated these challenges was influenced by various factors including their previous experiences, the teaching and support staff, their peers and the individual student's learning expectations.

Conclusions Cadaveric dissection is a valuable way to understand human anatomy. However, it is important to recognise that some students find the experience challenging. Understanding the troublesome emotional, cognitive and cultural challenges that students face enables educators to consider how they can put in place the appropriate support to maximise students' learning.

Keyword: cadaveric dissection, threshold concepts, emotional challenges

ID: 326267

Leveraging Cognitive Load Theory in Gross Anatomy Teaching Within the Spices Curriculum

Siti Nurma Hanim Hadie¹ Shamsi Amalina Shamsuddin¹ Nur Atiqah Sa'hari @ Ramli² Saiful Bahri Talip³ Yasrul Izad Abu Bakar²

1.Department of Anatomy, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Kota Bharu, Kelantan, MALAYSIA

2.Department of Anatomy and Physiology, Faculty of Medicine, Universiti Sultan Zainal Abidin, Malaysia

3.Department of Basic Medical Sciences, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, MALAYSIA

Objective Universiti Sains Malaysia pioneered problem-based learning (PBL) in Malaysia through the SPICES curriculum, (Simulation-based, Portfolio-based, Individualized workplace learning, Competence-based education, Electronic support, Structured workplace-based assessment). In gross anatomy, a blended approach integrates PBL, interactive lectures, technology-enhanced learning, and emerging methods such as team-based learning and work-based learning, currently at the exploratory stage. To optimize learning outcomes, a Cognitive Load Theory (CLT)-based instructional framework has been embedded into the anatomy curriculum, including lectures, PBL triggers, OSPE-based practical sessions, and learning materials. This study, part of USM's Scholarship of Teaching and Learning (SoTL) initiatives, aimed to evaluate the effectiveness of CLT-based instruction in enhancing anatomy learning.

Methods Mixed-method studies were conducted among pre-clinical medical students, assessing knowledge acquisition and retention, cognitive load, intrinsic motivation, and engagement using validated instruments. Students' learning experiences were explored through focus group discussions (FGDs). CLT-based guidelines were applied across various teaching components. Quantitative data were analyzed statistically, while qualitative feedback was thematically analyzed.

Results Students showed significant improvement in knowledge retention and understanding. Quantitative results indicated reduced extraneous load, increased germane load, and higher motivation and engagement. FGDs supported these outcomes, highlighting improved clarity, better retention, and more meaningful learning.

Conclusion Embedding CLT principles into anatomy teaching within the SPICES framework enhances cognitive efficiency and learning outcomes. These findings support the sustainability of CLT-based instruction and underscore the value of SoTL initiatives in strengthening evidence-informed anatomy education.

Keyword: Anatomy teaching and learning, cognitive load theory, scholarship of teaching and learning



ID: 318011

Public Perceptions of Human Fetal and Embryological Collections: An Ethical Analysis

Joyce El Haddad^{1,2}

1. The University of New South Wales

2. University of Queensland

Objectives This study aims to assess public perceptions towards human fetal and embryological collections, with a focus on the ethical implications of informed consent and the potential establishment of new collections.

Methods A cross-sectional survey methodology was employed, targeting a general population sample to gather data on public attitudes towards fetal and embryological collections. Participants were asked about their support for new collections, the importance of informed consent, and the ethical management of existing collections.

Results The survey yielded 313 responses. Over half of the respondents (56.5%) supported the establishment of new collections with proper informed consent. There was a notable preference for obtaining fetuses and embryos through informed consent among women, non-parents, and regular blood donors.

Conclusion The findings highlight a public discomfort with collections lacking informed consent and suggest a potential ethical framework for future collections that includes comprehensive community engagement and consent protocols. These results emphasize the need for ethical clarity and public trust in the management of fetal and embryological collections.

Ethical Approval: The study was approved by the Human Research Ethics Committee at the University of New South Wales, Sydney, Australia. Consent was obtained from all participants. No animals or human subjects were directly involved in the experimental procedures for this survey.

Funding: None.

Keyword: Informed consent, fetal collections, embryological collections, public ethics, ethical framework

ID: 318106

Is technology the next frontier to enhance gross anatomy education and improve life-long learning?

Awais Babri Amy H Chan

The University of Queensland

Introduction Gross anatomy is a core element of health professional education but faces challenges such as limited access to cadavers, ethical constraints, and the need for flexible learning approaches. Emerging technologies, including virtual reality (VR), 3D imaging, and digital platforms, offer promising solutions to improve anatomical understanding and support continuous learning. This study explores whether technology can revolutionize gross anatomy education, enhancing learning outcomes and better preparing healthcare professionals for future demands.

Materials & Methods A mixed-methods approach was used, combining a literature review of current technological applications in anatomy education with surveys (7-point Likert scale) and open-ended questions from participants (n=35) at The University of Queensland. Data on learning outcomes, student engagement, and long-term knowledge retention were collected.



Results Results show that technology-enhanced anatomy education significantly boosted spatial understanding, engagement, and accessibility. VR, 3D tools, and digital imaging systems effectively bridged gaps in traditional methods, providing immersive and interactive experiences. However, challenges such as high costs, technical issues, and the need for faculty training were noted. Students reported greater confidence and improved retention, while educators highlighted the potential for personalized and adaptive learning paths.

Conclusions Technology has the potential to transform gross anatomy education by increasing engagement and effectiveness. Despite some challenges, integrating tools like VR and 3D imaging can enhance learning and better prepare students for professional practice. Balancing innovation with ethical and practical considerations is essential for ensuring technology complements traditional anatomy education.

Keyword : Gross Anatomy Education, Virtual Reality (VR), 3D Imaging, Adaptive Learning Pathways, Anatomy Learning Tools

ID: 322020

Integrating Surface Anatomy into Clinical Practice: An Elective Course Experience for Medical Students

Cagatay Barut
Istanbul Medeniyet University

Objectives Surface anatomy plays a fundamental role in bridging theoretical anatomy with physical examination skills. This study aimed to design, implement, and evaluate an elective course titled “Surface Anatomy for Physical Examination”, intended to enhance medical students’ ability to localize anatomical structures on the living body in early medical education.

Methods The course was delivered through weekly interactive sessions, each structured around a checklist of anatomical landmarks including palpable bones, vascular structures, and organ projections. Sessions combined PowerPoint-based lectures, peer-assisted guided palpation exercises, and real-time demonstrations of how these landmarks are used in physical examinations. A full skeletal model was utilized to help students visualize spatial relationships and reinforce anatomical orientation. Two formative assessments were conducted to monitor student progress and provide feedback. In the final week, students wore white T-shirts and, in pairs, drew and labeled specific anatomical landmarks on each other according to a standardized list. These illustrations were photographed and submitted as part of their final practical evaluation.

Results Students demonstrated increased confidence in applying anatomical knowledge to live subjects. The integration of full-body skeletal demonstrations and self-directed palpation exercises improved their spatial understanding and ability to identify clinically relevant surface anatomy structures. Formative assessments confirmed progressive improvement in performance.

Conclusion This multimodal, hands-on elective course effectively supports the development of clinical examination skills through applied surface anatomy. It offers a replicable framework for preclinical education and can be adapted across various medical education environments to enhance clinical preparedness.

Keyword : Anatomical landmarks, hands-on learning, peer-assisted learning, physical examination, surface anatomy



ID: 322013

Anatomical and Histological Bone Modelling with 3D Pen: Istanbul Health and Technology University Elective Course Experience

Gkionoul Nteli Chatzioglou¹ Şinasi Bayram² Ayhan Parmaksız³ İdil Çirasun⁴

1.Department of Anatomy, Faculty of Medicine, Istanbul Health and Technology University, Istanbul, Türkiye

2.Department of Histology and Embryology, Faculty of Medicine, Istanbul Health and Technology University, Istanbul, Türkiye

3.Department of Biostatistics, Faculty of Medicine, Istanbul Health and Technology University, Istanbul, Türkiye

4.Faculty of Medicine, Istanbul Health and Technology University, Istanbul, Türkiye

Aim To evaluate the elective course of anatomical and histological modelling with 3D pens selected by the 2nd year students of the Faculty of Medicine.

Methods A total of 14/22 students chose the elective course at Istanbul Health and Technology University in 2024-2025 Fall Semester. 11/14 students provided feedback on anatomical and histological modelling by filling out the questionnaires. Open-ended questions were evaluated by thematic analysis method. Categorical data were summarized, and numerical data were summarized using arithmetic mean, standard deviation, median, minimum and maximum statistics. The relationships between numerical variables were determined by Pearson correlation coefficient. Statistical significance level was accepted as 5%.

Results Likert scale satisfaction questionnaire scores of 45.42 ± 4.25 (36-50) and 45.5 ± 4.1 (36-50) out of 50 were obtained for anatomical and histological modelling, respectively. Pearson correlation coefficients showed very strong positive correlation between the total score of satisfaction with histological modelling (SHM) and the total score of satisfaction with anatomical modelling (SAM) ($p < 0.001$). No statistically significant correlation was found between GPA score and SAM and SHM scores. From the open-ended questions, the experiences of the students were collected in 5 main themes as follows: improvement of the learning process, skill development, technical and physical difficulties, motivation and participation, suggestions and future studies.

Conclusion 3D modelling offers a more effective, sustainable and student-centred approach in anatomy education compared to traditional methods. These findings reveal the importance of technology integration in medical education.

Keyword: 3D modelling, 3D pen, anatomy education, active learning, visualization



ID: 322016

The Role of the Mastoid Foramen in Neurosurgery: Evaluation of Connection with the Groove for Sigmoid Sinus on Dry Bones

Emine Nas^{1,2} Gkionoul Nteli Chatzioglou³ Ayşin Kale² Özcan Gayretli²

1.Department of Anatomy, Institute of Graduate Studies in Health Sciences, Istanbul University, Türkiye

2.Department of Anatomy, Istanbul Faculty of Medicine, Istanbul University, Türkiye

3.Department of Anatomy, Faculty of Medicine, Istanbul Health and Technology University, Türkiye

Objective To investigate the variations of the mastoid foramen (MF) on dry human bones, which varies in number, localization and size.

Methods 74 (148 bilateral) skulls of unknown sex were included. The number, localization and size of the MF in the occipitomastoid and parietomastoid grooves, the temporal and occipital bones were evaluated. The connection of MF with the groove for sigmoid sinus was analysed and the morphometric distances were measured.

Results No MF was found in 22 of 148 bilateral skulls, totalling 370 MFs. The localization of the largest foramen of MF in each skull was examined. Accordingly; 69 were found in temporal bone, 34 in occipitomastoid groove, 17 in occipital bone, 3 in parietomastoid groove and 1 in ossa suturalia. The MF was connected to the internal part of the cranium in 64 of 126 skulls through the MF. 57 of these connections were found posterior to the groove for sigmoid sinus, 4 in the centre of the groove and 3 in the occipital bone. The average distance between the internal and external MF was 10.58±1.68 mm.

Conclusion Anatomical variability of the mastoid emissary veins within the MF plays an important role in neurosurgery. In presigmoid and retrosigmoid approaches to the cranium, inadequate identification of the mastoid process and surrounding vascular structures may cause serious bleeding risks. Therefore, detailed understanding of the anatomical variations of the MF and the vascular structures within it is of great importance to prevent potential complications in neuroanatomical surgical applications.

Keyword: mastoid foramen, neurosurgery, sigmoid sinus, temporal bone

ID: 321918

Anatomical Diversity and Dimensional Assessment of Dural Venous Sinuses within the Cranial Cavity

Eren OGUT* Cagatay BARUT

Istanbul Medeniyet University Medicine Faculty Department of Anatomy

Objectives The dural venous sinuses play a fundamental role in cerebral venous outflow, and their bony grooves on the endocranial surface reflect the underlying venous architecture of the brain. Understanding the morphometric relationship between grooves and sinus dimensions is critical for neurosurgical planning and anatomical education.

Methods This study included 30 formalin-fixed cadaveric heads. The length, width, and depth of the bony grooves corresponding to the transverse, petrosal, sigmoid, marginal, and occipital sinuses were measured. Dural sinus dimensions were also measured. Pearson's correlation analysis was used to assess the relationship between groove morphometry and sinus size.

Results Statistically significant positive correlations were observed between the width and depth of the transverse sinus grooves and the actual transverse sinus diameter ($p < 0.01$). Similarly, the



sigmoid, marginal, and petrosal sinuses showed a significant correlation between the groove depth and sinus thickness ($p < 0.05$). No significant correlation was found between the occipital sinus and the other variables. Moreover, the groove dimensions of the left and right transverse sinuses exhibited statistically significant asymmetry ($p < 0.05$), favoring the right side in most cases.

Conclusion The study reveals that certain dural sinuses, especially the transverse and superior petrosal sinuses, exhibit strong morphometric correlations with their bony grooves. These findings are clinically relevant for avoiding iatrogenic injury during posterior cranial fossa and midline neurosurgical intervention. Awareness of anatomical variations can improve surgical accuracy and reduce the risk of complications.

Keyword: Dural venous sinuses, osseous grooves, morphometry, cranial cavity, fixed cadaveric head

ID: 326493

Pushing the frontier: Transforming Anatomy Education with AI and Emerging Technologies at LKS Faculty of Medicine, HKU

Jian Yang*
The University of Hong Kong

Recent advancements in AI, VR, and 3D technologies have revolutionised medical education by enabling immersive, personalised learning. At HKUMed, we aimed to address challenges in anatomy education, such as accessibility, engagement, and clinical integration, by leveraging these tools to enhance spatial understanding, foster deep learning, and prepare students for modern clinical practice.

We implemented student-centred innovations, including VR Enhanced Tasks (VRETs), which integrate task-based, clinically oriented learning into large-scale anatomy curricula. Collaborating with students as partners, we co-designed VRETs to complement dissection classes and traditional pedagogy. Additionally, 3D scanning, AI-driven adaptive platforms, and the Technology-Enriched Learning Mezzanine (Techmezz) were deployed to support self-directed and peer-collaborative learning. Partnerships with the Hong Kong College of Surgeons extended these tools to surgical training.

VRETs significantly improved student motivation, communication, problem-solving, and knowledge retention. The majority of students reported enhanced visualisation of complex concepts and deeper engagement. Junior surgeons using VRETs demonstrated marked increases in anatomical confidence and clinical preparedness. Although the novice users highlighted initial operational challenges, students with prior VR and AI experience enjoyed the sessions more across all categories. Quantitative studies confirmed VRETs' effectiveness compared to traditional methods. HKUMed's integration of AI, VR, and 3D technologies has transformed anatomy education into an adaptive, clinically relevant ecosystem. The success of Techmezz and VRETs signifies the potential of immersive technologies to democratise access, enhance engagement, and align education with evolving healthcare demands.

Keyword: AI, VR, Education Technology



ID: 325327

Revolutionizing Anatomy Education: 3D Digital Specimens and AI-Powered Metaverse Learning

Florence Mei Kuen Mei Kuen Tang¹ Kenneth Chung Hin Lai² Cheuk Hang Siu³ Yat Shun Mak³

Hilary Ho Yuen Ng⁴ Franics Kee¹ Ellis Kin Lam Fok¹

1.SBS, The Chinese University of Hong Kong

2.Centre for eLearning Innovation and Technology (ELITE), CUHK

3.Bachelor of Medicine and Bachelor of Surgery Program, Faculty of Medicine, CUHK

4.Information Technology Services Center, CUHK

The photogrammetry for the digitalized 3D specimen (A360S) creates highly photorealistic digital models of human anatomy specimens for interactive platforms. A deep learning AI tutor, trained on a diverse array of text data from textbooks and lecture notes, generates tailored multiple-choice questions within an immersive virtual dissecting lab. This lab provides an engaging 3D environment with chatGPT and speech-to-text functionality. By leveraging the unique capabilities of emerging digital technologies, learners can thoroughly understand, memorize, and apply anatomy knowledge, stimulating both spatial and cognitive abilities. This engagement enhances their professional competence, ultimately leading to more informed and sustainable outcomes in creative learning for the next generation of learners.

Keyword: photogrammetry, digitalized 3D specimen, human anatomy, Deep learning AI tutor, ChatGPT and speech-to-text, creative learning

ID: 327443

Enhancing Medical Students' Awareness of Anatomical Variations: A Student-Created Digital Repository

Jada Chia Di Lee¹ Tomasz Stanislaw Cecot¹ Guilherme Fonseca¹ Mandy Rong Liu¹ Michael Magtoto Manio¹

Timothy Ka Chun Un² Jian Yang¹

1.School of Biomedical Sciences, Li Ka Shing Faculty of Medicine, The University of Hong Kong

2.Division of Cardiology, Department of Medicine, Queen Mary Hospital

Objectives Anatomical variations are traditionally addressed during clinical training; recent research suggests that early exposure to the clinical relevance of variations significantly enhances the understanding and retention of anatomical knowledge. This is a pilot project at HKUMed that creates a student-developed Anatomical Variations Digital (AVD) repository for preclinical anatomy education. This initiative exemplifies the integration of digital tools in medical education, aiming to better prepare students for real-world clinical practice and foster an early appreciation of anatomical diversity.

Methods During routine dissections, medical students engaged in an anatomical variation task guided by an interactive step-by-step task guide. Their observations were uploaded to the AVD repository, creating a comprehensive digital database. The repository provides two methods for evaluating students' knowledge of anatomical variations: validating identified structures on the platform and assessing quiz performance related to the AVD repository.

Results The AVD repository offers a practical and interactive approach to evaluating preclinical students' understanding of anatomical variations. It allows teachers to assess students' ability to



identify and comprehend anatomical variations through direct interaction with the digital content. This initiative enhances student motivation by increasing engagement and ownership of the learning process.

Conclusion Co-creating learning materials and assessments proves effective in higher education. The AVD repository promotes students' motivation to learn anatomical variations by fostering engagement and ownership. This innovative approach enriches the educational experience and clinical preparedness of medical students.

This project is funded by the Teaching Development Grant (TDG).

Keyword: Anatomical variations, Medical education, Teacher-student co-creation

ID: 328107

Active engagement in learning: a flipped classroom and blended learning approach

Benson, Wui-Man LAU* Joy, Chung-Man LAU
Hong Kong Polytechnic University

Objectives To enhance students' learning experiences and improve teaching effectiveness, the Human Anatomy foundation course at HKPolyU has introduced student-centered, interactive activities. These initiatives aim to boost student engagement beyond traditional, lecture-based teaching.

Methods As part of the course redesign, a dynamic flipped classroom and blended learning approach was implemented. Students completed pre-class activities—including online videos, exercises, and readings—before attending in-person sessions. Lectures were delivered both face-to-face and via live online platforms. Additional mini-lectures and online resources were made available for students to explore topics in greater depth. In-class collaborative sessions focused on case study discussions, encouraging critical thinking and communication. Innovative technologies, including virtual reality and mobile apps, were integrated alongside traditional cadaver and model-based learning to enrich the collaborative experience.

Results The revamped course combines digital and physical resources to create a multifaceted, active learning environment that emphasizes collaboration and engagement over rote memorization. Students responded positively, noting that the new approach made learning less stressful and more enjoyable.

Conclusion The adoption of a flipped classroom and blended learning model, supported by modern technology, has significantly enhanced the student learning experience in Human Anatomy. This approach may offer valuable insights for the future development of teaching methods.

Acknowledgement: The authors (JL and BL) would like to acknowledge the support of Learning and Teaching Development Seed Fund, by department of Rehabilitation Sciences, HKPolyU, (Ref no. 4.51.xx.88H).

Keyword: Flipped classroom, blended learning, engagement, experiential-learning



ID: 324458

Does Gender Influence Learning, Perceptions and Retention in Regional Anatomy Dissection Courses?

Veronica Antipova¹ Martin Siwetz¹ Franz A. Fellner^{2,3} Simone Manhal⁴ Julian F. Niedermair^{2,3}

Benjamin Ondruschka⁵ Amélie J. Poilliot⁶ Monika Wimmer-Röll⁷ Andreas Wree⁸ Niels Hammer^{1,9,10}

1.Division of Macroscopic and Clinical Anatomy, Gottfried Schatz Research Center, Medical University of Graz, Graz, Austria

2.Central Radiology Institute, Johannes Kepler University Hospital, Linz, Austria

3.Division of Virtual Morphology, Institute of Anatomy and Cell Biology, Johannes Kepler University, Linz, Austria

4.Office of the Vice-Rector for Studies and Teaching, Medical University of Graz, Graz, Austria

5.Institute of Legal Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

6.Anatomical Institute, University of Basel, Basel, Switzerland

7.Institute of Anatomy and Cell Biology, Johannes Kepler University, Linz, Austria

8.Institute of Anatomy, Rostock University Medical Center, Rostock, Germany

9.Department of Orthopedic and Trauma Surgery, University of Leipzig, Leipzig, Germany

10.Division of Biomechatronics, Fraunhofer Institute for Machine Tools and Forming Technology (IWU), Chemnitz and Dresden, Germany

Medical educators should understand the differences within the medical student population, including gender. Research on gender effects in learning and skill acquisition has yielded contradictory results, particularly in anatomy learning.

This study examined gender differences in several aspects of anatomy education. First, the ability of undergraduate medical students to identify anatomical structures was assessed to determine gender differences in learning gains. Second, learning outcomes were compared between a 3-month and a 1-month regional anatomy course, with attention to gender. Third, knowledge retention was evaluated at 6- and 12-month follow-ups. Finally, student perceptions of different embalming methods for anatomy learning were assessed with a focus on gender.

Minor differences were observed between genders across different regions in learning gains. Scores from the 3-month course were higher than those from the 1-month course, regardless of gender, particularly for the neck, thorax, and abdomen. A significant knowledge gain was noted in abdominal anatomy at the 6- and 12-month follow-up: scores improved by 56% in females and by 68% in males. The comparison of Thiel- versus ethanol-based embalming revealed gender differences regarding tissue pliability and the utility of tissues for achieving learning Objectives .

Subtle differences appear to exist between female and male students in terms of perceptions and learning outcomes in gross anatomy dissection courses. These findings will be useful in developing new curricula for undergraduate medical students, taking into account gender differences in the context of regional anatomy dissection courses.

Keyword: embalming, gender difference, objective structured practical examination, regional anatomy dissection course, undergraduate medical education



ID: 327211

Should Mesoscopic Anatomy be included in human structure courses?

Zhang Ming
Chinese University of Hong Kong - Shenzhen

In current anatomy textbooks, human anatomy is defined to study human structures macroscopically and microscopically. Mesoscopic anatomy provides morphological insight into the scale (sub-mm) existent between microscopy (μm) and macroscopy ($>\text{mm}$). More importantly, it emphasises three-dimensional functional territories of the human body. Mesoscopic anatomy is a rapidly evolving field in both morphological research and education. In this presentation, the author will introduce the newly redefined definition of human anatomy and present several examples, from both medical teaching and research perspective, to demonstrate why it is necessary to include mesoscopic anatomy in human structure courses. The author will also highlight some challenges and opportunities that are brought forth by mesoscopic anatomy and will foster a closer collaboration between the mesoscopic anatomy and its translation into various practical disciplines.

Keyword: Mesoscopic Anatomy, human structures, Teaching and Research

ID: 327415

Cinematic Rendering in Virtual Anatomy Education: Findings, Ongoing Studies, and Educational Impact

Julian F Niedermair^{1,2} Niels Hammer^{3,4,5} Veronica Antipova³ Franz A. Fellner^{1,2}

1. Central Radiology Institute, Johannes Kepler University Hospital, Linz, Austria

2. Division of Virtual Morphology, Institute of Anatomy and Cell Biology, Johannes Kepler University, Linz, Austria

3. Division of Macroscopic and Clinical Anatomy, Gottfried Schatz Research Center, Medical University of Graz, Graz, Austria

4. Department of Orthopedic and Trauma Surgery, University of Leipzig, Leipzig, Germany

5. Division of Biomechanics, Fraunhofer Institute for Machine Tools and Forming Technology (IWU), Chemnitz and Dresden, Germany

Objectives Johannes Kepler University Linz implemented an innovative blended-learning approach to anatomy education: medical students complete a traditional dissection course at the Medical University of Graz, followed by a virtual anatomy course in Linz using Cinematic Rendering and radiological imaging. This study explores the educational value of a Cinematic Rendering-based virtual anatomy course in supporting both dissection-based and radiological anatomical knowledge.

Methods To evaluate the impact of the virtual anatomy course, two studies were conducted on: (1) dissection-based knowledge in thoracic, abdominal, and pelvic anatomy, and (2) radiological anatomy knowledge in neuroanatomy and musculoskeletal anatomy.

Study one included 108 and study two included 178 students. Objective Structured Practical Examinations (OSPEs) were conducted before and after the course: in study one, on human anatomical specimens, and in study two, on cross-sectional radiological images. In both examinations, anatomical structures were marked, and students were asked to identify them, allowing assessment of anatomical understanding.

Results Cinematic Rendering-based anatomy teaching did not lead to significant gains in dissection-related anatomical knowledge. However, a significant improvement was observed in



radiological anatomical knowledge, suggesting that Cinematic Rendering can effectively enhance students' ability to interpret cross-sectional imaging.

Conclusion While Cinematic Rendering may not directly improve dissection-based anatomy knowledge, it offers a powerful tool to enhance understanding of cross-sectional anatomy and radiological imaging. This supports its integration into blended and digitally supported anatomy curricula, particularly at universities with limited access to human specimens.

Keyword : Anatomy education, Cinematic Rendering, Cross-sectional imaging, Radiological anatomy, Virtual anatomy

ID: 323854

Anatomy at the Frontier: Pioneering Medical Training in the Era of Surgical Specialization

niels.hammer@medunigraz.at*

Medical University of Graz

Background Medical education undergoes vast transformation, a decreasing emphasis on undergraduate anatomy teaching, and dissection-based training. These changes challenge the training of future medical doctors. In contrast, recent advancements in surgical subspecialties and allied health disciplines have further increased the demand for specialized training. This presentation shares experiences from our institution on adapting undergraduate and postgraduate training to meet evolving needs in medicine, while at the underpinning the role of anatomy as a pillar of medical education.

Methods A comprehensive review of the Medical University of Graz anatomy's approach to undergraduate and postgraduate training was conducted, with emphasis on the integration of translational anatomy. A focus was laid on balancing undergraduate training with advanced, hands-on postgraduate programs to reflect the latest surgical and technological advancements and address needs in self-efficacy.

Results Postgraduate training based on human tissues demonstrates significant value by addressing those gaps left by minimized undergraduate exposure, transforming the anatomy laboratory into a quasi-clinical environment. This approach supports the development of specialized skills and competencies. It integrates traditional anatomical principles with cutting-edge methods, while establishing anatomy as an ideal training platform in realism and in educational impact.

Conclusion Despite all the challenges posed by recent changes in undergraduate exposure to traditional anatomy, postgraduate anatomy education grows in being adaptable, and indispensable. Our journey at a core European center illustrates how translational anatomy may support a variety of medical specialties, thereby ensuring that future healthcare professionals remain well-equipped for the clinical setting.

Keyword: Anatomy training, postgraduate, self-efficacy, undergraduate, workshop



ID: 317992

Is There Any Novel Insert Points both Benefit for Anatomy and Biomechanical Part in Treating Humeral GT (Liu-Gang type I&II) Fracture

GANG-LIU Pasuk Mahakkanukrauh*

Department of Orthopedics and Center for Orthopedic Diseases Research, Affiliated Traditional Chinese Medicine Hospital of Southwest Medical University, Lu Zhou, China

Cannulated screws are among the most commonly used techniques for treating humeral greater tuberosity (HGT) split fractures (Liu-Gang types I and II). However, this traditional method is associated with various complications. Additionally, the specific neurovascular alignment of the greater tuberosity region, particularly in the En-face view, has not been thoroughly investigated. Therefore, we analyzed the neurovascular distribution across 15 zones of the En-face view of the HGT and designed three distinct insertion points for 3D-printed guider. Our aim is to identify novel insertion points that optimize both anatomical and biomechanical outcomes.

Keyword: Humeral greater tuberosity split fractures; Liu-Gang types I and II; 15 zones; Fresh-frozen cadavers

ID: 317976

The Foot Core System and its Role in Musculoskeletal Rehabilitation: From Clinics to Laboratory

Chich-Haung Richard Yang^{1,2,3} Tunpisith Jeamsupakorn² Pasuk Mahakkanukrauh⁴ Aatit Paungmali⁵
Shin-Yuan Chen^{2,6}

1.Department of Physical Therapy, College of Medicine, Tzu Chi University

2.Institute of Medical Sciences, College of Medicine, Tzu Chi University

3.Department of Biomedical Science and Engineering, College of Biomedicine and Innovation Technology, Tzu Chi University

4.Faculty of Medicine, Chiang Mai University, Thailand

5.Faculty of Associated Medical Sciences, Chiang Mai University, Thailand

6.School of Medicine, College of Medicine, Tzu Chi University

The core system, which includes muscles, tendons, and ligaments, forms an intricate structure that helps to form archings of the feet and aids in the stability and alignment of the body during movement in conjunction. Current research has identified it as important in preventing and treating musculoskeletal conditions. To improve balance and mobility in the elderly population and to provide new ideas for rehabilitation, our multidisciplinary team has also applied 3D printing technology. We have also accurately estimated the intrinsic plantar muscles with sonographic imaging to link the muscle architecture with clinical practice.

Keyword: Foot Core System, Intrinsic Foot Muscle, 3D Printing, Sonography



ID: 317989

Musculoskeletal Anatomy and Advancements in Ultrasound-Guided Interventions

YNakanishi

奈良医科大学

Recent advancements in ultrasound technology have expanded its use in diagnosing and treating musculoskeletal disorders. Ultrasound-guided interventions offer a promising, minimally invasive alternative for treatment. However, correlating ultrasound imaging with precise anatomical structures is essential to enhance the effectiveness and reproducibility of these treatments. This presentation explores the advancements in ultrasound-guided intervention techniques while emphasizing the importance of anatomical understanding in clinical applications.

Keyword: musculoskeletal anatomy, ultrasonography, ultrasound-guided intervention

ID: 317991

Advancing Forensic Osteology Research: The Transformative Role of Artificial Intelligence

Pasuk Mahakkanukrauh

Department of Anatomy, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

Our research focuses on biological identification, particularly in the context of natural disasters, where it has significant humanitarian implications. While DNA analysis remains the gold standard for identification, there are cases where examining dry bones becomes a last-resort option when DNA is not viable. Our research has well-documented and established the importance of skeletal remains in identifying human bodies. However, there is a growing trend toward developing user-friendly methods for forensic identification.

Keyword: Forensic osteology, Artificial Intelligence, Identification



ID: 327021

Maternal Socioeconomic Status and Placental Changes in Preterm Births in Kazakhstan

Gulmira Zhurabekova^{1,2} Oralkhan Zhibek¹ Berdalinova Akzhenis² Balmagambetova Aru²

1. Al-Farabi Kazakh National University

2. Marat Ospanov West Kazakhstan Medical University

Background Preterm birth (PTB) is a complex condition contributing significantly to neonatal morbidity and mortality. The impact of maternal social status on PTB remains underexplored in Central Asia.

Objective This study aimed to examine the relationship between maternal social status and placental morphological characteristics in preterm births across three regions of Kazakhstan.

Methods A case-control study included 270 postpartum women, with 90 singleton PTB cases categorized as extremely preterm (EPTB, n=17), very preterm (VPTB, n=37), and moderate to late preterm (MLPTB, n=36). Data were collected via questionnaires, medical records, and histological examination of placental tissue using standard criteria.

Results Women with a history of PTB had higher odds of recurrent PTB. Periodontitis during pregnancy doubled the risk of PTB, with similar trends observed in EPTB and VPTB subgroups. In MLPTB, PTB history and maternal education were associated factors, whereas periodontitis showed no significant association. Histological analysis showed the preterm group had increased intermediate villi (7.44 ± 8.46), circulatory disturbances (68.2%), central villous vessel positioning (59.7%), and thickened fibrinoid layers (87.6%).

Conclusion Prior PTB was the strongest predictor of recurrence. Additional factors included teen pregnancy, pre-gestational BMI, primigravida status, and poor general and periodontal health. Placental histology revealed distinctive structural changes in PTB cases, underscoring the role of placental abnormalities in PTB pathogenesis. These findings emphasize the importance of early placental monitoring in pregnancies at risk of preterm delivery.

Keyword: preterm birth, placental morphology, socioeconomic status, Kazakhstan

ID: 326675

Single-Cell Lineage Tracing in Cancer Study

Kai Miao^{*}

University of Macau

Cancer metastasis is the primary cause of cancer-related death, yet the capability that engaging cancer cells to adapt and colonize in the distinct organ remains elusive. Tumor cells derived from the same progenitor cell exhibit different gene expression patterns in different soils, and the cancer cell tumor microenvironment communication paradigm varies significantly between primary and metastatic tumors. In this study, we will develop a cell cycle-dependent single-cell evolving lineage tracing system, which could trace every newly proliferated cell to achieve the evolving lineage tracing with cell cycle resolution, to illustrate the tumor cell colonization phylogenetic tree.

Keyword: cancer metastasis, lineage tracing



ID: 326778

Mechanisms and Interventions in Gastrointestinal Aging: from Triggers to Strategies

Tingyi Sun
Capital Medical University

Age-related alterations in the gastrointestinal tract are significantly associated with an increased risk of various prevalent chronic diseases, which impose considerable medical and socioeconomic burdens. It is necessary and urgent to elucidate the mechanisms that trigger gastrointestinal aging and to develop intervention strategies to delay this process. To address these issues, we conducted a series of studies. Our findings indicate that persistent oxidative stress during aging acts as an initiating factor, leading to blocked glycosylation of mucins and reduced mucus secretion. This results in the deterioration of the mucosal barrier and facilitates bacterial translocation. The disruption of gut homeostasis, coupled with sustained mild inflammatory stimulation, further induces phenotypic transformation of intestinal muscularis macrophages and a subsequent reduction in interstitial cells of Cajal and enteric neurons, which are essential for regulating peristalsis. This leads to decreased intestinal motility, which in turn increases susceptibility to infection and inflammation. Our research indicates that disruption of gut homeostasis in the elderly is not only a high-risk factor for age-related diseases but also represents the potential target for mitigating gastrointestinal aging. Given the roles of melatonin and *Lycium barbarum* in antioxidation, anti-inflammation, and microbiota regulation, we selected them for animal experiments. Our observations demonstrated the efficacy of them in promoting probiotic colonization, improving mucosal barrier function, and restoring the intestinal microenvironment, thereby preventing colorectal inflammation and enhancing bowel motility. Overall, our series underscores that gastrointestinal aging can be delayed through appropriate and timely interventions, which may also prevent related diseases.

Keyword : senescence, gut microbial homeostasis, intestinal mucosal barrier, intervention strategies, inflammatory bowel disease

ID: 326673

Mechanoresponsive Periosteal Stem Cells Drive Bone Regeneration during Distraction Osteogenesis

Rongjie Wu Sien Lin^{*}
The Chinese University of Hong Kong

Background Periosteal stem cells (PSCs) are key contributors to bone repair, yet their mechanoresponsive mechanisms during distraction osteogenesis (DO) remain unclear. This study is to elucidate how PSCs respond to tensile strain to promote osteogenesis, offering insights into mechanical stimulation's role in bone regeneration.

Methods We compared the effect of cell therapy by using PSCs and bone marrow-derived mesenchymal stem cells (BMSCs) in a periosteum-defective bone lengthening rat model. The animals were treated under anaesthesia and sacrificed upon euthanized. DO callus and bone defect tissues were measured by bulk RNA-seq, qRT-PCR, and single-cell RNA sequencing analysis. Ex vivo mechanical stretching assay was applied in PSCs to verify the in vivo findings.



Finally, PI3K-AKT pathway activator or inhibitor was tested in bone lengthening and transport models, respectively.

Results PSCs predominantly drove DO callus formation versus BMSCs, with PI3K/AKT pathway enrichment. Akt1 inhibition delayed union, while PI3K activation enhanced consolidation and PSC marker expression. DO callus exhibited embryonic-like skeletal development, with a PSC subgroup expressing embryonic skeletal genes. Tensile stress upregulated stemness markers (e.g., Grem-1) and activated Wnt signaling in PSCs.

Conclusion PSCs are essential mechanoresponders in DO, with PI3K activation presenting a therapeutic strategy to boost regeneration and prevent nonunion. DO regeneration recapitulates embryonic skeletal growth, marked by PSCs adopting developmental signatures. These findings clarify PSCs' central role in mechanotransduction, revealing mechanisms by which mechanical cues promote osteogenesis and potential for mechanical reprogramming of PSCs.

Keyword: Distraction osteogenesis, Periosteal stem cells, Mechanotransduction

ID: 334607

The distinct top-down and bottom-up role of mPFC-claustrum interconnectivity in the encoding and retrieval of methamphetamine reward memory

Xiaowei Guan

Nanjing University of Chinese Medicine

Objectives Methamphetamine (METH) addiction or dependence is primarily driven by its effects on the reward and impulsive control. Emerging evidence highlights that both claustrum (CL) and medial prefrontal cortex (mPFC) are pivotal in drug addiction and the reinforcing effects of conditioned drug-associated cues. Although these two regions are anatomically and functionally interconnected, the precise neural circuit governing their role in addiction remains poorly understood.

Methods Here, we employed viral neural tracing, in vivo fiber photometry, chemogenetics, optogenetics and electrophysiology, alongside a METH conditioned place preference (CPP) experimental model, to dissect the structural and functional properties of the CL-mPFC circuit.

Results 1) The CL-mPFC circuit consists of two relatively independent neural pathways, incorporating both direct and indirect projections. 2) Under physiological conditions, the indirect pathway exerts strong feedforward inhibition, but this inhibition diminishes during METH CPP. 3) The mPFC-CL pathway primarily facilitates communication between the left and right hemispheres of the brain, while the CL-mPFC pathway predominantly connects regions within the ipsilateral hemisphere. 4) The CL-mPFC circuit plays distinct roles in associative memory processes, with the CL-mPFC pathway facilitating memory retrieval and the mPFC-CL pathway driving memory formation.

Conclusion These findings provide novel insights into the structural and functional organization of the CL-mPFC neural circuit, elucidating the circuit-level mechanisms underlying METH-induced associative learning, offering a foundation for targeted interventions in addiction treatment.

Keyword: Claustrum; CL-mPFC Circuit; Medial Prefrontal Cortex; Methamphetamine; Rewarding Effects



ID: 341737

Neural circuits mechanism of withdrawal memory retrieval

Xinli Guo Yu Yuan Ke Xu Huang Sheng Bin Lai Ping Zheng Ming Chen^{*}
Fudan University

Objectives To investigate the neural circuits and molecular mechanisms underlying the context-induced retrieval of morphine withdrawal memory, focusing on the roles of specific projection neurons in the basolateral amygdala (BLA) and nucleus accumbens (NAc).

Methods We used immunofluorescence staining and chemogenetic methods to assess their role in context-induced retrieval of morphine withdrawal memory. We also employed fluorescence-activated cell sorting (FACS), qRT-PCR, and electrophysiological recordings to investigate context-induced neural plasticity changes in these neurons.

Results The activation of ERK in BLA-NAc neurons was identified as an upstream mechanism for the context-induced increase in Arc expression, which is crucial for memory retrieval. Furthermore, dopamine D1 receptors in BLA-NAc neurons were shown to modulate ERK activation, highlighting their role in the retrieval process.

Conclusion The findings emphasize the importance of ERK signaling and dopamine D1 receptors in BLA-NAc neurons for this process, providing insights into the neural and molecular substrates of drug withdrawal memory.

All experimental procedures were approved by the Animal Care and Use Committee of the Shanghai Medical College of Fudan University (No. 20200306-148). This work was supported by grants from the Science Technology Innovation 2030 of China and Foundation of National Natural Science of China.

Keyword: Withdrawal memory retrieval, Basolateral amygdala, Nucleus accumbens

ID: 329874

The Role of Nucleus Basalis of Meynert Cholinergic Neurons in Sleep-Wake Regulation

张凯莹
复旦大学

Objectives The basal forebrain (BF) enables cortical activation and behavioral state transitions through its cholinergic neurons. The nucleus basalis of Meynert (NBM), as a major cholinergic nucleus of the BF, plays pivotal roles in arousal and sleep regulation. Previous studies highlight BF's role in modulating cortical desynchronization during wakefulness; however, the specific contribution of NBM remains unclear. This study investigates the role of cholinergic neurons in the NBM in modulating sleep-wake dynamics and their influence on cortical desynchronization during sleep.

Methods Using chemogenetic techniques, viral vectors were injected into the NBM of ChAT-Cre mice. These mice were implanted with EEG and EMG electrodes to record the sleep-wake behavior.

Results Chemogenetic activation of cholinergic neurons in the NBM led to a significant increase in the duration of wakefulness during the inactive phase in mice. Interestingly, there was a marked reduction in delta power within non-rapid eye movement (NREM) sleep, indicative of decreased sleep depth. Moreover, activation of the NBM cholinergic neurons altered the overall architecture of sleep, further emphasizing their pivotal role in modulating sleep-wake states.



Conclusion Our findings demonstrate that chemogenetic activation of cholinergic neurons in the NBM significantly disrupts sleep homeostasis by promoting wakefulness during inactive phases and reducing the depth of NREM sleep, as evidenced by decreased delta power. These results highlight the critical role of NBM cholinergic neurons in regulating the balance between wakefulness and sleep, providing new insights into the neural mechanisms underlying arousal and sleep depth modulation.

Keyword: Nucleus basalis of Meynert, Sleep, Delta power

ID: 318834

Interactive Connections between the Claustrum and Lateral Parabrachial Nucleus Participate in the Regulation of Nociceptive Information and Accompanying Negative Emotions

Qiu xintong

Air Force Medical University

Objectives The claustrum (CLA), located between the insula and striatum, is a widely connected brain region associated with pain sensation, yet its mechanisms remain elusive. This study aims to elucidate the central mechanisms of the CLA and neural pathways between the CLA and lateral parabrachial nucleus (LPB) involved in the regulation of nociceptive information and negative emotions in mice.

Methods To address these issues, the comprehensive approaches integrating morphological analysis, fiber photometry, electrophysiology, chemogenetics and optogenetics were employed to investigate the neural pathways, neuronal subtypes, synaptic plasticity and behavioral manifestations of the CLA.

Results Activation of the CLA vesicular glutamate transporter-2 (CLA^{VGLUT2}) neurons promotes nociceptive and anxiety-like behaviors, whereas CLA parvalbumin (CLA^{PV}) neurons in the core inhibit CLA^{VGLUT2} neurons. Morphologically, the CLA^{VGLUT2} neurons in the shell reciprocally communicate with the LPB^{VGLUT2} neurons. Manipulation of the LPB^{VGLUT2}-CLA^{VGLUT2} neural pathway, LPB^{VGLUT2}-CLA^{PV} neural pathway and CLA^{VGLUT2}-LPB^{VGLUT2} neural pathway results in bidirectional modulation of pain and negative emotions. Pharmacogenetic activation of the LPB^{VGLUT2}-CLA^{VGLUT2}-LPB^{VGLUT2} neural circuit facilitates nociception and anxiety-like behaviors, whereas inhibition leads to antinociceptive and antianxiety effects. Electrophysiological recordings reveal that CLA^{PV} neurons receive LPB^{VGLUT2} inputs and exert feedforward suppression effects.

Conclusions These findings illuminate the central mechanisms by which the CLA and its bidirectional neural connectivity with the LPB participate in the regulation of pain and negative emotions in mice, providing crucial insight to further unveil the functions of the CLA.

Keyword: Claustrum, Lateral parabrachial nucleus, Pain, Parvalbumin, Vesicular glutamate transporter-2



ID: 340854

Probing Neuroglia Function Through An Integrative Neuroscience Approach

Ai Peng Tan*

National University of Singapore

Microglia play a role in environmental surveillance and may influence individual susceptibility to environmental factors. Understanding how neuroglia, particularly microglia, shape brain development is critical for uncovering mechanisms of individual susceptibility to early life experiences. This presentation highlights an integrative neuroscience approach that combines longitudinal neuroimaging, functional genomics, and environmental data to probe microglial function in vivo. Drawing from a population-based Singaporean birth cohort (GUSTO), we applied an expression-based polygenic score (ePGS) derived from microglia-enriched genes to index individual genetic capacity for microglial response. This index was used to predict white matter development across early childhood and to explore its interaction with perinatal environmental exposures such as systemic inflammation and psychosocial adversity. Findings revealed sex-specific effects, with significant associations between microglia ePGS and the rate of white matter maturation (indexed by fractional anisotropy) observed only in females. Importantly, microglia ePGS moderated the effects of early environmental conditions on neurodevelopment and the emergence of socio-emotional difficulties in late childhood. This integrative framework provides a new pathway for identifying children at risk and tailoring early interventions based on neuroimmune profiles.

Keyword: Neuroimaging, microglia, white matter development

ID: 330494

Oligodendrocyte-encoded Lactate Dehydrogenase A Couples Glycolysis to (Re)myelination via Protein Lactylation

Yuan Zhang*

Shaanxi Normal University

Myelin injury, a hallmark of several neurological diseases, is highly sensitive to glucose metabolism disruptions. Here, we reveal that oligodendrocytes (OLs) within demyelinating lesions exhibit reduced glycolytic efficiency and lactate production, in contrast to the mature OLs. Administration of lactate, the primary product of glycolysis, or specific overexpression of Lactate Dehydrogenase A (LDHA), the key enzyme in lactate production, in Olig1+ OLs, significantly enhances remyelination. In contrast, conditional knockout of LDHA in Olig1+ lineage or CNPase+ premyelinating OLs leads to severe neuropathy with dysmyelination in a development-dependent and cell-specific manner. Mechanistic insights show that oligodendrocytes within demyelinating lesions undergo lactylation silencing, a lactate-induced epigenetic modification that impedes myelin restoration. Lactylation of LDHA and carbonic anhydrase II (CAII) couple glycolysis with oligodendrocyte maturation. Our findings elucidate the metabolic interplay between glycolysis, lactylation, and oligodendrocyte maturation, and provide novel enzymatic therapeutic perspectives for demyelinating disorders for which effective therapies are currently lacking.

Keyword: glucose metabolism, glycolysis, lactylation, oligodendrocyte, remyelination



ID: 333364

The functional role of Sept7 in OPC differentiation and remyelination

Jianmei Ma* Cong Du

College of Basic Medical Sciences, Dalian Medical University

Oligodendrocytes (OLs), the myelin-forming cells of the central nervous system (CNS), differentiate from oligodendrocyte precursor cells (OPCs) via a complex process characterized by significant morphological transformation. These transformation are critically dependent on the dynamic interactions between cytoskeletal networks. Septin7 (Sept7), a unique member of the novel cytoskeletal septin family, is involved in functions such as cell polarity and division. Recent studies have demonstrated that Sept7 is expressed in CNS myelin sheaths, with its expression decreasing during aging. Additionally, reduced Sept7 levels are observed in demyelinating mouse models harboring associated gene mutations. However, the cell-intrinsic role of Sept7 and the molecular mechanisms underlying OPC differentiation and remyelination remain unknown. In the present study, we discovered that Sept7 plays a critical role in the differentiation of oligodendrocyte precursor cells (OPCs) by modulating cofilin-mediated actin polymerization and depolymerization as well as the acetylation level of microtubules, thereby contributing to OPC differentiation. More significantly, Sept7 affected myelin regulatory transcription factors leading to reduced expression of myelin proteins via the phosphorylated extracellular signal-regulated kinase (ERK) pathway. Our findings demonstrate that Sept7 serves as a critical integrator of cytoskeletal dynamics and ERK signaling during OPC differentiation and remyelination. This discovery provides theoretical support for elucidating the mechanisms underlying myelin damage induced by aging and other factors, while also offering innovative insights into the pathogenesis and progression of CNS degenerative diseases.

Keyword: Sept7, OPC, myelin, p-ERK1/2

ID: 330619

Deficiency of Microglial-Derived Secreted Phosphoprotein 1 Accelerates Brain Aging via Compromising Oxidative Phosphorylation

Lilu¹ Meiling Wang¹ Yumin Chang¹ Aojie He¹ Jing Yang¹ Ang Li⁴ Hongqin Wang²

Kah-Leong Li⁵ Xing Guo³ Chengwu Zhang¹

1.School of Basic Medical Sciences, Shanxi Medical University, Taiyuan 030001, Shanxi, China.

2.Department of Neurosurgery, The First Hospital of Shanxi Medical University, Taiyuan, 030001, China.

3.State Key Laboratory of Reproductive Medicine and Offspring Health, Nanjing Medical University, Nanjing 211166, China.

4.Key Laboratory of CNS Regeneration (Ministry of Education), Guangdong Key Laboratory of Non-human Primate Research, GHM Institute of CNS Regeneration, Jinan University, Guangzhou 510632, China.

5.Lee Kong Chian School of Medicine, Nanyang Technological University. 11 Mandalay Road, Singapore 308232, Singapore.

Objective Brain aging involves memory deficits and alterations in the senescence-associated secretory phenotype, yet the role of microglial Spp1 in these changes remains unclear. Here, we map Spp1 expression in aged brains and define its impact on microglial phagocytosis and the underlying molecular mechanisms driving brain aging.



Methods We combined an inducible, microglia-specific Spp1 knockout with scRNA-seq, multiplex immunofluorescence, and RNA–protein co-localization to assess Spp1's roles in cognition, phagocytosis, and molecular signatures, and to confirm functional rescue via hippocampal AAV-Spp1 overexpression.

Results (1) Identification of an Spp1-positive microglial subpopulation in aged mouse and human brains exhibiting enhanced phagocytic activity. (2) Microglial Spp1 deletion impaired memory, elevated release of senescence-associated secretory phenotype factors, and reduced phagocytic capacity via downregulation of the AKT/mitochondrial complex I pathway and diminished oxidative phosphorylation. (3) AAV-mediated Spp1 overexpression restored microglial function and rescued age-related phenotypes.

Conclusion This study is the first to reveal the crucial role of microglial Spp1 in brain aging and to uncover its underlying mechanism, providing novel insights for the development of anti-aging strategies.

Keyword: Brain aging; Spp1; microglia; oxidative phosphorylation; mitochondrial complex I

ID: 328065

Navigating Anatomy's Digital Frontier: The Role of Digital Competency

Nur Atiqah Sa'hari Ramli¹ Shamsi Amalina Shamsuddin² Fazlina Kasim²

Ahmad Hadif Zaidin Samsudin² Siti Nurma Hanim Hadie²

1.Universiti Sultan Zainal Abidin

2.Universiti Sains Malaysia

Objectives Digital competency in anatomy is the confident, critical, and responsible use of digital tools in teaching and learning anatomy. The use of digital anatomy tools such as e-learning, 3D prints, augmented reality (AR), virtual reality (VR), and mixed reality (MR) alongside dissection enhances visualisation, cost-effectiveness, and flexible learning. However, challenges include ensuring efficacy, accuracy, maintaining focus on anatomy knowledge, high initial costs, and the lack of tactile feedback. In this study, e-learning was utilised to develop supplementary learning materials to help students understand the application of anatomy in lower limb clinical radiology. The study aimed to determine the effect of supplementary e-learning on student's learning, as well as the effect of integration of radiological images in e-learning on the cognitive load, engagement and comprehension of medical students.

Methods E-learning Engagement Design (ELED) Framework was used to guide the development of two types of supplementary e-learning (with and without radiological images). A randomised controlled trial involving 82 first-year medical students at Universiti Sains Malaysia was conducted to compare the effectiveness of these two e-learning materials.

Results There was a significant improvement in the post-assessment scores for both e-learning. Both e-learning showed high levels of engagement and self-perceived learning, while maintaining low levels of intrinsic and extraneous cognitive load.

Conclusion The use of a well-designed e-learning for anatomy learning has positive impacts on students' perception of the value of learning, cognitive engagement and emotional engagement.

Keyword: Digital Competency, Anatomy Education, E-learning



ID: 326471

Seeing Beyond Dissection: Integrating Radiology for a Smarter Anatomy Education

ASPALILAH ALIAS^{1,2,3} Arofi Kurniawan² Madihah Rushaidhi⁴ Nur Atiqah Sa'hari @ Ramli⁵
Siti Nurma Hanim Hadie⁶

1. Department of Basic Science, Faculty of Dentistry, Universiti Sains Islam Malaysia

2. Department of Forensic Odontology, Faculty of Dental Medicine Universitas Airlangga, Indonesia

3. Centre of Research for Fiqh Forensics and Judiciary (CFORSJ), Institut Sains Islam (ISI), Universiti Sains Islam Malaysia, Malaysia, Negeri Sembilan

4. Faculty of Medical Sciences, Newcastle University Medicine Malaysia (NUMed)

5. Department of Anatomy and Physiology, Faculty of Medicine, Universiti Sultan Zainal Abidin, Kuala Terengganu, Terengganu.

6. Department of Anatomy, School of Medicine, Universiti Sains Malaysia

Objective Radiology has become increasingly popular in modern medical education especially in teaching anatomy. This study aims to examine how the integration of radiological imaging enhances student understanding, compared to the traditional cadaveric dissection.

Methodology This review focusses on the integration of radiological imaging into anatomy education. The selected studies investigate how radiology contributes to improving anatomical learning through various modalities, including computed tomography (CT), magnetic resonance imaging (MRI), and digital radiography.

Result Reviews of the studies show that radiology significantly improves anatomy education by providing three-dimensional visualisation of anatomical structures. The advantages of non-invasive, flexible study by using the digital web at any time and everywhere offer alternative cadaver dissection study of anatomy. Furthermore, early exposure to clinical imaging helps students better understand anatomy in diagnostic contexts and improving clinical readiness. Radiology encourages curriculum innovation, integration with traditional methods in medical education.

Conclusion Radiology helps in anatomy education in terms of simplifying, non-invasive, being able to be anywhere or flexible as well as making the study of anatomy even more interesting. We need to combine the two traditional methods of examining cadavers in anatomy educators as well as using radiology as an added value for anatomy studies before students enter the clinical year.

Keyword: Anatomy Teaching, Medical Imaging, Radiology in Education, Virtual Learning,

ID: 327477

Cultural Tapestry in Anatomy: Weaving Global Competence into Healthcare Education

Madihah Rushaidhi^{1,2} Nurul Uyun Abdul Aziz^{1,2} Nor Alia Mohamad^{1,2}

1. Newcastle University Medicine Malaysia (NUMed), Malaysia

2. Newcastle University, UK

The evolving landscape of anatomy education necessitates a transformative approach that integrates multicultural competency into the medical and health sciences curriculum. As the demographic diversity of healthcare providers and patients continues to expand, it is imperative for anatomists and educators to cultivate an understanding of cultural nuances that influence anatomical knowledge, communication, and patient care. This presentation explores the vital role



of multicultural competency in anatomy education, emphasizing the importance of inclusive teaching practices that respect and reflect diverse cultural perspectives, especially in a multicultural country like Malaysia. Our current research investigates diverse multicultural responses to anatomy teaching resources, focusing on soft body cadavers and body donation programme. By engaging with various cultural groups, we aim to highlight how integrating multicultural competency into anatomy curricula enhances students' understanding of anatomical variations across populations. This integration prepares them to engage effectively with diverse patient populations, fostering a more empathetic and culturally aware healthcare environment. Additionally, we will discuss the challenges and opportunities presented by incorporating multicultural perspectives into anatomy education, including curriculum design, assessment methods, and faculty training. By showcasing successful case studies and innovative pedagogical strategies, we aim to provide actionable insights for educators seeking to enrich their teaching practices. Ultimately, as we reimagine the future-ready anatomist, this symposium will offer valuable perspectives on embedding multi-cultural competency in anatomy education, ensuring that future professionals are equipped to navigate the complexities of a globalized healthcare system while improving patient outcomes and fostering inclusivity in medical practice.

Keyword: Multi-cultural Competency, Anatomy Education, Inclusive Teaching Practices

ID: 343194

Visualization and Simulation of Ultra-High-Resolution 3D Anatomical Models for Advanced Morphological Analysis

IL KIM

CEO of SurgicalMind, Inc. Seoul

Objectives There is a global shortage of cadavers, and there is a growing need for anatomical approaches to specific situational changes that are difficult to learn with cadavers. Additionally, development was initiated to overcome the functional limitations of existing digital anatomy solutions and provide deeper anatomical information and knowledge for specialists in various fields.

Methods Preparing for the next era of anatomical education through the convergence of five technologies: XR technology, ultra-high-quality 3D modeling data, real-time rendering, optical tracking, and AI.

Results Created a digital human body capable of tactile reproduction and interaction. Presented a new approach to anatomy through dynamic anatomy. Provided a glimpse into the future of anatomical solutions by offering new UX using LLM and MCP.

Conclusion Pioneered an era of ultra-high-precision anatomy that can complement or partially replace cadaver workshops. Through the use of AI, users can operate the program more conveniently, and we have provided direction for the future integration of AI in digital anatomy.

Keyword: AI, Digital Anatomy, Dynamic Anatomy, XR



ID: 343195

Vision-Language Model (VLM) for Medical Domain

Donghun Yang

AI Model Development Team, Large-scale AI Research Center, KISTI, Daejeon, Republic of Korea

Objectives Since the release of ChatGPT, large-scale AI models have gained significant attention across diverse domains. In the medical field, vision-language models (VLMs), which combine visual and textual understanding, have emerged as a promising tool for tasks such as image captioning, radiology report generation, and visual question answering. This study aims to explore the current progress and challenges in adapting VLMs and large language models (LLMs) to the healthcare domain, particularly for medical imaging applications.

Methods We examine recent techniques for aligning visual encoders with medical text corpora and investigate newly developed benchmarks for evaluating performance on diagnostic image analysis and structured report generation. Additionally, we explore fine-tuning strategies that integrate clinical expertise into pre-trained architectures to enhance domain relevance.

Results Empirical evidence demonstrates that domain-adapted models significantly outperform general-purpose models when applied to medical imaging tasks. These improvements underscore the importance of specialized datasets and adaptation methods in achieving clinical utility.

Conclusion This study highlights the growing importance of adapting VLMs to the medical domain and outlines future directions such as scaling multimodal datasets, improving model interpretability, and ensuring ethical deployment in clinical settings. Our findings provide practical insights for advancing AI applications in healthcare, bridging the gap between research innovation and real-world clinical impact.

Keyword : Vision-Language Models(VLM); Medical Imaging; Specialized Large Language Model(sLLM); Multimodal AI; Fine-tuning

ID: 343196

Development of Foundational Data Infrastructure for Human Digital Twin

Kwangnam Choi

AI Model Development Team, Large-scale AI Research Center, KISTI, Daejeon, Republic of Korea

Objectives The Human Digital Twin (HDT) is a virtual representation of human anatomical, physiological, and behavioral characteristics in real time. It holds transformative potential for applications in healthcare, rehabilitation, education, manufacturing, and performance optimization. However, a key challenge in HDT development is the absence of high-fidelity anatomical and motion data. This study presents the initiatives by the Korea Institute of Science and Technology Information (KISTI) to overcome this limitation by constructing foundational datasets for HDT development.

Methods KISTI leveraged historical and ongoing projects to build comprehensive anatomical databases. The Visible Korean Project (2000) and Digital Korean Project (2003) provided detailed CT scans from 100 Korean cadavers (50 male, 50 female), which were segmented and statistically averaged into 206 skeletal components. Physical properties of each bone were quantified. Since 2022, the project has expanded to include dynamic datasets capturing joint motion (shoulder, knee, elbow, ankle), combining high-resolution musculoskeletal structures with kinematic motion profiles.



Results These efforts have resulted in a high-resolution, population-based digital skeletal model, enriched with physical and dynamic attributes. The integration of precise morphological data and dynamic joint movement profiles enables the development of anatomically accurate and behaviorally responsive HDT models.

Conclusion

The datasets developed by KISTI serve as a critical foundation for advancing digital anatomy applications. They support improved simulation accuracy, enable personalized modeling, and provide valuable resources for anatomical science, clinical decision-making, and biomechanics research. These developments mark a significant step forward in realizing the full potential of Human Digital Twin technology.

Keyword: Human Digital Twin, Korean Cadaver Dataset, Digital Anatomy, Biomedical Simulation

ID: 343198

Implementation of an Interactive Clinical Simulator Based on Facial Anatomy: An Enhanced Model for Injection Training

Ji-Young Son^{1,2} Hyeong-Seok Choi² Sang-su Park² Seung-Ho Han^{1,2}

1.Department of Anatomy, College of Medicine, Ewha Womans University, Seoul, Korea.

2.Ewha Medical Academy, Ewha Womans University Medical Center, Seoul, Korea

Objectives Minimally invasive facial procedures are widely performed in clinical practice, but insufficient anatomical knowledge and technical skills among practitioners increase the risk of complications. Despite the necessity of repeated training, adequate practice environments remain lacking in medical fields. This study aimed to develop an interactive clinical simulator for injection training based on facial anatomy, providing practitioners with an enhanced solution to improve their expertise and proficiency beyond time and space constraints.

Methods A clinical simulator was developed using standardized facial anatomical data. We integrated standardized female craniometric data from the Korea Institute of Science and Technology Information, facial soft tissue thickness measurements based on CT/MRI imaging, and arterial depth data from the skin surface synthesized from various academic literature. A 3D low-polygon model was created through multi-angle photography, then refined into a high-polygon model using standardized anatomical data. The high-polygon model was compressed and optimized for efficient software operation. A user interface providing anatomical structure selection and information display was developed. A silicone facial dummy was fabricated, and a hardware system including PC, optical tracking camera (NDI Vega), and passive reflective markers was constructed.

Results Successful integration of software and hardware was achieved. The optical tracking camera detected markers on the dummy and syringe, enabling real-time tracking of injection movements displayed on the monitor. Users could perform interactive injection procedures while observing the facial model on PC. Compared to existing VR-based models, anatomical precision was enhanced with a high-polygon model incorporating craniometric, soft tissue, and arterial information. The optimized capacity enabled compatibility with all devices. The optical tracking system demonstrated high precision with error ranges of 0.029-0.045mm and ≤ 1 mm maximum deviation.

Conclusion This study developed the first clinical simulator that improves upon existing VR-based models by integrating facial data for precise anatomical modeling and advanced hardware for real-time feedback. The simulator presents a novel approach for facial injection training and establishes a foundation for future research demonstrating educational effectiveness in clinical practice.



Keyword : Clinical simulator, Facial anatomy, Injection training, Optical tracking, Three-dimensional modeling

ID: 327575

Morphological Changes of the Mandibular Condyle in Response to Subtle Overload: Investigating a Mechanical Origin of Condyle Hyperplasia

Viviana Toro-Ibacache¹ Sonja Buvinic¹ Julián Balanta-Melo² Ricardo Miranda³ Valeria Caro¹

1.University of Chile

2.Universidad del Valle

3.Pontificia Universidad Católica de Chile

Mandibular condyle hyperplasia (HC) is a condition causing facial asymmetry mainly in young women, with causes not yet understood. Using a murine model of unilateral masseter muscle paralysis induced with botulinum toxin, we tested the hypothesis that subtle asymmetries of masticatory loads cause an asymmetric growth of the condyle head in adult individuals. Thirty-seven condyles of the hemimandibles from mice were studied using microCT-based trabecular bone (TB) morphometry and 3D geometric morphometrics. Thirteen mandibles (8M, 5F) corresponded to the paralyzed side (undeloaded, UL), 12 (7M, 5F) were the contralateral, overloaded (OL) hemimandibles, while 12 (7M, 5F) came from non-intervened (symmetrically loaded, SL) animals. The TB bone analysis showed that the main features distinguishing groups were Bone Volume, Bone Volume Fraction, Trabecular Thickness and Total Area, with OL and SL showing the most robust features. When only OL and SL were compared, the first three variables were most relevant, distinguishing primarily males and females, and secondarily, OL and SL. Although differences in the values of the variables were not statistically significant, OL females tended to have increased robusticity values than OL males. The TB variables showed a relationship with the 3D condyle shape, with more robust TB values being found in anatomically taller and broader condyles. We showed that a moderate increase in mandibular load causes the inner and external condyle structure to show features compatible with increased robusticity. This supports the general hypothesis of a mechanical origin of HC, with females being more affected than males.

Keyword : Mandibular condyle asymmetry, muscle function, biomechanics, trabecular bone morphometry, geometric morphometrics



ID: 326677

Dynamic Studies Of The Human Thoracic Duct And Lymphovenous Junction Using Heavily Weighted T2 Magnetic Resonance Imaging: A Pilot Study (Oral Presentation)

Ali Mirjalili*
University of Auckland

Introduction To pilot the use of non-contrast, heavily weighted T2 MRI for visualizing the anatomy of the central lymphatic system, including the thoracic duct, cisterna chyli, and lymphovenous junction, and to assess its potential for calculating dynamic physiological parameters such as thoracic duct lymph flow.

Methods Magnetic resonance imaging (MRI) was used to visualize major lymphatic and blood vessels in vivo in two human participants. All scanning was conducted using a 3T GE Medical Systems MRI scanner. Heavily weighted T2 imaging was performed to highlight the slow-moving fluid within the major draining lymphatic vessels in a region of interest encompassing the torso. Phase contrast flow imaging was conducted in the same regions of interest, using the same image resolution as the anatomical images, to enable quantification of volumetric lymph flow in the major lymphatic structures.

Results The central lymphatic system, including the thoracic duct, cisterna chyli, and major lymphatic tributaries, was successfully visualized. Venous structures appeared as dark pixel intensities. A set of axial cross-sectional images with a resolution of $0.6 \times 0.6 \times 1.6$ mm and 600–700 slices per participant was produced.

Conclusion Non-contrast, heavily weighted T2 MRI can effectively characterize the structural and functional anatomy of the thoracic duct.

Keyword: Lymphatics, MRI, Flow Biomechanics

ID: 327295

FEA-Based Stability Evaluation of External Fixators for Type C1.3a Pelvic Injury

Annika Meuser¹ Petr Henys² Daniel Haspinger¹ Niels Hammer^{1,3,4}

1.Division of Macroscopic and Clinical Anatomy, Gottfried Schatz Research Center, Medical University of Graz, Austria

2.Institute of New Technologies and Applied Informatics, Faculty of Mechatronics, Informatics and Interdisciplinary Studies, Technical University of Liberec, Czech Republic

3.Department of Orthopedic and Trauma Surgery, University of Leipzig, Germany

4.Division of Biomechatronics, Fraunhofer IWU, Dresden, Germany

Type C1.3a pelvic fractures are complex and unstable, requiring temporary emergency stabilisation with an external fixator. This study uses Finite Element Analysis to evaluate the biomechanical stability of three pelvic external fixators. A detailed, patient-specific 3D model was created that realistically depicts the anatomical features of the pelvic ring and relevant ligaments. Comprehensive research was performed to optimise material properties for bone, articular facets, cartilage and ligaments. The models were validated using previously obtained experimental data and physiological load curves to simulate realistic conditions. The FE-model was able to reproduce



the experimentally observed load–deformation behaviour with sufficient accuracy (adjusted $R^2 = 0.98$; slope = 0.74; intercept = 30.7; $p = 1.2 \times 10^{-25}$).

A sensitivity analysis was carried out to evaluate model reliability. This examined how changes in central model parameters affect predictions regarding fixation stability. Significant effects of pin configuration were found for both pubic and sacral displacement (pubis: $F(2,128) = 311.1$, $p < 2 \times 10^{-16}$; sacrum: $F(2,128) = 21.4$, $p = 9.88 \times 10^{-9}$). Post-hoc tests confirmed statistically significant differences between all configurations, with the most stable configuration showing the least fracture displacement (up to 0.73 mm less than the least stable setup).

Overall, the results show that finite element simulations are a valuable tool for improving external fixation methods in complex pelvic injuries. Stiffness, stability, and potential failure mechanisms are demonstrated for each configuration, supporting the use of such models to optimise treatment of type C1.3a injuries and improve fixation stability.

Keyword: Finite Element Analysis, Pelvic Fractures, External Fixation, Biomechanical Stability

ID: 324351

Comparison of Orthotics and Exercise Training on Hallux Valgus: A Biomechanical Study Based on Muscle Synergies and Kinematic Synergies

Lei Qian Jun Ouyang^{*}
Southern Medical University

Objectives Interventions with different mechanisms may have different effects on lower limb biomechanics in patients with hallux valgus (HV). This study investigates the effects of two distinct intervention modalities, orthoses and foot exercise, on neuromuscular control and the lower limb musculoskeletal system in patients with HV over an extended intervention period.

Methods 13 young patients received orthotic intervention, while 10 received foot exercise intervention. All participants underwent ultrasounds for foot muscle cross-sectional area, HV angle measurements, and center of plantar pressure assessments at baseline, 4 weeks, and 12 weeks. Surface electromyography and degrees of freedom were collected during self-paced walking tests and analyzed using non-negative matrix factorization to extract muscle synergy and kinematic synergy.

Results There is no significant differences between groups in HV angle and kinematic synergy post-intervention. However, changes in muscle morphology and muscle synergy were observed, with these differences becoming more pronounced at 12 weeks. The orthotic intervention group demonstrated a decrease in abductor hallucis muscle cross-sectional area and alterations in the muscle synergy module structure, suggesting orthosis-induced muscle atrophy and compensatory knee joint muscle activation. In contrast, the exercise intervention group exhibited reduced module numbers, increased muscle activation, and a significant decrease in center of plantar pressure.

Conclusion The results indicated that foot exercise may promote muscle synergy module consolidation and enhanced muscle activation to improve motor performance and balance ability. For patients concerned about muscle function, exercises are an appropriate option with more positive effects.

Keyword: Hallux valgus; muscle synergy; orthoses; therapeutic exercise



ID: 326734

Chorioallantoic Membrane – alternative Model for \Biomaterial Testing

Eva Petrovova* Lenka Luptakova Zuzana Tirpakova Zuzana Demcisakova
University of Veterinary Medicine and Pharmacy in Kosice

Avian chorioallantoic membrane (CAM) is a simple, alternative and ethical approach that bridges the classical in vitro and in vivo technologies and fulfills the 3Rs principle. Due to its vascularization, CAM represents a useful screening tool that can be used to innovatively investigate the biocompatibility and angiogenic potential of different biomaterials. We demonstrate methodology of ex ovo quail CAM assay for testing of biomaterials using the polyhydroxybutyrate/chitosan (PHB/CHIT) composite. We conducted the evaluation of the acellular biomaterial applied with focus on morphological, histological, immunohistochemical, molecular methods and protein detection. Our findings confirmed the angiogenic potential of the PHB/CHIT scaffold, which exhibited non-toxicity and biocompatibility on the CAM assay. The study's comprehensive approach, combining various analytical methods, provided insights into the biomaterial's interactions, including the transition of endothelial cells from a quiescent to an angiogenic state and the involvement of crucial molecular pathways like VEGF/VEGFR, Notch/Notch ligand, and angiopoietin/TIE2. Our study focused on a porous PHB/ CHIT scaffold designed for bone and cartilage regeneration. The ex ovo quail CAM assay offers distinct advantages, such as a shorter generation interval, increased experimental turnover, possibility to use the chicken-specific markers, and the use of unique quail-specific marker QH1, which differentiates it from traditional chicken CAM assay. This study enhances our understanding of biomaterial angiogenesis interactions and underscores the potential of the quail CAM assay as a valuable tool in biomaterial angiogenic potential and biocompatibility pre-screening testing for regenerative applications and tissue engineering.

Keyword: Angiogenesis, Avian animal model, Bone regeneration, Chitosan, Polyhydroxybutyrate

ID: 328527

New concept of hybrid Breast reconstruction. Anatomical approach.

Ilya Kazantsev
Tomsk Regional Clinical Hospital

Objective To improve the results of breast reconstruction with a combination of flap and fatgrafting by studying the vascular anatomy of the perforator vessels of the chest wall intact after mastectomy.

Methods The study of the vascular anatomy of the chest wall was performed on 10 cadavers by dissection. Comparison of the obtained data on the normal anatomy of the significant perforating vessels with the data of CT of 30 patients who had undergone mastectomy.

Results The main sources of blood supply to the flaps of the lateral surface of the chest wall were revealed: vessels from the anterior branch of the thoraco-dorsal artery (TDA) (2-4 perforator vessels at the level of the IV-V ribs supplying the tissues suitable for the flap design), lateral intercostal perforators wick consisting of 2 arteries and 4 veins in 70% of cases and 1 artery and 2-3 veins in 30% of cases while located anatomically-permanently along the anterior axillary line in the VI intercostal space). When studying the data of CT of already operated patients, it was revealed that intercostal perforators due to wide dissection of the mastectomy flaps out of 30



patients were absent in 23 patients, while the perforators of the anterior branch of the remained preserved in 100% of cases.

Conclusion. Perforator vessels of the anterior branch of the TDA protected by the anterior edge of the TDL muscle after mastectomy to form a universal flap design for a new method of hybrid breast reconstruction.

Keyword: breast reconstruction, perforator vessels, perforator flap

ID: 326686

Cardiology Pearls: What Time Does to the Heart and How Could We Time-Proof It?

Suwanna

VitalLife Scientific Wellness Center

Cardiovascular aging is a predominant determinant of morbidity and mortality, yet its mechanistic basis and potential for intervention are not fully integrated into clinical paradigms. This presentation reframes cardiovascular aging through the lens of geroscience, emphasizing the interplay between anatomical, cellular, and molecular changes—such as arterial stiffening, myocardial remodeling, and inflammaging. We review advances in understanding the mechanistic basis of cardiovascular aging, with a focus on cardiomyocyte regeneration. Evidence from animal models, as well as human studies, highlights both the limited but measurable renewal of cardiomyocytes and the potential for enhancement through interventions such as mechanical unloading in heart failure patients. Emerging regenerative strategies—including stem cell therapies, direct cellular reprogramming, and mRNA-based approaches—are discussed alongside their translational challenges. The presentation also examines the promise of senolytics and anti-inflammaging interventions in targeting senescent cells and chronic inflammation to support cardiac repair. Additionally, we explore the development of imaging-based cardiac biological clocks, using modalities like echocardiography, cardiac MRI, and AI-enhanced ECG to quantify heart aging and stratify risk. By integrating anatomical expertise with these innovative biological and technological tools, this session offers a concise framework for recognizing and addressing the hallmarks of cardiac aging. Attendees will gain insights into upcoming strategies for attenuating cardiovascular aging, promoting cardiac longevity, and extending cardiovascular healthspan.

Keyword : cardiovascular aging, geroscience, cardiomyocyte regeneration, senolytics, inflammaging



ID: 325429

Cross-scale Monitoring Anatomical Structures and Dynamic Changes in Living Organisms

陈俊*

Sports Medicine Institute of Fudan University, Department of Sports Medicine, Huashan Hospital, Fudan University, Shanghai

Living organisms represent nature's most sophisticated material systems, exhibiting remarkable complexity across ten orders of spatiotemporal magnitude (from nanometers to meters) and multiple organizational levels (molecules to organ systems). Disease progression similarly demonstrates cross-scale dynamics, from micrometer-scale molecular alterations to centimeter-scale tissue remodeling, unfolding across timescales ranging from milliseconds to days. Traditional imaging techniques, constrained by fixed resolutions and limited modalities, fail to capture these interconnected biological processes comprehensively. To overcome these limitations, we developed an advanced NIR-II fluorescence imaging platform - the "Life Observatory" - capable of seamless cross-scale visualization. This innovative system integrates high-resolution fluorescence imaging with deep-tissue penetration, enabling simultaneous observation of macro-scale physiological processes (vascular/lymphatic/neural networks) and micro-scale cellular dynamics (stem cell migration, immune interactions, extracellular vesicle trafficking). By bridging critical gaps between molecular events and systemic functions, our platform provides unprecedented insights into life's fundamental mechanisms.

Keyword: in vivo, NIR-II fluorescence imaging, cross-scale

ID: 327472

Living Lessons: Enhancing Anatomy Education with Soft-Body Cadavers and Silent Mentors

Madihah Rushaidhi^{1,2} Sakina Ghauth³

1.Newcastle University Medicine Malaysia (NUMed), Malaysia

2.Newcastle University, UK

3.Universiti Malaya (UM), Malaysia

As anatomy education evolves, innovative teaching methodologies are essential for enhancing student engagement and understanding. This presentation focuses on the integration of soft-body cadavers and the Silent Mentor programme within cadaver-based teaching and research. Soft-body cadavers provide realistic anatomical models that deepen understanding while addressing ethical concerns associated with traditional dissection practices. The Silent Mentor programme, which honours donors by emphasizing their contributions to medical education, fosters a culture of respect and gratitude among students. This initiative not only enriches the learning experience but also encourages students to reflect on the ethical implications of body donation and the responsibilities of future healthcare professionals. We will present findings from our research on the effectiveness of these methodologies in improving anatomical knowledge retention and empathy among medical students, utilizing undergraduate clinical anatomy workshops as a platform. Additionally, we have organised centralised training for anatomists to develop their skills as competent clinical anatomy educators using the same soft cadavers from the Silent Mentor programme. By incorporating feedback from participants, we aim to showcase how these innovative approaches can be adapted to diverse educational settings. We will also discuss



challenges encountered during implementation, such as logistical considerations and the necessity for enhanced faculty training. Ultimately, this symposium will underscore the significance of soft-body cadavers and Silent Mentor programmes in cultivating a compassionate, knowledgeable, and ethically aware generation of healthcare professionals, reinforcing the value of cadaver-based education in contemporary anatomy curricula.

Keyword: Soft-body cadavers, Silent Mentor programme, Anatomy education

ID: 325539

Our First Patients: The Silent Mentor Programme in Anatomy Education

George W Yip^{*}

National University of Singapore

Anatomy is of fundamental importance in medical education. Modern students have access to a plethora of educational resources that can aid their learning of human anatomy. These include electronic books, pre-recorded lectures and videos, 3D-printed anatomical models, digital tools and online material, amongst others. However, none of these can completely replace the unique learning experience offered by the study of cadaveric specimens through prosection and dissection. At the National University of Singapore, these precious specimens for medical education are made available by the kind generosity of our whole-body donors in the Silent Mentor Programme of the medical school. Through the Silent Mentors, we aim to not only impart knowledge of the anatomy of the human body but also inculcate humane values such as altruism, kindness, respect, gratitude and professionalism in our medical, dental, nursing and allied health students. In this presentation, I will provide examples of various cadaveric and non-cadaveric learning resources that are available to our students for the learning of human anatomy. In addition, I will share feedback on our Silent Mentor Programme from the perspective of the learner, the whole-body donor, and the donor's family.

Keyword: education resources, professionalism, respect, Silent Mentor Programme, whole-body donation

ID: 327448

The Enduring Gift of Body Donors in Anatomy Education

Stephanie Woodley^{*}

University of Otago, Dunedin, New Zealand

Objectives Anatomy education is integral to a range of programmes, including science, medical, surgical and health professional courses and workshops. In many institutions, body donors form an important basis for teaching and learning, in an environment where dedicated anatomy teaching hours and resources are reducing, and student numbers are increasing. The purpose of this presentation is to provide an overview of how donated tissues are central to teaching and learning anatomy at the University of Otago, including student perceptions of these educational experiences.



Methods and Results Tissues sourced from body donors are prepared in a variety of ways, and dependent on their course of study, students are offered opportunities to dissect (whole body and isolated regions) and/or interact with prosections and plastinates. Students overwhelmingly value in-person laboratories where they work with donated tissues (92% rate educational value as “very valuable or valuable”) and these experiences are a key contributing factor to their motivation to learn. In addition to acquiring anatomical knowledge and highlighting clinical applicability, interacting with human tissues in a laboratory environment enables the integration of transferable skills, such as problem solving, critical thinking and team work. These tissues are also used in assessments, and workshops to support professional development for a number of clinical disciplines.

Conclusion Learning from body donors has multiple benefits and continues to be a motivating factor for our students, piquing their curiosity in the human body and its clinical relevance and preparing them for their chosen vocation.

Keyword: Anatomy education, body donor, motivation

ID: 327205

Cadaver-based research remains an irreplaceable component of medical education and clinical practice

Zhang Ming

Chinese University of Hong Kong - Shenzhen

Cadaver-based research has been a cornerstone of medical education and clinical practice for centuries. The study of human cadavers provides invaluable insights into anatomy, pathology, and surgical techniques, forming the foundation of modern medicine. Even with advancements in imaging and simulation technologies, cadaveric dissection and sectional anatomy remain irreplaceable in training healthcare professionals and refining clinical procedures. In particular, contemporary mesoscopic anatomy further enriches cadaver-based research by providing a detailed understanding of tissue organization, disease pathology, and functional relationships. It bridges the gap between macroscopic and microscopic observations, making it a critical tool in anatomical, medical, and biomedical research. In this presentation, in addition to classic cadaveric dissection, the author will present several examples to support the explanation of mesoscopic anatomy and its correlation with cadaver-based research. The presentation will also highlight some challenges and opportunities that are brought forth by mesoscopic anatomy and will continue to benefit modern medicine while adapting to future needs.

Keyword: Education, research, clinical medicine, cadaver-based



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会
11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS
39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

Abstract



● 亚太 A1. Anatomical Variations ● Podium

ID: 318072

Anatomy and Cartilaginous Variations of the Carina: A Cadaveric Study

Chung Yoh Kim^{1,2} Kristen Rizzuto³ Daniel Tahan³ Devendra Shekhawat¹ Rarinthorn Samrid^{1,4}
Yoko Tabira^{1,5} Stephen J. Bordes⁶ Joe Iwanaga^{1,5,7,8,9,13} R. Shane Tubbs^{1,7,8,9,10,11,12}
1.Department of Neurosurgery, Tulane Center for Clinical Neurosciences, Tulane University School of
Medicine, 131 S. Robertson St., Suite 1300, New Orleans, LA 70112, USA
2.Department of Anatomy, Dongguk University School of Medicine, Gyeongju, Republic of Korea 3
Tulane University School of Medicine, New Orleans, LA, USA
3.Tulane University School of Medicine, New Orleans, LA, USA
4.Department of Anatomy, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand
5.Division of Gross and Clinical Anatomy, Department of Anatomy, Kurume University School of Medicine,
Kurume, Fukuoka, Japan
6.Department of Surgery, Louisiana State University Health Sciences Center, New Orleans, LA, USA
7.Department of Neurology, Tulane Center for Clinical Neurosciences, Tulane University School of Medicine, New
Orleans, LA, USA
8.Department of Structural & Cellular Biology, Tulane University School of Medicine, New Orleans, LA, USA
9.Department of Neurosurgery and Ochsner Neuroscience Institute,
Ochsner Health System, New Orleans, LA, USA
10.Department of Anatomical Sciences, St. George's University, St. George's, Grenada
11.Department of Surgery, Tulane University School of Medicine, New Orleans, LA, USA
12.University of Queensland, Brisbane, Australia
13.Dental and Oral Medical Center, Kurume University School of Medicine, 67 Asahi-machi, Kurume,
Fukuoka, Japan

Objectives The carina is a keel-shaped cartilaginous ridge at the tracheal bifurcation, traditionally considered part of the trachea. We aimed to elucidate the detailed anatomy and cartilaginous variations of the carina in human cadavers.

Methods Distal trachea and main bronchi from 32 adult cadavers were examined. 29 specimens were dissected using a surgical microscope. Three specimens underwent micro-computed tomography (micro-CT) to reconstruct three-dimensional cartilaginous structures. For endoscopic images, the internal surface of the distal trachea and position of the carina were photographed. Histological sections in axial, coronal, and sagittal planes stained with hematoxylin and eosin, and Masson's trichrome were examined for microscopic tissue details.

Results Eight distinct carinal types were identified based on contributions from the last tracheal ring and left and/or right main bronchial cartilages. The most common type (34.48% of cases) was a carina composed solely of right bronchial cartilage, followed by a bilateral bronchial cartilage type (24.14%). The carina was slightly deviated to the left of midline in most specimens. Micro-CT clearly delineated cartilaginous components, and histology confirmed normal respiratory epithelium and extensive bundles of collagen fibers under the respiratory epithelium layer.

Conclusion Although traditionally regarded as part of the distal trachea, most carinal cartilages were composed of the most inferior tracheal ring and/or bronchial cartilages in the present study. The right main bronchial cartilage was the most common contributor followed by the left main bronchus.

Keyword: Cartilage · Trachea · Bronchus · Carinal cartilage



亚太 A1-129-0002

改良 kidner 手术联合距下关节松解术治疗青少年 2 型 软扁平足副舟骨疼痛的疗效观察

宁可^{Ms} (2285368678@qq.com) 李玉飞^{PhD} 文捷^{PhD} 刘粲^{Ms} 丁一通^{Ms}
湖南师范大学医学部解剖教研室 长沙 410000

探讨改良 kidner 手术联合距下关节松解术治疗青少年 II 型副舟骨疼痛伴扁平足的临床疗效。从 2018 年 1 月到 2022 年 1 月，我院收治了 25 名患有 II 型副舟状肌和灵活扁平足疼痛的青少年患者（40 足），其中包括 13 名男性（23 足）和 12 名女性（17 足）。所有患者均接受改良 kidner 手术联合距下关节融合术。术前和最后随访时，在负重前后和侧位 x 线片上测量了 Meary 角、距骨第一跖角（APTMT）、距骨第二跖角、俯仰角、距石倾斜角、距骨覆盖角（TCA）、距石-跟骨角（LTCA）和跟骨角。采用美国骨科足踝协会（AOFAS）中足评分和视觉模拟评分（VAS）评估足部功能和疼痛的改善情况。所有患者平均随访 17.4 ± 2.6 个月（12-24）。25 名患者的切口一期愈合。足部负重前后和侧位 x 线片显示，缝合锚没有拔出或断裂，足弓没有进一步塌陷。所有患者均未进行螺钉拔出或二次手术以取出螺钉。在最后一次随访中，患足的术后视觉模拟评分（VAS）明显低于手术前（ $P < 0.01$ ），美国骨科足踝协会（AOFAS）足功能评分明显高于手术前（ $P < 0.01$ ）。在最后一次随访中，负重前后和外侧足部 x 射线片显示：与手术前相比，Meary 角、距骨第一跖角（APTMT）、距骨第二跖角、俯仰角、距角倾斜角、talonavicular oversite 角（TCA）、talocalcane 角（LTCA）和跟骨角显著改善（ $P < 0.01$ ）。改良 kidner 手术联合距下关节松解术治疗青少年 II 型副舟状痛伴灵活扁平足具有良好的临床效果，能有效改善疼痛症状，改善足部功能和影像学表现，纠正扁平足畸形。

亚太 A1-129-0006

Identification of Plasma Biomarkers associated with Osteoporosis by Proteome Analysis

Li Chunyan Liu Fan
首都医科大学附属北京积水潭医院

Objective Osteoporosis is one of the most commonly occurring conditions worldwide increasing the risk of fractures with age. The current study aimed to identify significant biomarkers for osteoporosis diagnosis.

Methods We analyzed serum concentrations of cytokines and proteins of 39 osteoporosis patients, 26 osteopenia patients, and 13 healthy subjects using Luminex detection and Elisa assay. Protein-protein interaction (PPI) network, weighted gene co-expression network analysis (WGCNA), and random forest (RF) analysis were constructed to explore osteoporosis-related biomarkers. The predictive value of the indicator panels was assessed using the area under the receiver-operator characteristic curve (AUC).

Results The serum cytokine profiling demonstrated upregulation of GM-CSF, interleukin (IL)-6, and MIP-1 α in the osteoporosis group compared with the healthy group and the osteopenia group. The proteomics assay identified AFM, APOL1, BCHE, CETP, FETUB, IGFALS, ITGA2, and PTPRJ downregulated while LDB3 and SNAPIN upregulated with the exacerbation of osteoporosis. Combined with clinical data, these promising serum biomarkers were identified as closely related to traditional indicators including Age, QCT, and BMD. Notably, both the combined panels of differentially expressed proteins (DEPs) and the RF model we established could accurately differentiate the osteoporosis group from the osteopenia group and the healthy group with a high AUC value.



Conclusion This comprehensive serum biomarker study covered cytokines and serum proteins from low to high abundance. Through logistic regression analysis and RF machine learning, we built stable, accurate panels of combinations of clinical data and cytokines (Age, IL6, GCSF, and MIP-1 α) as well as ten DEPs. These panels identified different degrees of bone loss and could be used for early prevention, stratified diagnosis, and treatment of osteoporosis.

Keywords: osteoporosis, biomarkers, diagnosis, proteomics, cytokines

亚太 A1-129-0011

新疆阿克苏地区维吾尔族成年人握力水平与体成分、 人体测量学指标的关联性分析

黄婷 (ht18341652980@163.com)

温有锋 锦州医科大学生物人类学研究所 锦州 121000

调查新疆地区维吾尔族成年人的握力水平，并探究其与体成分和人体测量学指标的关系，为该地区临床肌力评估以及老龄化应对策略提供数据支持。采用整群随机抽样方法选取阿克苏地区 1133 例成年维吾尔族居民（男 442 例，女 691 例）作为研究对象，利用握力计、生物电阻抗分析仪、手部图像扫描仪、围度尺等分别测定握力、体成分、腰围、臀围及手部尺寸等指标。利用方差分析、t 检验、偏相关性以及多元线性回归的统计方法。结果显示：1. 维吾尔族成年人握力水平在 20-30 岁达到峰值，之后随年龄增长逐渐下降；2. 调整年龄、身高及体重后，在男性中，去脂体重、肌肉量及掌宽均与握力呈正相关，而脂肪量及体脂率与握力呈负相关；在女性中，BMI、去脂体重、肌肉量、手长及掌宽均与握力呈正相关，而脂肪量、体脂率、腰围、腰臀比、腰高比与握力呈负相关；3. 多元线性回归分析显示，在男性中，年龄及肌肉量对握力的影响具有统计学意义；女性中，年龄、肌肉量、腰臀比及手长对握力的影响具有统计学意义。新疆维吾尔族成年人握力呈年龄依赖性下降，男性主要受肌肉量影响，女性同时受肌肉量和腰臀比调控，为该地区制定不同性别的肌力评估标准提供了重要依据。

亚太 A1-129-0013

NEK7 mediates neuroinflammation and cognitive impairment in Alzheimer's disease via NLRP3/Caspase-1/IL-1 β signaling pathway

Lin Wang^{1,2}, Jiaqi Liu^{1,3}, Chuanhua Ge^{1,3}, Junhua Li^{1,3}, Huai Wang^{1,3}, Zhimin Long^{1,3}, Qinghua Zeng^{1,3}, Guiqiong He^{1,3*}

1 Institute of Neuroscience, Basic Medical College, Chongqing Medical University, Chongqing, China;

2 Department of Basic Medicine, Chongqing College of Traditional Chinese Medicine, Chongqing, China;

3 Department of Anatomy, Basic Medical College, Chongqing Medical University, Chongqing, China.

Objectives Recent studies have suggested the association between NLRP3 inflammasome and Alzheimer's disease (AD) and the significant function of NEK7 in NLRP3 inflammasome activation. However, the relationship of NEK7 with AD is vague yet. This study aimed to investigate the expression patterns and regulatory mechanisms of NEK7 in AD.

Methods Immunohistochemistry and immunofluorescence were utilized to visualize senile plaques deposition and evaluate NLRP3/NEK7 expression and co-localization in human postmortem brain



tissues and APP/PS1 mouse models. Lentiviral overexpression or knockdown of NEK7 was injected into the lateral ventricle in 10-month-old APP/PS1 double transgenic mice anesthetized with sodium pentobarbital. Cognitive function was rigorously assessed through the Morris Water Maze tests. Western blotting was employed to analyze the changes of NEK7-related inflammatory pathway.

Results Our Results show that AD patients and DTg mice have increased amounts of A β deposition and elevated levels of NEK7 and NLRP3 proteins. In addition, we found that both exogenous A β ₁₋₄₂ and endogenous APP genes increase NEK7 expression in AD model cells. Knockdown of NEK7 down-regulated the expression of NLRP3, caspase-1, and IL-1 β , which reduced microglia activation and senile plaque deposition in the brains of DTg mice and ameliorated AD-induced cognitive deficits, whereas overexpression of NEK7 produced the opposite results.

Conclusion NEK7 expression was significantly increased in the brains of AD patients and DTg mice. Exogenous and endogenous A β can significantly induce NEK7 expression. NEK7 regulates neuroinflammation in AD animals through the NLRP3/Caspase-1/IL-1 β signaling pathway. Our **Results** suggest NEK7 may play an important role in neuroinflammation and warrants further study of AD and other inflammatory diseases.

Key Words: NEK7, NLRP3 inflammasome, Alzheimer's disease

亚太 A1-129-0023

Molecular Network Analysis of the Association Between Anxiety and the Anterior Cingulate Cortex.

Yi Zheng¹ (544390000@qq.com), Liulin Xiong², Department of Anesthesiology, The First People's Hospital of Zunyi(The Third Affiliated Hospital of Zunyi Medical University), Zunyi 563000, China.

Objectives The anterior cingulate cortex (ACC) is a critical brain region involved in the regulation of anxiety, but its underlying molecular mechanisms remain unclear. This study aimed to identify key targets and elucidate potential pathways linking the ACC and anxiety using bioinformatics approaches.

Methods Targets associated with "Anxiety" and "Anterior Cingulate Cortex" were retrieved from the GeneCards database. Overlapping targets were identified via Venn analysis. A protein-protein interaction (PPI) network was constructed using the STRING database and Cytoscape software. Key genes were screened with the MCC algorithm via CytoHubba. Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) enrichment analyses were conducted. A "symptom-region-key target-pathway" network was integrated.

Results A total of 120 overlapping genes were identified, from which ten core genes (BDNF, CREB1, FOS, CRH, NPY, NTRK2, TH, POMC, IL1B, TNF) were found. GO analysis indicated enrichment in autophagy regulation, neuron projection development, long-term memory, and learning. KEGG analysis revealed 99 pathways, notably including retrograde endocannabinoid signaling, glutamatergic synapse, insulin secretion, morphine addiction, and dopaminergic synapse. The constructed network illustrated the potential molecular mechanisms by which the ACC regulates anxiety.

Conclusion This study found several critical molecular targets and pathways linking the ACC to anxiety, therefor providing a theoretical basis for future experimental validation and therapeutic intervention strategies.

Key Words: Anterior cingulate cortex, Anxiety, Molecular network, Bioinformatics



亚太 A1-129-0024

Integrated Network Pharmacology Analysis of Molecular Mechanisms and Core Targets Linking Anxiety and the Prefrontal Cortex

Zhang Jing (876664874@qq.com) Xiong Liulin

Department of Anesthesia, The Third Affiliated Hospital of Zunyi Medical University, Zunyi 563000

Objective This study was designed to investigate the molecular mechanisms linking anxiety and the prefrontal cortex (PFC) through an integrated network pharmacology approach to provide a theoretical basis to identify key targets and signaling pathways, and provide a theoretical basis for exploring the mechanisms of anti-anxiety drug action.

Methods Target Collection and Screening: Potential targets associated with “Anxiety” and the “Prefrontal Cortex” (PFC) were retrieved from the GeneCards database using relevance score thresholds of ≥ 4.9 for anxiety and ≥ 7 for the PFC, resulting in the identification of 316 anxiety-related targets and 368 PFC-related targets. Intersection Analysis and Network Construction: A total of 147 overlapping targets was identified using the Wei Sheng Xin Venn tool. Subsequently, a protein–protein interaction (PPI) network was constructed via the STRING database; the top 10 core targets (including FOS, CREB1, BDNF, among others) were further screened using the Cytoscape CytoHubba plugin based on the MCC algorithm. Functional Enrichment Analysis: Gene Ontology (GO) and KEGG pathway analyses were conducted using the DAVID database ($P < 0.05$), and the **Results** were visualized using bubble plots. Network Integration: An “emotion-region–key target–KEGG pathway” network was established to integrate the core PPI targets with the enriched pathways.

Results A total of 147 intersection targets between anxiety and the PFC were identified. PPI network analysis revealed the top 10 core targets, including FOS, CREB1, BDNF, INS, and TNF. GO enrichment analysis indicated that biological processes were primarily involved in G protein-coupled receptor signaling and peptide hormone response; cellular components were predominantly located in presynaptic active zones and nuclear membranes; while molecular functions included β 2-adrenergic receptor binding and voltage-gated calcium channel activity. The top 10 KEGG pathways identified included TNF signaling, cGMP-PKG signaling, and longevity regulation. The integrated “emotion-region–key target–KEGG pathway” network demonstrated that the PFC modulates anxiety-related pathways via INS, IL6, and additional targets.

Conclusion The interaction between anxiety and the PFC is mediated by a complex regulatory network involving multiple targets and pathways. Core targets—such as FOS, BDNF, and TNF—and key pathways including TNF signaling and G protein-coupled receptor signaling may serve as promising therapeutic intervention points, thereby providing potential molecular targets for the development of anti-anxiety drugs.

Keywords Anxiety; Prefrontal Cortex; Network Pharmacology; Protein-Protein Interaction Network; KEGG Pathway; Gene Ontology (GO) Enrichment Analysis.



亚太 A1-129-0025

焦虑与蓝斑核关联的分子机制及网络药理学研究

高伟忠 (1003401614@qq.com) 廖宇奉 熊柳林
遵义市第一人民医院睡眠医学临床治疗中心 563000

焦虑的神经机制与蓝斑核 (Locus Coeruleus, LC) 密切相关, 但其分子靶点与通路网络尚待系统解析。本研究通过整合多数据库 (GeneCards、ETCM、HERB) 筛选焦虑相关靶点 8693 个和蓝斑核相关靶点 4475 个, 经 Venn 分析获得 112 个关键交集基因。利用 STRING 数据库构建蛋白质互作网络 (PPI), 结合 Cytoscape 拓扑分析鉴定出前 10 核心靶点 (BDNF、NPY、TAC1、CRH、DRD2 等)。GO 富集分析显示, 这些靶点显著参与对外源性刺激反应 (BP)、突触后膜功能 (CC) 及 G 蛋白偶联受体活性 (MF) 等生物学过程 (共富集 526 条功能条目)。KEGG 通路分析揭示其富集于神经递质相关通路 (如谷氨酸能突触、多巴胺能突触、5-羟色胺能突触) 及成瘾行为 (尼古丁、安非他命)。进一步构建的“症状-部位-靶点-通路”多维网络模型, 直观呈现了蓝斑核调控焦虑的分子路径, 为靶向干预提供了理论依据。本研究通过多维度生物信息学分析, 系统阐明了蓝斑核在焦虑中的关键分子机制, 为开发精准抗焦虑策略奠定了网络药理学基础。

● 亚太 A1. Anatomical Variations ● Poster

ID: 320636

Langer's arch crossing superficially over the axillary neurovascular bundle: a case report

Hongtae Kim Mi-Sun Hur
Department of Anatomy, Daegu Catholic University School of Medicine

Objectives Langer's arch is a muscular or fibrous anatomical variant occasionally encountered in the axilla, with a reported prevalence of 5–8% in the population. It represents a variation of the latissimus dorsi muscle and is also referred to as Langer's axillary arch or simply the axillary arch.

Methods During a routine cadaveric dissection in a gross anatomy course, a Langer's arch was identified in a 79-year-old Korean male cadaver.

Results Langer's arch originated from the latissimus dorsi muscle on the lateral thoracic wall at the level of the fifth rib. It initially arose as a muscular band, which ascended while gradually narrowing, and transitioned into a long and thin tendinous slip. The arch crossed superficially over the basilic vein just before it drained into the axillary vein and over the medial cord of the brachial plexus. The arch ultimately inserted into the coracoid process. The width of the tendinous portion at its insertion measured 2.5 mm, and the length of the arch was 45.7 mm.

Conclusion Contraction of the latissimus dorsi may cause the Langer's arch to compress the underlying basilic vein and medial cord of the brachial plexus, potentially leading to venous or neurological symptoms. If unrecognized, the Langer's arch can complicate axillary procedures such as breast reconstruction, bypass surgery, or lymph node dissection. Thus, thorough awareness and careful identification of this anatomical variant are important for safe and effective surgical management of the axilla.

Keyword: Anatomical variation, axillary arch, Langer's arch, latissimus dorsi muscle



亚太 A1-129-0010

颅底-鼻腔联合入路小型猪与小鼠咽鼓管的取材和比较观察

李瑞 (2268023734@qq.com) 方璇 刘怀存 王月琪 钟贞 程全成 李蔓 丁慧如 王超姚义凡 张卫光 刘俊秀
北京大学第一医院耳鼻咽喉头颈外科 北京 100034 北京大学基础医学院人体解剖学教研室

人体咽鼓管组织难以获取这一现实问题限制了咽鼓管研究的发展。本研究探索了无内镜辅助条件下小型猪咽鼓管组织取材的方法及体视显微镜下 Sprague – Dawley (SD) 大鼠与 C57BL/6J 小鼠咽鼓管取材方法, 帮助进行咽鼓管相关研究者快速完整的解剖猪与鼠咽鼓管。本研究解剖比较了 5 头小型猪、9 只 C57BL/6J 小鼠、9 只 Sprague-Dawley (SD) 大鼠用于咽鼓管取材方法的探索, 咽鼓管取材后石蜡包埋切片进行 HE 染色进行形态学观察, Luxol fast blue 髓鞘染色进行神经纤维髓鞘染色观察咽鼓管神经分布。研究发现, 小型猪咽鼓管总长度约为 29.2-34.9mm ($32.35\pm2.173\text{mm}$), 咽鼓管咽口高度为 8.2-14.3mm ($10.60\pm2.611\text{mm}$), 鼓室口处高度为 2.1-1.7mm ($2.348\pm0.1097\text{mm}$)。C57BL/6J 小鼠咽鼓管总长度约为 1.05-1.28mm ($1.152\pm0.084000\text{mm}$), 咽鼓管咽口直径为 0.10-0.14mm ($0.1133\pm0.01633\text{mm}$), 鼓室口处直径为 0.17-0.38mm ($0.2283\pm0.08085\text{mm}$)。SD 大鼠咽鼓管咽总长度约为 3.68-3.80mm ($3.738\pm0.04355\text{mm}$), 咽口直径约 0.13-0.23mm ($0.1800\pm0.04000\text{mm}$), 鼓室口处直径约 0.41-0.47mm ($0.4300\pm0.02280\text{mm}$)。C57BL/6J 小鼠与 SD 大鼠咽鼓管咽口直径小于鼓室口直径。咽鼓管有髓神经纤维主要位于骨或软骨组织。经颅底联合鼻腔入路能相对快速解剖出巴小型猪完整咽鼓管, 避免从外耳道剖开颞骨打开鼓室这一过程, 并能选择性保留咽鼓管周围组织结构。大小鼠以鼓室大泡为标志保留整个中耳与内耳结构是保持咽鼓管结构完整性的有效方法。

亚太 A1-129-0022

有氧运动通过脑-肠轴对共病性失眠小鼠 Vlp0 区神经元的保护作用

赵鹏 (zhaopeng336@jiangnan.edu.cn) 赵奕儒
江南大学无锡医学院神经解剖与病理实验室 无锡 214122

研究有氧运动对共病性失眠小鼠的改善作用, 进一步探讨肠道菌群通过脑-肠轴在其中的作用及相关机制。本研究使用小鼠跑步机对 8 月龄 C57/6J 共病性失眠小鼠进行为期两周的有氧运动训练。首先对小鼠进行戊巴比妥钠翻正反射实验并通过高效液相色谱质谱联用仪对小鼠下丘脑 Vlp0 区进行相关神经递质含量的测定; 通过对小鼠下丘脑 MNR、Vlp0 区进行 HE、尼氏染色观察神经元形态以及炎症浸润等病理变化, 以及 Western blot、免疫荧光染色检测神经元受体含量的变化情况; 随后在宏基因组学信息提示下对小鼠进行粪菌移植并对小鼠的下丘脑 GABA、5-HT 神经元进行相关检测, 对小鼠的脑电进行 24h 监测。结果发现: 有氧运动训练的小鼠在 Vlp0 区的 GABA 神经元相较于共病性失眠小鼠无炎症浸润且形态饱满, 并且能够改善因神经递质减少而其受体适应性增加的病理情况。通过宏基因组筛查发现: 经 AE 训练的小鼠显著改善肠道中的有益菌丰度而减少了有害菌的丰度。经实验结果发现: 经 AE 训练的小鼠的肠道菌群能够改善共病性失眠小鼠的脑电、神经元形态、炎症浸润。



● 亚太 A1. Anatomical Variations ● Abstract

亚太 A1-129-0015

The neck movement morphology of Mamenchisaurus was inferred based on a comparative analysis of ostrich cervical ribs

Fayi Chen, Chenchen Zhou, Zixi Fan, Xuhe Bao, Yanghui Ou*, Hongjin Sui*, Nan Zheng* (zhengnan831016@163.com)

Department of Anatomy, College of Basic Medicine, Dalian Medical University, Dalian, China.

Objectives Mamenchisaurus is a sauropod dinosaur. It has the highest number of cervical vertebrae among all sauropods. Its neck is the longest of any sauropod. Additionally, it has paired cervical ribs. Studies suggest that cervical ribs played a critical role in maintaining cervical postural stability in sauropods. Ostriches, as bird relatives of sauropod dinosaurs, share similarities in their skeletal structure with sauropods.

Methods Ostrich and Mamenchisaurus fossils were studied using gross anatomy, histology, and P45 plastination techniques to analyze cervical ribs morphology and positional relationship with adjacent structures. The study aimed to infer the neck movement patterns of Mamenchisaurus.

Results The Results showed that both species had 18 cervical vertebrae with paired cervical ribs (C3-C16), resembling the rib morphology in humans. The cervical ribs consist of a rib head and a rib body. From the head extend an anterior process, a ventral process, and a tuberculum, which together with the cervical vertebrae create a transverse foramen. The transverse foramen allows the passage of blood vessels. Histological analysis indicates that cervical ribs consist of cancellous and cortical bone. Collagen fibers were also identified, exhibiting a longitudinally parallel alignment extending from the cranial to caudal direction. The capitulum and anterior process of the ostrich cervical ribs articulate with the adjacent superior vertebra. During joint movement, the transverse foramen alters its lumen size, exerting compressive forces on the traversing vasculature, thereby regulating cranial blood supply. Three muscle groups (intercervical, intertubercular, interventral process) synergistically control rib dorsoventral/lateral motions.

Conclusion This study concluded that the ostrich cervical ribs assist in maintaining an upright neck posture, regulate neck blood supply in coordination with adjacent structures. These findings provide a comparative anatomical basis for speculating on the neck movement patterns of Mamenchisaurus.

Keywords: Cervical ribs, Mamenchisaurus, Neck movement, P45 plastination techniques

亚太 A1-129-0016

骨骼肌纤维 NLRP3 炎症小体激活、亚细胞定位及 3D 重建

厉洋洋 (liyyang0814@163.com) 菅晓婷 黄静雯 王琪森 桂炜超 张小龙 赵子炜 胡稷杰 廖华
南方医科大学基础医学院解剖教研室 广州 510515 南方医科大学南方医院创伤骨科

本研究聚焦于体外炎性环境中肌纤维内 NLRP3 炎症小体的激活、亚细胞定位及其 3D 重建。通过体外培养 C2C12 细胞并利用马血清进行分化，采用脂多糖 (LPS) 及尼日利亚菌素 (Nig) 刺激分化肌管内 NLRP3 炎症小体激活。运用 qPCR 及 Western blot 技术，对 NLRP3、ASC、Caspase - 1 基因及蛋白水平进行检测；借助免疫荧光分析 NLRP3、ASC 的聚集与共定位情况；通过共聚焦观察及 Imaris 软件重建，揭示聚合态 NLRP3、ASC 与特定细胞器（高尔基体、线粒体、内质网）



的联系。结果显示，在体外条件下，LPS 和 Nig 联合刺激能够使肌纤维内 NLRP3、ASC、Caspase - 1 基因以及蛋白水平显著上调，在细胞浆内可观察到 NLRP3、ASC 的聚集现象。同时，肌纤维内线粒体功能分子 TOM20、高尔基体分子 TGN38 显著上调，且聚集态 NLRP3、ASC 与线粒体、高尔基体存在共定位关系。综上得出，LPS 联合 Nig 刺激能够诱导骨骼肌纤维内 NLRP3 炎症小体的激活，并且活化的 NLRP3 炎症小体组分与线粒体及高尔基体存在紧密关联。本研究为深入理解体外炎性环境下肌纤维内 NLRP3 炎症小体的特性提供了关键依据。

亚太 A1-129-0017

Anomalous Left Hepatic Artery and Splenic Artery Variation with Absence of the Celiac Trunk: A Case Report

Zhu Junyao¹, Li Wenquan¹, Lv Huanmei¹, Li Siying¹, Chen Meiting¹, Lin Xi¹, Mo Jijia¹, Chen Taibai¹, Wei Li²(759649859@qq.com).

1.The Second Clinical School of Medicine, Guangxi Medical University, Nanning 530021;

2.Department of Human Anatomy, Guangxi Medical University.

A rare anatomical variation of the celiac trunk and hepatic artery was observed during a gross anatomy dissection of a male cadaver. The celiac trunk was absent, with the common hepatic artery (4 mm diameter) originating directly from the abdominal aorta at the T12-L1 level. The superior mesenteric artery arose 10 mm distal to the hepatic artery and gave rise to the splenic artery (5 mm diameter). The common hepatic artery give rise to two left gastric arteries before continuing as the proper hepatic artery, which further divided into the left/right hepatic and right gastric arteries, terminating as the gastroduodenal artery (3 mm diameter). This variation is characterized by the absence of the celiac trunk, the dual origin of the left gastric artery, and the anomalous branching of the splenic artery from the superior mesenteric artery. Such anomalies may impact surgical interventions, including laparoscopic gastrectomy, hepatic procedures, and splenic artery embolization, underscoring the necessity for preoperative vascular assessment to mitigate operative risks. Although rare, anatomical variations must be carefully identified during surgery. In laparoscopic gastrectomy, left gastric artery variations should be assessed. For liver surgery, note celiac trunk and hepatic artery variations. Splenic artery variations are particularly relevant in splenic artery embolization and laparoscopic abdominal procedures.

Key Words: Absence of the Celiac Trunk, Splenic Artery, Hepatic Artery

Funding

This work was supported by grants from the Natural Science Foundation of Guangxi Zhuang 2024GXNSFAA010200



亚太 A1-129-0018

生长抑素能神经元影响成年海马神经发生 参与小鼠疼痛相关认知功能障碍

孟庆胜,张雨冰,段嘉宾,曹靖
郑州大学

慢性疼痛是一种与实际或潜在的组织损伤相关或类似的不愉快的感觉和情绪体验,严重影响着人们的生活质量。认知障碍是慢性疼痛的常见合并症,临床研究证明部分慢性疼痛患者的许多认知领域如学习记忆、注意力和信息处理速度等都受到了损害。成年海马神经发生(adult hippocampal neurogenesis, AHN)指成年动物海马齿状回(dentate gyrus, DG)中新神经元的产生。这在记忆和其他认知功能以及情绪调节中起着至关重要的作用。研究表明慢性疼痛状态下 AHN 会受到抑制。生长抑素(somatostatin, SOM)中间神经元是特异性抑制锥体细胞树突的 γ -氨基丁酸(γ -aminobutyric acid, GABA)能中间神经元的一个主要亚群。SOM 神经元在 DG 中能够通过对颗粒细胞(granule cells, GCs)的抑制作用参与海马对记忆的信息加工处理。成年新生神经元从多种类型的 GABA 能中间神经元获得局部连接。然而, DG 区 SOM 神经元在慢性疼痛合并认知障碍模型中的具体作用机制仍待研究。

本研究旨在通过行为学、形态学和电生理学等方法,探究 DG 的 SOM 神经元在慢性疼痛合并认知障碍模型中的活性变化以及 SOM 神经元对小鼠痛行为和认知行为的作用以及具体机制。

材料与方法 1.建立坐骨神经慢性压迫性损伤(Chronic constriction injury of the sciatic nerve, CCI)模型,使用 0.07g 和 0.4g von Frey 丝检测小鼠的痛行为,通过巴恩斯迷宫(Barnes maze test, BMT)和 Y 迷宫(Y-maze)实验检测认知行为。

2.通过腹腔注射 5-溴脱氧尿嘧啶核苷(5-Bromodeoxyuridine, BrdU)或脑立体定位注射表达绿色荧光蛋白的逆转录病毒(Retroviral vector expressing-EGFP, ROV-EGFP)检测 AHN。

3.通过免疫荧光及离体海马脑片全细胞膜片钳检测 DG 区 SOM 神经元的活性和兴奋性。

4.使用 SOM-Cre 小鼠,通过脑立体定位技术化学遗传靶向调控 DG 区 SOM 神经元,结合疼痛行为学和认知行为学以及神经发生,阐明 SOM 神经元在慢性疼痛合并认知功能障碍中的作用。

5.通过免疫荧光的方法检测 DG 区 SOM 神经元与 mGluR1 α /5 的共标情况,通过 Western-blot 检测 CCI 模型中 DG 区 mGluR1 α /5 的表达变化。利用套管给药的方法在小鼠 DG 区给予受体激动剂或拮抗剂,检测小鼠痛行为、认知行为及神经发生变化,探究 SOM 神经元在慢性疼痛合并认知障碍模型中的具体作用机制。

结果 1.慢性疼痛合并认知障碍小鼠 DG 区 AHN 受损: CCI 术后 28 天小鼠 DG 区 BrdU 和 DCX 共标数量降低,新生神经元树突复杂性、树突数量和树突总长度降低。

2.慢性疼痛合并认知障碍小鼠 DG 区 SOM 神经元兴奋性升高: CCI 术后 28 天小鼠 DG 区 SOM 和 c-Fos 共标率升高,电生理实验显示 SOM 神经元的动作电位发放频率升高,基强度和静息膜电位降低。

3.化学遗传激活小鼠 DG 区 SOM 神经元,小鼠 AHN 受损,认知水平下降;化学遗传抑制 CCI 模型小鼠 DG 区 SOM 神经元,小鼠 AHN 恢复,认知水平恢复。两种刺激均对小鼠的机械痛没有影响。

4.mGluR1 α 和 mGluR5 均与 SOM 存在共定位: DG 区 74.52% 的 SOM 表达 mGluR1 α , 85.83% 的 mGluR1 α 表达 SOM; 50% 的 SOM 表达 mGluR5, 53.89% 的 mGluR5 表达 SOM。CCI 术后 28 天小鼠 DG 的 mGluR1 α 和 mGluR5 蛋白表达升高。

5.靶向激活小鼠 DG 区 mGluR1 α /5,小鼠认知水平下降;靶向抑制 CCI 模型小鼠 DG 区 mGluR1 α 而非 mGluR5,小鼠认知水平恢复。两种刺激对小鼠的机械痛均无影响。靶向抑制 CCI 模型小鼠 DG 区 mGluR1 α ,小鼠 AHN 恢复。

结论 抑制 mGluR1 α 的表达可逆转慢性疼痛小鼠 DG 区域 SOM 神经元对成年海马神经发生的抑制,改善认知功能。



关键词：慢性疼痛；认知障碍；生长抑素；神经发生；代谢型谷氨酸受体

亚太 A1-129-0019

广西壮族成年女性腹主动脉数字化解剖学研究

李迎熙，甘恬，唐成，玉洪荣

广西医科大学基础医学院 南宁 530021 广西高校人体发育与疾病研究重点实验室
广西医科大学第一附属医院放射科

本研究旨在揭示广西壮族成年女性腹主动脉三维形态特征及其与年龄的关联规律，为个性化介入治疗提供解剖学依据。通过回顾性分析，纳入广西地区 30~75 岁壮族健康成年女性无血管病变及严重钙化的 CTA 影像数据 79 例。采用 Mimics 21.0 软件进行三维重建，沿血管中心线精准测量腹主动脉各段形态参数，包括长度、管径、截面积及分支夹角，并应用 Pearson 相关分析探讨年龄相关性。结果显示：（1）广西壮族成年女性腹主动脉干的长度为 (145.12 ± 12.90) mm，始端管径和截面积分别为 (18.04 ± 2.08) mm、 (250.85 ± 67.89) mm²，肠系膜上动脉平面管径和截面积分别为 (16.10 ± 1.87) mm、 (201.07 ± 52.71) mm²，肾动脉平面管径和截面积分别为 (13.15 ± 1.46) mm、 (133.52 ± 32.97) mm²，末端管径和截面积分别为 (12.83 ± 1.76) mm、 (128.10 ± 39.82) mm²，腹主动脉与肠系膜上动脉夹角为 $(45.03 \pm 19.61)^\circ$ ，左右髂总动脉夹角为 $(46.83 \pm 12.31)^\circ$ ；（2）腹主动脉长度、始端管径及其截面积、上中段管径及其截面积、下中段管径及其截面积、末端管径及其截面积与年龄呈不同程度的正相关性（ $P < 0.05$ ）；（3）随年龄增长，腹主动脉的长度、始端管径及其截面积、上中段管径及其截面积、下中段管径及其截面积、末端管径及其截面积均呈增大趋势。

亚太 A1-129-0020

An Updated Review of Rhinoplasty Techniques in East Asian Populations: A Comparative Analysis of East vs. West Approaches

Feven Birara

南方医科大学珠江医院

Background Rhinoplasty, a complex procedure influenced by both aesthetic and functional considerations, exhibits distinct approaches between Eastern and Western practitioners. This study aimed to comprehensively compare anatomical differences and recent advancements in rhinoplasty techniques between these regions.

Methodology A comprehensive literature search was conducted using PubMed, Google Scholar, and Scopus databases. Keywords included "rhinoplasty," "eastern and western," "anatomy," "techniques," and "advances." Inclusion criteria were research articles and clinical studies published in English, focusing on anatomical comparisons and rhinoplasty techniques between Eastern and Western populations. After initial screening of titles and abstracts, full-text articles were assessed for eligibility. Data extraction focused on anatomical differences, surgical techniques, and outcomes. A narrative synthesis approach was used to analyze and compare findings from included studies.

Results Search produced 325 results. After primary screening, the duplicates were removed and we remained with 226 results. Screening for content, we remained with a total of 67 eligible articles that were further examined to identify relevant information. Comparative analysis revealed significant anatomical variations between Eastern and Western populations, including disparities



in nasal bone and cartilage dimensions, skin thickness, and nasal tip morphology. These differences significantly impact surgical planning and execution.

Recent advancements such as 3D planning, biodegradable materials, minimally invasive techniques, and augmented reality have transformed rhinoplasty. However, adoption rates vary regionally. While Western practitioners often embrace novel techniques, Eastern surgeons tend to favor traditional approaches. Eastern rhinoplasty increasingly utilizes closed techniques incorporating autologous grafts (e.g., ear cartilage) and implants (silicon, PIFE, Medpor). However, implant-related complications, including visibility and infection, necessitate careful consideration. Western practitioners frequently employ ultrasonic devices for precise tissue manipulation.

Keywords: Rhinoplasty Techniques; East Approaches; West Approaches

亚太 A1-129-0026

Network Pharmacology-Based Study on Molecular Interaction Mechanisms Between Anxiety and the Bed Nucleus of the Stria Terminalis (BNST).

Cao Xinya¹(734566909@qq.com), Xiong Liulin²

1. Department of Anesthesia

2. The Third Affiliated Hospital of Zunyi Medical University, Zunyi 563000, China.

Objectives Anxiety is a prevalent mental health disorder, and the bed nucleus of the stria terminalis (BNST) plays a critical role in emotional regulation. This study aimed to investigate the molecular mechanisms linking anxiety and BNST using network pharmacology to identify key targets and pathways.

Methods Targets associated with "Anxiety" and "The bed nucleus of the stria terminalis (BNST)" were retrieved from the GeneCards database. Overlapping targets were identified using Venn diagrams. A protein - protein interaction (PPI) network was constructed using the STRING database and Cytoscape software. Key genes were screened with the MCC algorithm via CytoHubba. Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) enrichment analyses were conducted. An "Emotion-Region-Key Target-Pathway" network was generated.

Results A total of 115 overlapping genes were identified, from which ten core genes (NPY, CRH, TAC1, FOS, TH, POMC, PDYN, OXT, SST, CRHR1) were selected. GO analysis highlighted enrichment in pain perception regulation, synaptic vesicle membranes, and ligand-gated ion channel activity. KEGG analysis revealed 24 pathways, notably including calcium signaling, neurodegeneration, and insulin secretion. The integrated network illustrated connections between anxiety, BNST, core targets, and pathways.

Conclusion This study identified critical targets and pathways bridging anxiety and BNST, providing a theoretical foundation for understanding anxiolytic mechanisms and guiding future drug discovery.

Key Words: anxiety, BNST, network pharmacology, bioinformatics.



- 亚太 A2. Clinical Anatomy (Surgical and Non-surgical) ● Podium

ID: 311727

Some Empirical Evidence of Non-Local Knee Pain Anatomy

Abdurachman
Medical Faculty, Airlangga University

Objectives Knee pain is often attributed to local anatomical and pathological causes, leading to localized treatments such as injections or surgical interventions. This study aims to present evidence challenging this assumption, emphasizing the potential non-local origins of knee pain and their implications for clinical practice.

Methods Four case reports were analyzed, each involving patients presenting with knee pain. None of the cases employed treatments directly targeting the knee. Instead, therapeutic interventions were applied to the foot—either ipsilateral or contralateral to the affected knee. Patient outcomes were documented, and the efficacy of these non-localized interventions was assessed.

Results All four cases demonstrated significant improvement in knee pain following foot-targeted therapies. The findings highlight the role of distal anatomical interconnections in the manifestation of knee pain, suggesting that the origin of symptoms may lie beyond the affected joint.

Conclusion This study provides novel evidence that knee pain may not always be localized, urging caution in administering local injections or considering total knee replacements. Understanding the potential non-local origins of knee pain is critical for optimizing patient outcomes and avoiding unnecessary invasive procedures.

Keyword: Anatomy, Case Reports, Knee Pain, Non-Local Treatment, Total Knee Replacement

ID: 318126

Systematically Reviewing the Anatomy of the Thoracic Duct, Cisterna Chyli and Lymphovenous Junction

Seyed Ali Mirjalili Lomani O'Hagan Sara Moazzam
University of Auckland

Objectives The cisterna chyli and lymphovenous junction (LVJ) are key lymphatic structures. The cisterna chyli, located at the caudal end of the thoracic duct, is vital in retroperitoneal surgery and interventional radiology. The LVJ, the principal outlet of the thoracic duct, has growing clinical significance in lymphatic outflow obstruction and minimally invasive procedures. Both structures show considerable anatomical variability. This study aimed to review their anatomy and function to improve clinical intervention.

Methods A systematic review was conducted to investigate the anatomy of the cisterna chyli and LVJ. Literature searches were performed across MEDLINE, Scopus, and Google Scholar. Studies involving both healthy volunteers and patients, without language or date restrictions, were included. Forty-nine studies on the cisterna chyli and forty-six on the LVJ met the inclusion criteria.

Results The cisterna chyli varied in location (T10 to L3), size (2–32 mm in diameter, 13–80 mm in length), morphology, and tributaries. Its detectability ranged from 1.7% to 98% depending on methodology. The LVJ also showed variability; a lymphovenous valve was often absent, but when present, it displayed morphologies such as bicuspid semilunar, ostial, and flap-like forms. Functional platelet plugs and the tangential course of the terminal thoracic duct may regulate blood flow.



Conclusion Both the cisterna chyli and LVJ show significant anatomical variation. Improved criteria for identifying these structures and further in vivo studies are essential to enhance understanding and clinical outcomes.

Keyword: anatomy, cisterna chyli, lymphovenous junction, lymphatics, lymphovenous junction

ID: 318185

Craniometric Analysis for Sex Determination from Dry Skulls in a Thai Population

Zhaokang Du¹ Pagorn Navic^{2,3} Apichat Sinthubua^{2,3} Patison Palee⁴ Pasuk Mahakkanukrauh^{2,3}

1. PhD Program in Anatomy, Faculty of Medicine, Chiang Mai University

2. Department of Anatomy, Faculty of Medicine, Chiang Mai University

3. Excellence Center in Osteology Research and Training Center (ORTC), Chiang Mai University

4. College of Arts, Media and Technology, Chiang Mai University

Objectives Sex determination is a crucial step in biological identification from skeletal remains, particularly in forensic contexts. Among the various skeletal remains, the skull plays a particularly significant role in sex determination. Moreover, craniometric from dry skulls have been reported with sexual dimorphism in various population. Therefore, this research aim to study sex determination based on craniometric measurements from dry skulls in a Thai population.

Methods Forty-three measurements were taken from 50 skulls (25 male, 25 female) with ages ranging from 20 to 87 years. All samples were obtained from the Osteology Research and Training Center (ORTC), Faculty of Medicine, Chiang Mai University.

Results Statistically significant differences in craniometric measurements were observed between males and females, with males exhibiting larger dimensions. Using stepwise discriminant analysis, 11 parameters were identified as the most effective for sex determination as follow: upper facial breadth, nasal height, and breadth, basion-prosthion length, foramen magnum length, and breadth, bizygomatic breadth, bigonial breadth, left condyle width and left minimum ramus breadth and height, respectively.

Conclusion The Results suggest that craniometric analysis from the skull can be useful for biological identification, particularly in cases where other skeletal elements are unavailable. Moreover, these findings contribute to the development of population-specific standards for sex determination in the Thai population in future studies.

Keyword: Sex determination, Craniometric, Dry skull, Thai



ID: 318190

Do We Understand the Physiology of Flow and Pressure in the Thoracic Duct? A Systematic Review

Sara Moazzam Lomani A. O'Hagan S. Ali Mirjalili
University of Auckland

Background The thoracic duct (TD) is the largest vessel of the lymphatic system. It transports interstitial fluid and proteins back into the venous circulation via the lymphovenous junction. The transmitted effects of breathing and heart rate have long been considered key to the propulsion of lymphatic fluid through the TD, but the literature presents inconsistent and conflicting findings on this relationship. This article aims to systematically review the literature regarding the effect of respiration and circulation on the flow and pressure of TD lymph in humans and animals.

Methods and Results A systematic review was conducted using the MEDLINE, Embase and Google Scholar databases. Studies up to March 2024 were included with no language or past date restrictions. Sixty-one published human and animal studies met the inclusion criteria. The reported impact of respiration and circulation is inconsistent, ranging between no impact to a strong reliance of the duct on both. Autonomic activity of the TD has also been described as a propagator of lymph into the venous system.

Conclusions The influence of respiration and circulation on the dynamics of TD lymph remains highly variable between individual studies. Future MR studies could aid the visualisation of TD lymph and contribute to a detailed understanding of lymphatic physiology in healthy and diseased states.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Keyword: thoracic duct, lymphatic system, respiration, circulation, flow, pressure

ID: 318371

Cerebellar Patterning and Volume Changes in Health and Disease

Hassan Marzban
University of Manitoba

Cerebellar compartmentation is defined by region-specific gene expression, neuronal birthdating, and afferent/efferent connectivity, particularly involving Purkinje cells (PCs), the sole output neurons of the cerebellar cortex. These features establish conserved transverse zones and parasagittal stripes. In mice, the cerebellum comprises four transverse zones: anterior (AZ; lobules I–V), central (CZ; lobules VI–VII), posterior (PZ; lobules VIII–dorsal IX), and nodular (NZ; ventral lobule IX and lobule X), each reflecting distinct developmental origins, functions, and vulnerability. This study investigates age- and sex-related cerebellar volume changes using MRI data from six neuroimaging datasets, including healthy individuals and patients with neurodegenerative and neuropsychiatric disorders. Total cerebellar and region-specific volumes were quantified across transverse zones and lobules. We found significant age-related volume reduction, with the CZ, linked to emotion and cognitive regulation, showing the most pronounced decline. In healthy and neurodegenerative groups, males exhibited smaller cerebellar volumes and steeper age-related decline than females. In contrast, in mental disorders, females showed greater volume loss with age. These findings re



veal sex-specific and disease-dependent trajectories of cerebellar atrophy aligned with its functional topography. The Results reinforce the cerebellum's role beyond motor control and suggest that MRI-based regional cerebellar analysis may serve as a valuable biomarker for tracking brain aging and disease progression across a range of neurological and psychiatric conditions.

Keyword: Cerebellar transverse zone, neuroimaging datasets, mild cognitive impairment (MCI), Alzheimer disease (AD), Parkinson disease (PD), schizophrenia (SZ)

ID: 318373

Anatomical Re-evaluation in the Costoclavicular Ligament

Kenji Emura^{1,2} Ryo Nitta² Takamitsu Arakawa^{3,4}

1.Shijonawate Gakuen University

2.Kobe University Graduate School of Medicine

3.Osaka Dental University

4.Kobe University Graduate School of Health Sciences

Objective The costoclavicular ligament (CCL) strongly regulates the motion in the sternoclavicular joint which is basilar to the shoulder girdle. Anatomical data on the CCL, such as fiber direction and relation to the sternoclavicular joint capsule or subclavius muscle, remain controversial, and how CCL controls clavicular motion is obscure. This study aimed to update the precise morphology of the CCL for the kinesiology of the sternoclavicular joint.

Methods We investigated 12 sides of the CCL from seven cadavers (five males and two females; mean age at death 88 years) donated to Kobe University Faculty of Medicine. In six sides, the inner structure of the CCL was investigated by cutting the CCL with the sternoclavicular joint capsule or sectioning in the sagittal plane. In the remaining six sides, the relationship between the CCL and subclavius was macroscopically investigated.

Results The lateral part of the CCL ran in posteroinferior to anterosuperior direction as the first rib coursed posterior to the clavicle. The CCL and the lateral part of the sternoclavicular joint capsule were continuous. Muscle fibers of the subclavius fronted on the anterior surface of the CCL.

Conclusion The lateral part of the CCL could limit the protraction of the clavicle as well as elevation. The CCL directly reinforces the lateral part of the sternoclavicular joint capsule. The CCL could have a close morphological relation to the subclavius.

Keyword: costoclavicular ligament, sternoclavicular joint, subclavius, shoulder girdle



ID: 318468

Morphology of the Costochondral Cartilage in Comparison to the Radial Head and Glenoid Fossa and Their Suitability for Autologous Chondroplasty

Phil Blyth Luke Orange Hrvoje Vidakovic
University of Otago

Objectives To define the detailed anatomy of the radial head and neck, and the glenoid fossa including dimensions and anatomical planes with respect to clinically relevant bony landmarks. This study also aims to correlate radial and glenoid measurements with the morphology and detailed anatomy of the costochondral joints from ribs 2-6 of a matched cadaver.

Methods A total of 28 cadavers were dissected and 22 radii, 28 scapula and 28 sets of costochondral cartilages were extracted and soft tissue removed with a periosteal elevator. The proximal radii and glenoid area of the scapula were isolated using an oscillating saw, and mounted on a rotating turntable with the use of a custom 3Dprinted jig. Specimens were scanned using a Space Spider (Artec) laser scanner. STL models of the bone were imported into Blender (Blender.org) software, manually identified anatomical landmarks and custom python scripts were used to record and calculate morphological measurements of interest.

Results There is a moderate direct correlation between the areas of the radial head and the costochondral cartilages of ribs five and six. These costochondral junctions each cover 30-50% of the radial head, and 14-27% of the glenoid fossa. There is no correlation between the glenoid fossa area and the costochondral cartilage area.

Conclusions The present study reports the extent of overlap in area of costochondral cartilage with the radial head and glenoid fossa of an individual cadaver which represents the maximal proportion of damage to these structures for which an autologous costochondral graft could be considered.

Keyword: Costochondral cartilage, Autologous graft, Orthopaedic Surgery, Morphology

ID: 318731

TAC in the Management of Localized Facial Fibrosis: Regression and Efficacy Post-Growth Factor Injections

Jiaqi Kou¹ Yueming Wang¹ Yuanqi Qi¹ Xue Wang² Zhen Zhang² Yan Wo¹

1.Department of Anatomy and Physiology, School of Medicine, Shanghai Jiao Tong University, Shanghai, China

2.Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Dermatology Department, China

Objective To investigate treatment strategies for local tissue fibrosis caused by improper growth factor injections.

Methods A fibrosis model was established by injecting growth factors into the backs of Nu-BALB/c mice under inhaled isoflurane anesthesia, followed by treatment with 5-fluorouracil (5-FU) and triamcinolone acetonide (TAC). Tissue changes were examined fourteen days post-treatment using hematoxylin-eosin (H&E) and Masson's trichrome (Masson) staining. Additionally, a clinical scale survey was designed and administered, and the resulting data were analyzed to evaluate treatment effectiveness.



Results The application of inhibitory agents significantly reduced fibrosis in the animal model, and findings from the clinical scale survey confirmed the efficacy of this approach.

Conclusion 5-FU and TAC demonstrated notable efficacy in suppressing local tissue fibrosis induced by improper growth factor injections, providing a promising new treatment strategy for clinical practice.

Keyword: Tissue Fibrosis; Growth Factor Injections; 5-Fluorouracil; Triamcinolone Acetonide

ID: 329607

Neuroprotective Role of Intermittent Fasting in Chronic Stress-Induced Brain Damage: A Narrative Review

Nurathifah Mohd Zaki Dr. Mohd Asnizam Asari* Muhammad Syakiron Abdullah
School of Medical Sciences, Health Campus, Universiti Sains Malaysia

Objective Chronic stress is increasingly common among youth and known to impair brain regions such as the hippocampus and prefrontal cortex, heightening the risk of cognitive and emotional disorders. While exercise and antioxidant-rich diets offer neuroprotective effects, evidence supporting intermittent fasting (IF) as a similar strategy remains limited. This narrative review aims to evaluate the effects of IF on oxidative and inflammatory damage in the hippocampus and prefrontal cortex of chronically stressed rats.

Methods A comprehensive literature search was conducted using PubMed, Scopus, and Science Direct to identify original in vivo studies published in English. The search focused on rodents exposed to chronic stress and treated with IF. Relevant keywords were combined using Boolean operators, including: "intermittent fasting," "chronic stress," "oxidative stress," "inflammation," "hippocampus," "prefrontal cortex," and "rats." Studies were selected based on relevance to the review's objective, with inclusion criteria emphasizing outcomes related to oxidative stress, inflammation, neuroprotection, and histological changes in the hippocampus and prefrontal cortex.

Results Evidence suggests IF may reduce oxidative stress by lowering malondialdehyde levels and increasing antioxidant enzymes such as superoxide dismutase and catalase. IF also reduces inflammation by decreasing IL-6 and TNF- α . Further studies reported IF preserved brain structure and minimized stress-induced damage.

Conclusion IF may enhance brain resilience by reducing oxidative stress and inflammation, offering neuroprotection in key regions like the hippocampus and prefrontal cortex. Its potential as a non-pharmacological strategy for stress-related neurological disorders warrants further investigation.

Keyword: Chronic stress, intermittent fasting, oxidative stress, inflammation, hippocampus, prefrontal cortex



ID: 335598

Protective Effect of Intermittent Fasting on The Thymic Response to Chronic Stress-Induced Inflammation In Rats: A Narrative Review

MUHAMMAD SYAKIRON ABDULLAH MOHD ASNIZAM ASARI*
UNIVERSITI SAINS MALAYSIA

Objective Chronic psychological stress disrupts immune homeostasis, leading to thymic atrophy, altered T-cell maturation, and increased systemic inflammation. While antioxidants and adaptogens have been studied for immune protection, the potential of intermittent fasting (IF) to counter stress-induced thymic changes remains underexplored. This narrative review aims to investigate the protective effects of IF on thymic structure and inflammatory profiles in chronically stressed rats.

Methods A literature search was conducted using Google Scholar, PubMed, and ResearchGate to identify original in vivo studies in English involving rodent models exposed to chronic stress and treated with IF. Keywords included “intermittent fasting,” “chronic stress,” “inflammation,” “thymus,” and “rats,” combined using Boolean operators. Studies were selected based on relevance, focusing on outcomes related to inflammation, immune protection, and thymic histology.

Results Findings showed that rats under chronic stress (CS) exhibited thymic cortical thinning, disrupted corticomedullary architecture, elevated pro-inflammatory cytokines, and increased corticosterone levels. Conversely, rats in the IF+CS group demonstrated preserved thymic architecture, reduced cytokine expression, and lower corticosterone levels, suggesting a protective immune effect of IF.

Conclusion Intermittent fasting may help preserve thymic structure and function during chronic stress by modulating inflammatory and neuroendocrine responses. These findings suggest IF as a promising non-pharmacological approach to support immune resilience under prolonged psychological stress.

Keyword: Chronic stress, immune protection, intermittent fasting, inflammation, thymus

ID: 340506

Anatomical Basis and Clinical Significance of Needle Knife for Trigger Finger

Yuanxun Lin Weixing Zhong Yikai Li
School of Traditional Chinese Medicine, Southern Medical University

Objective To provide an anatomical basis for acupotomy treatment of stenosing tenosynovitis of the flexor tendons.

Methods 50 fingers from 10 adult upper limb specimens were injected with emerald green dye at needle insertion points, and examined A1 pulley histology and needle insertion point localization. Layered dissection measured the structural characteristics of the pulley's surrounding tissues.

Results A1 pulleys consisted of tough transverse fibers, continuous proximally with synovial fibers. The mean of pulley length was 5.95 ± 0.25 mm. Needle insertion point coincided with proximal edge midpoint in fingers 1-4, and the midpoint of the proximal edge of the pulley of the caudal finger is (3.67 ± 0.54) mm radial to the needle entry point. The mean of distances to ulnar nerves was 5.14 ± 2.98 mm; radial nerves was 7.09 ± 0.51 mm. The mean of distances to ulnar arteries was 6.58 ± 3.60 mm; radial arteries was 8.85 ± 1.89 mm. Thumb release rates were $40.46 \pm 2.22\%$, $63.52 \pm 4.$



49%. Needle insertion point 3.06 ± 0.14 mm proximal to thumb pulley edge. The pulley consists of dense transverse fibers. The needle insertion points for fingers 1-4 are located at the proximal margin of the pulleys, while the little finger's insertion point is on its ulnar side.

Conclusion The anatomical key points of acupuncture treatment lie in the extended and abducted position of the thumb and the neutral position of the remaining four fingers. A longitudinal incision is made along the proximal edge of the pulley, taking care to avoid the neurovascular bundles located laterally at distances ranging from 3.60-11.85 mm.

Keyword: anatomy; lumbar flexor tendon stenosis tenosynovitis; needle knife therapy; trigger finger;

亚太 A2-129-0001

A study on the influence of tissue compliance changes in the cranio-cervical junction on cerebrospinal fluid dynamics

Qing Shao¹, Lu Zhang¹, Xue Song¹, Zixi Fan¹, Shujun Lü¹, M Adeel Alam Shah¹, Baoyu Hou², Hongjin Sui^{1*}, Nan Zheng^{1*}(zhengnan831016@163.com)

¹ Department of Anatomy, College of Basic Medicine, Dalian Medical University, Dalian, China.

² Department of Rehabilitation, Sinopharm (Dalian) Rehabilitation Hospital, Dalian, China.

Objectives The cranio-cervical junction (CCJ) represents a critical transitional zone between the cranium and the cervical spine. Tissue compliance changes within this region have been shown to disrupt cerebrospinal fluid (CSF) flow.

Methods A collagen fibrous hyperplasia model was established by injecting bleomycin (BLM) into the posterior atlanto-occipital interspace (PAOiS) in mice. Histological staining and semi-quantitative analysis were used to analyse the collagen fiber amount in PAOiS. Quantitative real time polymerase chain reaction (qRT-PCR) was used to evaluate the expression of fibrosis markers collagen Ia1 (colla1) and α -smooth muscle actin (α -SMA). Tissue compliance in the PAOiS was assessed by uniaxial tensile testing, and CSF pressure in lateral ventricle was monitored using fiber-optic pressure sensor.

Results Masson-stained sections and semiquantitative analysis demonstrated a significant increase in collagen fiber deposition in the PAOiS following BLM treatment. The proliferative fibers were more regularly organized and densely packed, accompanied by marked thickening of the posterior atlanto-occipital membrane. qRT-PCR revealed significantly elevated expression levels of colla1 and α -SMA in the BLM-treated group. Uniaxial tensile testing showed a significant increase in the elastic modulus of the tissue in the PAOiS after hyperplastic changes, indicating heightened stiffness and reduced compliance of the tissue. Additionally, measurement of CSF pressure indicated that the CSF pressure in lateral ventricle was elevated in mice following the decreased tissue compliance in the PAOiS.

Conclusion These findings suggest that reduced tissue compliance resulting from hyperplasia may disrupt normal CSF dynamics. This study provides a foundation for clinical investigations into neurological disorders linked to abnormal CSF dynamics in the CCJ.

Key Words: Cranio-cervical junction; Compliance; Cerebrospinal fluid dynamics; Posterior atlanto-occipital interspace; Central nervous system diseases



亚太 A2-129-0002

Preliminary Investigation Treatment into Localized Tissue Fibrosis Induced by Growth Factor Injections

Jiaqi Kou¹, Yueming Wang², Yuanqi Qi¹, Xue Wang³, Zhen Zhang³, Yan Wo²

¹ Shanghai Jiao Tong University School of Medicine, China

² Department of Anatomy and Physiology, School of Medicine, Shanghai Jiao Tong University, Shanghai, China

³ Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Dermatology Department, China

Objective To investigate treatment strategies for local tissue fibrosis caused by improper growth factor injections.

Methods A fibrosis model was established by injecting growth factors into the backs of Nu-BALB/c mice, followed by treatment with 5-fluorouracil (5-FU) and triamcinolone acetonide (TAC). Tissue changes were examined fourteen days post-treatment using hematoxylin-eosin (H&E) and Masson's trichrome (Masson) staining. The study was further extended to human samples, including control specimens from the Anatomy Laboratory at Shanghai Jiao Tong University School of Medicine and abnormal specimens from clinical patients, to validate both the feasibility of the animal model and the therapeutic outcomes. Additionally, a clinical scale survey was designed and administered, and the resulting data were analyzed to evaluate treatment effectiveness.

Results The application of inhibitory agents significantly reduced fibrosis in the animal model, and findings from the clinical scale survey confirmed the efficacy of this approach.

Conclusion FU and TAC demonstrated notable efficacy in suppressing local tissue fibrosis induced by improper growth factor injections, providing a promising new treatment strategy for clinical practice.

亚太 A2-129-0007

Pain-Free Survival After Endoscopic Rhizotomy Versus Radiofrequency for Lumbar Facet Joint Pain: A Real-World Comparison Study

Tao Du, MD, Guang Lu, MD, Junchi Li, MD, Bing Ni, MD, Wei Shu, MD, Tao Sun, MD, Dou Yang, MD, and Hongwei Zhu, MD

Background Endoscopic rhizotomy (ER) of the medial branch has been recently developed for the treatment of lumbar facet joint pain (LFJP). However, there are no studies comparing the pain-free duration after ER and radiofrequency (RF).

Objectives To evaluate the long-term outcomes for pain and physical function in patients who underwent ER versus RF for LFJP and compare their pain-free survival.

Study Design Open label, prospective, real-world study that includes patients treated with ER or RF at a single center between November 2021 and February 2024.

Setting The research took place within a single university-based neuro-spine center.

Methods Patients with a positive diagnostic medial branch block ($\geq 80\%$ pain relief) were treated with ER or RF. Numeric rating scale (NRS), Oswestry Disability Index (ODI), and Global Impression



of Change (GloC) were obtained at the baseline, and at 6 months and 12 months postoperatively. The duration of pain-free time was recorded at every follow-up. The final follow-up was conducted in March 2025.

Results Of 55 patients with LFJP, 19 underwent ER, and 36 underwent RF. Both ER and RF groups showed significant decreases in NRS and ODI scores at 6 months and 12 months compared with baseline ($P < 0.001$). ER had significantly better efficacy than RF in NRS, ODI, and GloC scores at 6 and 12 months ($P < 0.05$). The pain-free survival curves showed that the median pain-free duration was 20 months and 10 months in ER and RF, respectively.

Limitation Patients were not randomized to different groups, which may have led to bias.

Conclusions Both ER and RF can improve the pain and physical function in patients with LFJP. ER is associated with a longer operative duration and medical expenses; however, it provides more sustained efficacy than RF. The surgical choice should depend on the patients' specific conditions.

Key words: Low back pain, facet joint, medial branch, endoscopic, rhizotomy, radiofrequency, pain-free survival, real-world study

亚太 A2-129-0009

Key Anatomical Points and Clinical Applications of Facial Rejuvenation

Qi Xiangdong

Affiliation: Zhujiang Hospital, Southern Medical University

Address: 253 Gongye Avenue, Haizhu District, Guangzhou

Email/Phone: 392123225@qq.com, 020-62782055

Objective The process of facial aging is accompanied by volume loss and relaxation of all facial tissues, including bones, muscles, ligaments, fascia connective tissues, fat and skin, which leads to true and pseudo ptosis. Based on age-related changes, this study digitally evaluated key anatomical points in facial aging and explored the efficacy of various rejuvenation methods. The paper focus was on applying three-dimensional reconstruction software to quantitatively assess the effects of SMAS-layer filling, ligament-layer filling, SMAS-layer lifting/folding/fixation, ligament-layer lifting/folding/fixation, and radiofrequency therapy. This provides critical anatomical and clinical insights for facial rejuvenation.

Methods A total of 100 patients with facial sagging, brow ptosis, and prominent orbital-cheek grooves, tear troughs, mid-cheek grooves, nasolabial folds, and marionette lines were enrolled. After software analysis, patients were divided into five groups (20 cases each): deep ligament filling injection (hyaluronic acid), traditional superficial filling injection, deep ligament lifting/folding/fixation, superficial ligament lifting/folding/fixation, and photo-acoustic-electrical therapy. Full-face 3D scans were performed pre- and post-treatment. Mimics 13.0 software was used to measure the radii of the transverse arc (D-B-E) and coronal arc (A-B-C) in the zygomatic region.

Results Significant increases in the radii of D-B-E and A-B-C arcs were observed in all groups post-treatment (deep/superficial filling, deep/superficial ligament lifting, and photo-acoustic-electrical therapy), with statistically significant differences between pre- and post-treatment Results ($P < 0.05$).

Conclusion Hyaluronic acid injection into the deep ligament layer demonstrated superior lifting effects compared to traditional superficial filling. Deep ligament lifting/folding/fixation outperformed superficial ligament techniques, and ligament lifting generally surpassed hyaluronic acid filling. Additionally, photo-acoustic-electrical therapy showed clinical efficacy in skin tightening, wrinkle reduction, and facial rejuvenation.



Keywords: Facial rejuvenation; Clinical application; Ligaments; Minimally invasive injection; Endoscopic rhytidectomy; SMAS folding

亚太 A2-129-0014

Protection mechanism of scutellarin on retinal ganglion cells in diabetic retinopathy

Xin-Hui Tang, Bao-Lei Zhang, Md Miftahul Mithu, Ting-Hua Wang*

Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;

*Corresponding author: Ting-Hua Wang, Kunming, Yunnan Province, China; Email: wangtinghua@vip.163.com

Objective The aim of this study investigates the core mechanism of scutellarin (SCU) in the protection of retinal ganglion cell (RGC) in rats with diabetic retinopathy.

Methods Forty-five male SD rats of SPF class were used in the experiment and randomly divided into a normal control group (CON group), a diabetes model group (DR group), and a marigold glucoside-treated group (SCU group), with 15 rats in each group. After 12 hours of fasting in the DR and SCU groups, diabetes was induced by intraperitoneal injection of streptozotocin (STZ, 60 mg/kg). Subsequently, the SCU group was injected intraperitoneally with lanugin (50 mg/kg) daily for 4 weeks, while the CON and DR groups were injected with an equal amount of saline. Fasting blood glucose and body weight of the rats were monitored weekly during the experiment. After completion of treatment, anesthesia was induced by intraperitoneal injection of sodium pentobarbital 80 mg/kg, and after deep anesthesia, retinal tissues were carefully sampled, and single-cell sequencing analyses were performed for the Sham, DR, and SCU-treated groups, respectively, and a series of data analyses were performed after obtaining data returned by the company and extracting the RGC cells, including differential gene analysis and PPI protein interactions.

Results We screened for differentially expressed genes that were up-regulated in the DR group relative to the Sham group and down-regulated in the SCU group relative to the DR group, obtaining 3036 differentially expressed genes. The top10 cores were also identified using Cytoscape 3.10.1 built-in plugin cytohubba based on Degree algorithm, which are Gapdh, Pdcd11, Ubb, Tlr4, Uba1, Sod2, Prkaca, Cd74, Mrpl2, and Bcl2 in that order.

Conclusion RGC cells are a very important cell type in the treatment of diabetic retinopathy with SCU. We utilized single-cell sequencing as well as bioinformatics prediction to obtain 10 genes that play major roles in the treatment process, including Gapdh, Pdcd11, Ubb, Tlr4, Uba1, Sod2, Prkaca, Cd74, Mrpl2, and Bcl2. This result explained a therapeutic mechanism for the role of SCU in the treatment of DR.

Keywords: scutellarin, diabetic retinopathy, retinal ganglion cells, single cell sequencing, bioinformatic.



亚太 A2-129-0017

Molecular Network investigation of BBR's Protection on RGCs in Diabetic retinopathy

NaLi1, JilinChen, Tinghua Wang*

1. Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;

*Corresponding author: Ting-Hua Wang, Kunming Medical University, Kunming, Yunnan, China; Email: wangtinghua@vip.163.com.

Objective The aim of this study was to comprehensively explore the protective effect of berberine (BBR) on diabetic retinopathy (DR). Specifically, it aimed to uncover the alterations in the cellular molecular network, identify the crucial role of transthyretin (TTR), and elucidate the underlying transcriptome mechanisms involved in this protective process.

Methods Diabetic rat models were established through intraperitoneal injection of streptozotocin (STZ) at a dosage of 60mg/kg. Subsequently, the rats in the BBR treatment group received BBR via gavage at a daily dose of 150 mg/kg for 16 weeks. A series of experimental techniques were employed, including optical coherence tomography (OCT) to observe retinal structural changes non-invasively, hematoxylin-eosin (HE) staining to analyze histological features of the retina, transcriptome analysis to identify differentially expressed genes (DEGs), quantitative PCR to validate gene expression levels, IF staining to detect specific proteins, and in vitro retinal ganglion cell (RGC) culture experiments to assess cellular responses.

Results In comparison with the diabetic model group, the BBR-treated group exhibited a more compact retinal structure, fewer vacuoles, improved cell morphology, and a marked increase in retinal thickness. Transcriptome analysis led to the identification of 20 common DEGs across different experimental groups. GO and KEGG pathway analyses revealed that these DEGs were significantly enriched in processes related to focal adhesion, protein domain specific binding, and neurodegenerative pathways. PPI analysis indicated that certain common DEGs had direct interactions. Moreover, in vitro cell experiments further confirmed the regulatory effects of BBR and TTR on RGC cells, showing their influence on cell viability, apoptosis, and morphological changes.

Conclusion BBR protects effectively the retina in DR. And the protective mechanism is likely associated with the regulation of multiple genes and signaling pathways, among which TTR appears to play a pivotal role. These findings amplify the clinic application of BBR in the treatment of DR explain molecular mechanisms underlying DR.

Keywords: Berberine; Diabetic retinopathy; Molecular mechanism; Transthyretin.



亚太 A2-129-0018

The Impact of Acupuncture at Acupoint Qihuan (Umbilical Ring) on Intestinal Microbiota, Serum Neurological Related Cytokines, and Therapeutic Efficacy in Chronic Atrophic Gastritis

Huina Ma^{1,2}, Dr Tang Kok Hong², Dr Tanima Bhattacharya², Yanwu Ling³

1 Department of Pathophysiology, Youjiang Medical University for Nationalities, Baise 533000, China

2 Faculty of Applied Science, Lincoln University College (LUC), Petaling Jaya 47301, Malaysia.

3 Department of Human Anatomy, Youjiang Medical University for Nationalities, Baise 533000, China

Objectives Chronic atrophic gastritis (CAG) is a prevalent gastrointestinal disease associated with an increased risk of gastric adenocarcinoma. The combination of traditional Western medicine (WM) with acupuncture at Zhongwan (CV12) and Zusanli (ST36) acupoints in Traditional Chinese Medicine (TCM) has shown promising therapeutic effects. However, the impact of acupuncture at the Qihuan (Umbilical Ring) acupoint in Zhuang medicine, based on the bioblogographic theory, on gut microbiota, serum neuro-related cytokines, and therapeutic efficacy in CAG remains under investigation.

Methods Patients diagnosed with CAG from January 2023 to January 2025 were divided into three groups based on treatment modalities: WM group (n=64), WM combined with acupuncture at Zhongwan and Zusanli (n=66), and WM combined with acupuncture at the Qihuan acupoint (n=112). Gut microbiota analysis, serum neuro-related cytokine measurements, and efficacy evaluations were conducted to assess the effects of acupuncture on these parameters.

Results Gut microbiota analysis revealed significant differences in the levels of Firmicutes, Bacteroidetes, Actinobacteria, Proteobacteria, and p-Proteobacteria among the groups (* $p < 0.05$). Both the Qihuan acupuncture group and the Zhongwan-Zusanli acupuncture group exhibited significantly reduced serum levels of neuro-related cytokines, including tumor necrosis factor- α (TNF- α), interleukin-6 (IL-6), brain-derived neurotrophic factor (BDNF), nerve growth factor (NGF), and neuron-specific enolase (NSE), compared to the WM group (* $p < 0.05$). The Qihuan acupuncture group demonstrated superior therapeutic efficacy in remission rate compared to the Zhongwan-Zusanli acupuncture group (* $p < 0.05$).

Conclusion Acupuncture at the Qihuan acupoint regulates gut microbiota composition and serum neuro-related cytokine levels, thereby enhancing the therapeutic outcomes of conventional WM treatment in CAG patients.

Key Words: Acupuncture; Acupoint Qihuan; Acupoint Zusanli; Intestinal Microbiota; Chronic Atrophic Gastritis



● 亚太 A2. Clinical Anatomy (Surgical and Non-surgical) ● Poster

ID: 318194

Pancreatic fatty degeneration: A retrospective histopathological study in cadaver specimens

Shuang-Qin Yi¹ Ting Yang¹ Ke Ren² Xiangquan Chen² Taku Toriumi³

1.Department of Frontier Health Sciences, Graduate School of Human Health Sciences, Tokyo Metropolitan University, Tokyo, Japan

2.Faculty of Physical Education, Qu Jing Normal University, Yun Nan, China

3.Department of 1st Anatomy, Nippon Dental University School of Life Dentistry at Niigata, Niigata, Japan

Objectives Pancreatic fatty degeneration (PFD) has attracted attention as a risk factor for pancreatic cancer. This study systematically and in detail investigated the prevalence of PFD in elderly people, its classification and related causes, and its relationship with other pancreatic lesions.

Methods 74 cadaveric pancreatic specimens without any known pancreatic diseases or abdominal surgery were employed for a histopathological or immunohistochemical staining analyses were performed on the tissue sections.

Results PFD was present in 96% of the specimens, of which fatty infiltration of the pancreas (FIP) accounted for 84%, fatty replacement of the pancreas (FRP) for 82%, and intralobular diffuse fat deposition (IDFD) for 82%. A total of 81% of IDFD cases occurred in the dorsal pancreatic anlage. A correlation analysis showed that PFD was significantly correlated with pancreatic intraepithelial neoplasia (PanIN) ($p = 0.027$) and acinar ductal metaplasia (ADM) ($p = 0.001$), while FIP was significantly correlated with PanIN ($p = 0.040$), inflammatory cell infiltration ($p = 0.001$), and ADM ($p < 0.001$).

Conclusion Although our subjects were limited to the elderly, this has no influence on our finding that PFD should be divided into three different forms: FIP, FRP, and IDFD. The formation mechanisms, clinical manifestations, and outcomes of these three types of PFD, especially their association with pancreatic cancer, differ and need to be treated separately in follow-up examinations. Notably, IDFD is selectively absent or less prevalent in the embryonic ventral pancreas than dorsal pancreas, and its mechanism deserves further exploration.

Keyword: pancreatic steatosis, nonalcoholic fatty pancreas disease, uneven fatty replacement, intra-pancreatic fat deposition, PanIN, cadaver

ID: 318222

Convolutional neural network for sex determination using ventral pubis in a Thai population

Pagorn Navic¹ Patison Palee² Pasuk Mahakkanukrauh^{1,3}

1.Department of Anatomy, Faculty of Medicine, Chiang Mai University

2.College of Arts, Media and Technology, Chiang Mai University

3.Research Cluster in Osteology Research and Training Center (ORTC), Chiang Mai University, Chiang Mai, Thailand

Objectives Accurate identification, particularly in the context of sex determination, is crucial in forensic investigations. As artificial intelligence (AI) continues to advance rapidly, deep learning has



emerged as a powerful tool, demonstrating remarkable success in a variety of forensic applications. This study aims to apply convolutional neural networks (CNNs) within deep learning to determine sex based on the ventral pubis in a Thai population.

Methods A total of 100 images of the ventral pubis were divided into training (70%) and validation (30%) sets, respectively. Neural network architecture was utilized for sex classification.

Results The accuracy of sex determination using the CNNs model was notably high, achieving 90.00-100.00%.

Conclusion These findings encourage further research into AI-based Methods for sex determination from the pubic bone. Moreover, a deep learning approach using pubic bones provides an efficient method for sex determination and is highly applicable in forensic science.

Keyword: convolutional neural network; deep learning; sex determination; pubic symphysis; Thai

ID: 318255

Morphology of the deep leg flexor muscles – a dissection study.

Natasha Flack Katie Frost Charlie Humphrey Stephanie Woodley
University of Otago, Dunedin, New Zealand

Objectives Posterior tibial tendon dysfunction (PTTD) is a degenerative condition of the tibialis posterior (TP) tendon, affecting approximately 5% of women over 40. Individuals may experience pain, impaired walking, medial arch collapse, and reduced plantarflexion strength. Although there is some understanding of changes that occur within the TP tendon, it is unclear how the muscle belly is affected, as well as the flexor digitorum longus (FDL), and flexor hallucis longus (FHL). Additionally, little is understood about the architecture of this muscle group which is important to inform PTTD treatment such as physiotherapy and/or surgery.

Methods This dissection study examined the morphology of TP, FDL, and FHL in 28 cadavers (14 males; mean age 84.5 ± 8.5 years). Key anatomical parameters (muscle volume, proximal attachment cross-sectional area (CSA), innervation, and musculotendinous junctions) were documented.

Results Muscle volumes averaged $36.3 \pm 15.8 \text{ cm}^3$ (TP), $9.6 \pm 3.6 \text{ cm}^3$ (FDL), $22.6 \pm 16.3 \text{ cm}^3$ (FHL), with no sex differences. Mean proximal CSA was $91.8 \pm 21.0 \text{ cm}^2$ (TP, larger in males, $p=0.003$), $20.1 \pm 3.7 \text{ cm}^2$ (FDL), and $21.8 \pm 5.9 \text{ cm}^2$ (FHL). Typically one tibial nerve branch innervated TP ($n=6/10$); FDL and FHL shared another branch that bifurcated to enter the deep surface of each muscle ($n=6/10$).

Conclusion The specificity of these architectural parameters for the deep leg flexors will enable future exploration into the progression of PTTD and implications for not only the tendons but also the muscles. In turn, this will help inform physiotherapy and surgical interventions.

Keyword: deep leg flexors, dissection, muscle architecture



ID: 320106

Ultrasound-guided Non-standard Lateral Decubitus Low-Thoracic Epidural Puncture and Catheterization: A Randomized Controlled and Non-inferiority Trial

Yuexin Huang Tingting Li Fang Gao Fei Liu

Department of Anesthesia, West China Hospital of Sichuan University, Chengdu, China

Objectives Patients in some specific conditions (obesity, postoperation, et al.) could not maintain a standard epidural puncturing lateral decubitus (forehead to knees). This study aims to investigate whether the realtime ultrasound guidance Results in a non-inferior success rate of low-thoracic epidural puncture under a non-standard lateral decubitus with that of patients under a lateral standard decubitus.

Methods Patients undergoing major thoracic or upper abdominal surgeries with planned thoracic epidural placement at T8-9 or lower were enrolled in this randomized controlled trial. Participants were categorized based on the puncturing position (non-standard group vs. standard group) for epidural catheterization. The primary outcome was the overall success rate. Secondary outcomes included first-pass success rate, number of redirection or reattempt, procedural duration, incidence of difficult puncture, anatomical measurements (epidural depth, needle path distance, interlaminar space width), ultrasound image quality, and incidence of puncture-related complication.

Results In this study, 128 patients were equally allocated into either non-standard group and standard group. The 95% CI of the difference in the overall success rate between the groups didn't exceed the non-inferior margin of 5% (non-standard group vs. standard group, 98.4% vs. 98.4%; difference 0; 95% CI -4.3% to 4.3%). The rest outcomes showed no difference between the groups.

Conclusion Realtime ultrasound-guided low-thoracic epidural puncture under non-standard lateral decubitus demonstrates non-inferior success rates compared with standard lateral decubitus, while maintaining equivalent safety for providing reliable anatomical visualization.

Keyword: Realtime ultrasound guidance, Epidural catheterization, Patient positioning, Non-inferiority trial

ID: 320241

Morphological Alterations of the Trigeminal Nerve in Trigeminal Neuralgia

Lifeng Yu Han Meng Wenli Wang Xinyu Du Xue Bai Ruiyang Wang Bingqi Xu Ping Wang Pengfei Li
Tarim University School of Medicine

Objective The pathophysiology of trigeminal neuralgia (TN) remains unclear. This study investigates morphological changes in the trigeminal nerve (CN V) during TN progression.

Methods High-resolution 3.0 T MRI images from 100 TN patients and 100 controls (non-TN) were retrospectively analyzed using HOROS. Cross-sectional measurements of five CN V terms were compared: encompassing the cisternal root (near the trigeminal ganglion), CN V1, V2, V3, and trigeminal ganglion (TG) area.

Results Non-TN controls exhibited larger cisternal root widths (9.79 ± 2.55 mm vs. TN: 8.12 ± 2.34 mm; $p < 0.05$, except left side: $p = 0.37$), CN V2 (3.98 ± 1.13 mm vs. 3.45 ± 0.89 mm; $p < 0.05$), and TG area (78.17 ± 24.51 mm² vs. 65.23 ± 20.14 mm²; $p < 0.05$). Conversely, TN patients showed enlargement in CN V1 (3.15 ± 0.83 mm vs. 3.07 ± 0.98 mm; $p < 0.01$) and CN V3 (6.26 ± 1.81 mm vs. 4.78 ± 1.78 mm; $p < 0.01$). Left CN V2 in controls (4.05 ± 1.13 mm) was larger than in



n TN patients (3.72 ± 0.98 mm; $p = 0.02$). No additional sex- or side-specific differences were identified in the V1/V2 divisions.

Conclusion TN-associated morphological changes, such as mandibular nerve enlargement and TG atrophy, reflect structural variations that may elucidate underlying pathophysiological mechanisms of TN.

Keyword: MRI, Neuroanatomy, Pathophysiology, Trigeminal Ganglion, Trigeminal Neuralgia

ID: 320676

Detailed Anatomical Study of the Quadratus Lumborum Muscle for Optimizing Injection Sites

Anna Jeon¹ Ji-Young Son¹ Hong-San Kim¹ Nakgil Seong¹ Je-Hun Lee² Seung-Ho Han¹

1.Department of Anatomy, College of Medicine, Ewha Womans University

2.Korea Institute for Applied Anatomy, College of Sports Science, Korea National Sport University

The quadratus lumborum (QL) muscle stabilizes the lumbar vertebrae and can cause low back pain due to dystonia. Botulinum neurotoxin injections are used for relief. This study aimed to identify the QL muscle's attachment points and intramuscular nerve pathways to determine effective injection sites. Twenty-one embalmed Korean cadaver specimens were dissected and stained with Sihler's technique. The QL muscle was measured using the supracristal plane and median lines as references. The muscle was divided into eight regions to assess neuromuscular junction density. The total length of the QL was 149.3 mm, with males having significantly longer muscles than females (157.7 mm vs. 129.0 mm, $p = 0.025$). The muscle originated from the iliac crest, iliolumbar ligament, and L5 transverse process, and attached to L1–L4 transverse processes and the inferior border of the 12th rib. It was innervated by T12 and L1–L3 spinal nerves. Maximum neuromuscular junction density was observed in the lateral 3/4, 4/4, and medial 3/4 regions. This detailed anatomical study provides valuable insights for improving QL block procedures and managing spasticity. This study was approved by the Institutional Review Board (IRB) of Chung-Ang University (IRB No: 1041078-202008-BRBM-217-01). All procedures followed the tenets of the Declaration of Helsinki.

Keyword: Quadratus lumborum muscle, Spasticity, Pain control, Low back pain



ID: 321180

Implantation of Bone Marrow-Mesenchymal Stem Cells on Osteocalcin (OCN) Expression Post Tooth Extraction in Experimental Rats

Gusti Revilla¹ Henry Mulyani² Andries Pascawinata³

1.Department of Anatomy, Faculty of Medicine, Andalas University, Padang City, Indonesia

2.Department of Pathological Anatomy, Faculty of Medicine, Andalas University, Padang City, Indonesia

3.Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Baiturrahmah University, Padang City, Indonesia

Tooth extraction can lead to complications such as alveolar bone resorption, resulting in reduced dimensions and quality of the alveolar bone. One approach to accelerate healing and prevent excessive resorption is alveolar bone preservation using stem cells. This study aimed to investigate the effect of implanting bone marrow-mesenchymal stem cells (hBM-MSCs) on as an indicator of osteocalcin (OCN) expression.

The research employed a pure experimental design with a post-test control group design. Sixteen male rats underwent extraction of the upper right incisor under general anesthesia (ketamine + xylazine). They were then divided into a control group where the extraction socket was left empty, and a treatment group where hBM-MSCs (2×10^6) were implanted using a micropipette. Rats were euthanized on day-14 and day-28 post-surgery, and the jaws were analyzed through immunohistochemistry to assess OCN expression. Kruskal-Wallis test was used for OCN analysis. The Results showed a statistically significant decrease in OCN expression with hBM-MSCs treatment on days 14 ($p = 0.008$) and 28 ($p = 0.001$) compared to the control group.

The implantation of hBM-MSCs enhanced the osteogenesis process, indicating their potential as graft cells for alveolar bone preservation. This study suggests that hBM-MSCs implantation effectively reduces OCN expression, highlighting their role in preserving alveolar bone quality and dimensions following tooth extraction

Keyword: BM-MSCs, alveolar bone, implantation, osteocalcin

ID: 327440

Role of Neurogenesis in the Basal Forebrain of Rats in Cholinergic Neuron Injury Models

li

Sun Yat-sen University

The basal forebrain (BF) cholinergic system is crucial for cognition and emotion. The role of the BF projection to the medial habenula (MHb) in anxiety, cognition, and post-lesion neurogenesis remains unclear. This study investigated BF neurogenic responses and their correlation with long-term behavioral alterations after selective lesioning of BF-MHb cholinergic neurons in rats.

Adult male rats received bilateral MHb 192-IgG-Saporin injections to lesion BF-MHb cholinergic neurons. Behavioral tests (anxiety, cognition) were performed for up to 28 days. BF tissue was analyzed using immunofluorescence (ChAT, Nestin, BrdU, NeuN, GFAP) and single-nucleus RNA-sequencing (snRNA-seq) to assess cholinergic neuron loss and neurogenic activity.

The BF-MHb pathway, containing Nestin-positive (28.5%) and Nestin-negative (71.5%) cholinergic



neurons, was confirmed. Lesions induced significant, persistent anxiety-like behaviors and cognitive deficits. An early (7-14 days) transient increase in Nestin expression and radial glial cell (RGC) proliferation indicated BF neurogenesis. However, by 28 days, newly generated BrdU+ cells differentiated primarily into non-cholinergic (NeuN+/ChAT⁻) neurons. Behavioral impairments correlated with ChAT+ neuron loss, not with this transient neurogenesis.

BF-MHb cholinergic neurons are essential for normal emotional and cognitive functions; their loss causes lasting deficits. Although injury triggers transient BF neurogenesis via RGC activation, this neither restores cholinergic neurons nor ameliorates behavioral impairments. Thus, endogenous neurogenesis is insufficient for functional recovery post-BF-MHb cholinergic lesion. Directing RGC differentiation towards a cholinergic fate may offer a therapeutic strategy for diseases like Alzheimer's.

Keyword: Cholinergic neurons, Basal forebrain, Neurogenesis, Anxiety, Cognition

亚太 A2-129-0004

Role of aquaporin 9 serine 292 phosphorylation in metabolic dysfunction-associated steatotic liver disease

Quancheng Cheng, Xuan Fang, Man Li, Chao Wang, Huiru Ding, Chunhua Chen, Weiguang Zhang*
(E-mail: zhangwg@bjmu.edu.cn; cch@bjmu.edu.cn)

Department of Human Anatomy and Histology and Embryology, School of Basic Medical Sciences,
Peking University Health Science Center, Beijing 100191, China

Objectives Metabolic dysfunction-associated steatotic liver disease (MASLD) is the most prevalent chronic liver condition worldwide. However, effective treatments are lacking. The molecular mechanisms must be elucidated to develop new therapeutic strategies. Aquaporin 9 (AQP9) is the main glycerol channel in the liver. Whether post-translational modification of hepatic AQP9 affects its function remains unclear. In this study, we aimed to explore whether AQP9 phosphorylation occurs in hepatocytes and identify the modification site and underlying mechanism of action in MASLD.

Methods We used database predictions and mass spectrometry to screen for phosphorylation sites on AQP9 expressed in hepatocytes. The AQP9 phosphorylation mechanism in hepatocytes and its effect on lipid metabolism in MASLD were investigated using in vitro and in vivo gene editing (male C57BL/6 mice), lipidomics, and immunoprecipitation studies combined with proteomics and in vitro kinase assays.

Results AQP9 phosphorylation in hepatocytes enhanced its glycerol uptake. With the aid of zona occludens-2 (ZO-2), AQP9 was specifically phosphorylated at serine 292 (S292) by CaMKII δ , promoting MASLD progression. In vitro, pharmacological CaMKII δ inhibition and Tjp2 (ZO-2) knockdown reduced AQP9 S292 phosphorylation and decreased lipid droplet formation. In mice, a high-fat diet significantly increased liver AQP9 S292 phosphorylation, whereas pharmacological CaMKII δ inhibition or simulation of AQP9 S292 dephosphorylation effectively antagonised MASLD progression.

Conclusion S292 phosphorylation by CaMKII δ and ZO-2 is crucial in determining the AQP9 glycerol uptake capacity, thereby affecting lipid accumulation and MASLD progression. KN93, an CaMKII inhibitor, can effectively halt MASLD progression.

This study involves animal experiments and was approved by the Institutional Animal Care and Use Committee of the Peking University Health Science Center (DLASBD0149).

Key Words: AQP9; CaMKII δ ; ZO-2; phosphorylation; metabolic dysfunction-associated steatotic



liver disease.

● 亚太 A2. Clinical Anatomy (Surgical and Non-surgical) ● Abstract

亚太 A2-129-0003

Transcriptomic analysis of skin, dorsal root ganglia, spinal dorsal horn, and cortex after plantar incision in rat

Bi-Hua Xie^{1,2}, Bao-Lei Zhang³, Ting-Ting Li¹, Qiu-Xia Xiao⁴, Liu-Lin Xiong⁴, Ting-Hua Wang¹, Fei Liu^{1*}.

1. Department of Anesthesiology, West China Hospital, Sichuan University, Chengdu, Sichuan, China;

2. Department of Anesthesiology, The Third People's Hospital of Yibin, Yibin, Sichuan, China;

3. Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;

4. Department of Anesthesiology, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China.

*Corresponding author: Fei Liu, No. 37 Guoxue Lane, Wuhou District, Chengdu, Sichuan Province, China;
Email: 30333870@qq.com.

Objective This study aimed to investigate mRNA expression alterations in the skin, dorsal root ganglia (DRG), spinal dorsal horn, and cortex following plantar incision in rats, focusing on potential mechanisms underlying postoperative pain.

Methods Six Sprague-Dawley rats were allocated to sham group (Group S, n=3) or plantar incision pain group (Group P, n=3). Both groups underwent sodium pentobarbital-induced anesthesia. Group S received no surgical intervention, while Group P underwent a standardized left plantar incision. Tissue samples (incised skin, DRG, spinal dorsal horn, and cortex) were collected 6 hours post-procedure. RNA sequencing and subsequent bioinformatics analyses (Gene Ontology, KEGG pathway, STRING, Cytoscape) were performed to identify hub mRNAs.

Results Significant mRNA expression disparities were observed in skin and DRG tissues between groups. The skin exhibited 501 differentially expressed mRNAs (296 upregulated, 205 downregulated), predominantly enriched in muscle contraction and immune pathways, notably interferon-related genes (e.g., *Usp18*, *Rsad2*, *Mx1*, *Ifit3*). DRG tissues demonstrated 658 differentially expressed mRNAs (656 upregulated, 2 downregulated), primarily associated with immune response and tissue repair (*Syk*, *Fn1*, *Vav1*, *Ptprc*). Minimal mRNA changes were detected in spinal dorsal horn and cortical tissues.

Conclusion Plantar incision induces robust immune-related transcriptional changes in peripheral nociceptive pathways (skin and DRG), while central nervous system regions remain largely unaffected at the 6-hour timepoint. The pronounced upregulation of interferon signaling and tissue remodeling genes suggests a potential peripheral immune mechanism in early postoperative pain pathogenesis, warranting functional validation.

Keywords: postoperative pain, transcriptomics, skin, Dorsal Root Ganglion, Immunomodulation.



亚太 A2-129-0005

The positional relationship of the external pudendal vein, superficial epigastric vein and spermatic vein

Yanshu Shao, Wenjing Han, Xianfeng Sun, Zhenzhong Li, Zhen Liu (zhen@sdu.edu.cn)
山东大学

Objectives The most commonly used microsurgical treatment for varicocele is to use ligation to block the blood flow of the internal spermatic vein. Although spermatic vein ligation improved the internal perfusion of the testicular parenchyma, it could temporally deteriorate the stasis of the epididymis. In order to design a new surgical procedure for the treatment of varicocele, this study explored the positional relationship of the external pudendal vein, superficial epigastric vein and spermatic vein in the cadavers.

Methods The bilateral external pudendal vein, superficial epigastric vein and spermatic vein in 10 male cadavers were dissected. Define points X and Y as the closest points on the designated landmark line for the external pudendal vein and superficial epigastric vein respectively, then measure their corresponding shortest distances to the internal spermatic vein.

Results Intercorrelative relationships exist among the tripartite venous variables, with the diameter of the right external pudendal vein at point X demonstrating high correlations ($r > 0.9$) with the diameter of the superficial epigastric vein (or its common trunk, when present) at its junction with the great saphenous vein, delineating potential research trajectories. Variables lacking currently discernible correlations still merit further investigation.

Conclusion After the spermatic vein of varicocele is anastomosed with the external pudendal vein and superficial abdominal vein, it is necessary to further establish a computer hemodynamic model for analysis and in vivo hemodynamic testing to verify whether it is like a physiological vein blood drainage.

Key Words external pudendal vein; superficial epigastric vein; spermatic vein; positional relationship; clinical significance

亚太 A2-129-0008

Acetaminophen versus Ibuprofen for Pain Management in Pediatric Tonsillectomy: A Randomized Clinical Trial.

Feng-Ting Ma¹, Fei Liu^{1*}

1. Department of Anesthesiology, West China Hospital, Sichuan University, Chengdu, Sichuan, China;

*Corresponding author: Fei Liu, No. 37 Guoxue Lane, Wuhou District, Chengdu, Sichuan Province, China;
Email: 30333870@qq.com.

Objective Pain after pediatric tonsillectomy is common, often severe, and undertreated. The primary objective of this study was to compare the analgesic efficacy and safety profiles of acetaminophen and ibuprofen for children undergoing coblation tonsillectomy.

Methods In this prospective, randomized, controlled trial, 145 children aged 3 to 14 years scheduled for coblation tonsillectomy were randomized to receive either acetaminophen (15 mg/kg) or ibuprofen (5 mg/kg). The regimen included an initial preoperative dose administered 2 hours before surgery, followed by subsequent doses every 6 hours for a total of 72 hours. Pain intensity was dynamically assessed using the Wong-Baker FACES Pain Scale-Revised (FPS-R) during swallowing and resting states at 2, 6, 12, 24, 48, and 72 hours postoperatively. The primary



outcome was the area under the curve (AUC) of swallowing pain scores over 72 hours. Secondary outcomes included resting pain AUC, postoperative pain scores at different time point, adverse events (AEs), and parental satisfaction scores.

Results The median swallowing pain AUC was 131.0 (IQR 68.0–186.0) for acetaminophen versus 122.0 (IQR 48.0–159.0) for ibuprofen, with no significant intergroup difference ($\Delta=12$, 95% CI: -12.0–42.0; $P=0.503$). Resting pain AUC also showed comparable Results ($\Delta=0$, 95% CI: -9.0–14.0; $P>0.05$). Both groups exhibited a significant downward trend in pain scores over time (2h vs. 72h: $P<0.05$). Adverse event rates were similar: nausea (4.1% vs. 0%), vomiting (4.1% vs. 0%), and delayed hemorrhage (1.3% vs. 1.4%) ($P>0.05$). Parental satisfaction scores showed no statistical difference (9.78 ± 0.41 vs. 9.82 ± 0.37 ; $t=0.52$, $P=0.603$).

Conclusion Acetaminophen and ibuprofen demonstrated equivalent analgesic efficacy and safety profiles in multimodal postoperative analgesia for pediatric coblation tonsillectomy.

Keywords: Pediatric tonsillectomy; Postoperative pain; Acetaminophen; Ibuprofen;

亚太 A2-129-0010

A randomized controlled study of high and low frequency transcranial magnetic stimulation in the treatment of Alzheimer's disease

Ting Hou , Junting Huang

Sun Yat-sen Medical College, Guangzhou, China, 441288977@qq.com

Objectives Recent studies have demonstrated that Repetitive transcranial magnetic stimulation (rTMS) has the advantage of improved cognition and mild side effects in the treatment of Alzheimer's disease (AD). To analyze the difference between high-frequency transcranial magnetic stimulation and low-frequency transcranial magnetic stimulation in the clinical treatment of AD patients, the changes of cerebral metabolism and function were studied by imaging wave imaging in order to deduce the related mechanism.

Methods Sixty AD patients were randomly assigned to high frequency (20 Hz) and low frequency (1 Hz) treatment groups. The target area of stimulation was the left dorsolateral prefrontal cortex (L-DLPFC). After two consecutive weeks of treatment, the patients were assessed with different scale, to assess their cognitive function. Mrs and fMRI were performed before and after treatment to analyze the signal changes of glutamate.

Results Both high-frequency rTMS and low-frequency rTMS could improve cognitive function of AD. Both MRS and resting-state brain functional connectivity **Results** were shown by the difference.

Conclusion 1. Although both high-frequency rTMS and low-frequency rTMS have improved cognitive function, high-frequency rTMS is superior to low-frequency rTMS in improving cognitive function in AD patients.

2. The Results of Mrs and fMRI showed that the changes of neurotransmitters and functional connections between brain regions in AD patients were different after high-frequency and low-frequency therapy, so high-frequency and low-frequency therapy had different therapeutic mechanisms.

Keywords: Alzheimer's disease, repetitive transcranial magnetic stimulation, clinical efficacy, magnetic resonance popper, resting state functional connectivity



亚太 A2-129-0011

Network Pharmacology Analysis of Exercise (Swimming, Running) for Depression

Ze-Yong Zou*, Qi-Yu chen
Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;
Email: Ze-Yong Zou, 1193300237@qq.com

Objective This study employed the approach of network pharmacology to deeply analyze the potential molecular correlation mechanisms between exercise (swimming, running) for depression.

Methods Using "Exercise Swimming Running" and "Depression" as search terms, relevant target data were collected from databases such as ETCM, HERB, and GeneCards. After deduplication and merging, a Venn intersection diagram was drawn through the Bioinformatics Service Platform to identify the common targets. The information of the intersecting targets was imported into the STRING database to construct a Protein-Protein Interaction (PPI) network, and the core key targets were screened with the aid of the Cytoscape software. The DAVID database was used to conduct Gene Ontology (GO) functional enrichment and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment analyses on the intersecting targets. Finally, a visual network of "Exercise, Swimming, Running - Depression - Key Targets - KEGG Pathways" was constructed in Cytoscape.

Results A total of 930 potential targets related to exercise, swimming, and running, and 285 potential targets related to depression were screened out, with 208 intersecting targets between the two. The PPI network analysis identified the top ten key targets such as IL6 and IL1B. The GO enrichment analysis showed that in terms of Biological Process (BP), it was mainly enriched in functions such as sodium ion transmembrane transport; in terms of Cellular Component (CC), it was concentrated on Lewy bodies, etc.; and in terms of Molecular Function (MF), it was reflected in activities such as ryanodine-sensitive calcium-release channel activity. The KEGG pathway analysis enriched a total of 153 pathways, and the top 10 pathways mainly involved the neurotrophin signaling pathway, etc.

Conclusion This study successfully revealed the potential molecular targets and signaling pathways underlying the intervention of depression by exercise (swimming, running), providing important theoretical support for further in-depth exploration of the internal mechanisms by which exercise improves depression.

Keywords: Exercise; Swimming; Running; Depression; Network Pharmacology

亚太 A2-129-0012

Incidence of Deep Venous Thrombosis in Posterior Cruciate Ligament Avulsion Fractures with Low Molecular Weight Heparin followed by Rivaroxaban Versus No Prophylaxis

Md Miftahul Mithu^{1,2,3} (MBBS, MD), ZhuoYuan Chen² (MD, PhD)¹, Ting-Hua Wang (MD, PhD)^{1*},
Youbao Zhu (MD, PhD)^{*3}

1: Institute of Neuroscience, Kunming Medical University, Kunming, 650500, China.

2: Department of Orthopedics of Yan'an Hospital Affiliated to Kunming Medical University, Kunming, Yunnan Province, China.

3. International Education School, Kunming Medical University, Kunming, 650500, China.

Objective The study aimed to compare the effectiveness of Low Molecular Weight Heparin (LMWH) followed by Rivaroxaban with no anticoagulant treatment in preventing Deep Venous Thrombosis



(DVT) after open reduction and internal fixation surgery (ORIF) for PCL avulsion fractures.

Methods This quasi-experimental study enrolled 37 patients with posterior cruciate ligament (PCL) avulsion fractures. Following surgery, 4 patients were excluded for not meeting the inclusion criteria, and the remaining 33 participants were allocated into Group A (n=16) and Group B (n=17). Surgical **Methods** involved standard protocols of open reduction and internal fixation surgery (ORIF) and anatomical alignment restoration using absorbable Bone Anchor Nails. Group A received prophylactic anticoagulation with LMWH followed by Rivaroxaban, while Group B did not. Postoperative care included standardized rehabilitation protocols and monitoring for DVT using color doppler ultrasound examinations. Patients underwent follow-up ultrasound examinations at 7 days and 1-month post-operation to assess DVT presence and condition. This comprehensive methodology allows for a thorough evaluation of the efficacy and safety of prophylactic anticoagulation in patients with PCL avulsion fractures and complications were observed between the two groups.

Results The study included 33 patients who had undergone surgical treatment for PCL avulsion fractures, divided into Group A (LMWH followed by Rivaroxaban) and Group B (No anticoagulant treatment). No statistically significant differences were found in the demographic and preoperative laboratory data between Group A (LMWH followed by Rivaroxaban) and Group B (no anticoagulation). Postoperatively, ESR, CRP, ALB, and Hb levels showed no significant differences between the two groups ($P > 0.05$). Postoperative days 7 and 10 ($P < 0.05$). At 1 month postoperatively, the overall incidence of DVT was significantly lower in Group A (6.25%) than in Group B (35.29%) ($P = 0.041$). The percentage of DVT-free patients was 93.75% in Group A and 64.71% in Group B ($P = 0.041$). During the first 7 postoperative days, the DVT incidence was 6.25% in Group A and 17.65% in Group B ($P = 0.316$), with a higher percentage of DVT-free patients in Group A ($P = 0.041$). From day 8 to 1 month postoperatively, no DVT cases were detected in Group A, while the incidence in Group B was 21.43% ($P < 0.01$).

Conclusion LMWH followed by Rivaroxaban significantly reduced DVT after PCL avulsion surgery. In addition, the D-D levels postoperatively were lower in group of LMWH followed by Rivaroxaban group at 7 and 10 days after the operation. As for other inflammatory markers, there was no significant difference between the two groups. Thus, the reduction in DVT risk and D-Dimer levels suggests that the LMWH-rivaroxaban regimen may offer a clinically beneficial approach to anticoagulation therapy in patients undergoing PCL avulsion surgery.

Keywords: Posterior Cruciate Ligament (PCL), avulsion fracture, Low Molecular weight heparin (LMWH), Rivaroxaban, Deep Vein Thrombosis (DVT)

亚太 A2-129-0016

Transcriptomic analysis of skin, dorsal root ganglia, spinal dorsal horn, and cortex in rats subjected to plantar incision pain

Bi-Hua Xie^{1,2}, Bao-Lei Zhang³, Ting-Ting Li¹, Qiu-Xia Xiao⁴, Liu-Lin Xiong⁴, Ting-Hua Wang¹, Fei Liu^{1*}.

1. Department of Anesthesiology, West China Hospital, Sichuan University, Chengdu, Sichuan, China;

2. Department of Anesthesiology, The Third People's Hospital of Yibin, Yibin, Sichuan, China;

3. Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;

4. Department of Anesthesiology, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China.

*Corresponding author: Fei Liu, No. 37 Guoxue Lane, Wuhou District, Chengdu, Sichuan Province, China; Email: 30333870@qq.com.

Objective This study aimed to investigate transcriptomic mRNA expression in the skin, dorsal root ganglia (DRG), spinal dorsal horn, and cortex following plantar incision pain in rats, focusing on potential mechanisms underlying postoperative pain.



Methods Six Sprague-Dawley rats were allocated to sham group (Group S, n=3) or plantar incision pain group (Group P, n=3). Both groups underwent sodium pentobarbital-induced anesthesia. Group S received no surgical intervention, while Group P underwent a standardized left plantar incision. Tissue samples (incised skin, DRG, spinal dorsal horn, and cortex) were collected 6 h postoperatively. RNA sequencing and subsequent bioinformatics analyses (Gene Ontology, KEGG pathway, STRING, Cytoscape) were performed to identify hub mRNAs.

Results Significant mRNA expression disparities were observed in skin and DRG tissues between groups. The skin exhibited 501 differentially expressed mRNAs (296 upregulated, 205 downregulated), predominantly enriched in muscle contraction and immune pathways, notably interferon-related genes (e.g., Usp18, Rsad2, Mx1, Ifit3). DRG tissues demonstrated 658 differentially expressed mRNAs (656 upregulated, 2 downregulated), primarily associated with immune response and tissue repair (Syk, Fn1, Vav1, Ptpcr). Minimal mRNA changes were detected in spinal dorsal horn and cortical tissues.

Conclusion Plantar incision induces robust immune-related transcriptional changes in peripheral nociceptive pathways (skin and DRG), while central nervous system regions remain largely unaffected at the 6-hour timepoint. The pronounced upregulation of interferon signaling and tissue remodeling genes suggests a potential peripheral immune mechanism in early postoperative pain pathogenesis, warranting functional validation.

Keywords: postoperative pain, transcriptomics, skin, Dorsal Root Ganglion, Immunomodulation.

● 亚太 A3. Radiological Anatomy and Imaging ● Podium

ID: 318288

Multi-Class Deep Learning Segmentation of Periodontal Tissue Ultrasound Images

Piaojiangzhen¹ Kyung-Seok Hu¹ Hee-Jin Kim²

1.Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 FOUR Project, Yonsei University College of Dentistry, Seoul, Korea.

2.Department of Electric and Electronical Engineering, College of Engineering, Yonsei University, Seoul, Korea.

Objectives Intraoral ultrasound, characterized by portability, low cost, non-invasiveness, and radiation-free imaging, has potential as a complementary approach to cone-beam computed tomography (CBCT) for periodontal examination. However, clinicians still encounter challenges in interpreting periodontal ultrasound images. Deep learning algorithms can extract complex features from ultrasound images for classification, diagnosis, or automatic contour segmentation. This study aimed to utilize a deep convolutional neural network to automatically segment enamel, cementum, alveolar bone, and gingiva from ultrasound images.

Methods We propose a hierarchical segmentation framework that leverages geometric and style augmentations. Coarse segmentation is performed using dual U-Net architectures with randomly shuffled encoder blocks to enhance feature diversity, and decoder outputs are fused via a channel-spatial cross-attention mechanism. The upsampling operations in both U-Net and attention computation are replaced with the efficient EUCB module. The refined representations are then processed by a Unet++ encoder-decoder for fine segmentation. A total of 1,200 images were used for training, 200 images for validation, and 200 images for testing.

Results The Dice coefficients achieved by the model on the test dataset were as follows: gingiva 91.7%, alveolar bone 89.2%, enamel 87.7%, and cementum 88.1%. The segmentation demonstrated accuracy and reliability at clinically acceptable levels.



Conclusion This study demonstrates the potential value of deep learning-based Methods for identifying periodontal anatomical structures in dental ultrasound images and obtaining diagnostic parameters for periodontal assessment.

Keyword: artificial intelligence, automatic segmentation, deep learning, periodontal, ultrasonography.

ID: 318347

Mapping and Modeling Individual-level Morphometric Similarity Network Deviations in Autism

Makliya Mamat¹ Yiyong Chen¹ Lin Li²
1.Ningbo University
2.Nanjing Medical University

Background Autism spectrum disorder (ASD) is associated with widespread alterations in brain structure, yet conventional case-control studies often overlook the substantial inter-individual variability among autistic individuals. In this study, we applied normative modelling to identify person-specific deviations in cortical morphometric similarity and explore their neurogenomic underpinning.

Methods We analyzed structural MRI data from 315 individuals with ASD and 364 typically developing controls. Morphometric inverse divergence (MIND) networks were constructed across 308 cortical regions based on five MRI-derived features to quantify regional morphometric similarity. Using Bayesian linear regression normative models, we mapped individual-level deviations from expected morphometric similarity patterns. We further examined whether these deviations clustered within specific brain regions and networks, and assessed their relationship to spatially resolved cortical gene expression profiles. Through semi-supervised clustering, we delineated putative biotypes and explored their clinical characteristics.

Results Autistic individuals exhibited heterogeneous deviations in morphometric similarity, with patterns of both increased and decreased similarity across cortical regions. Certain frontal and temporal regions showed a higher prevalence of deviations, contributing to altered network hub architecture. Spatial correlation analyses revealed that regions with frequent deviations aligned with cortical expression of gene sets enriched for neurodevelopmentally relevant pathways, including synaptic function, axon guidance, and neuronal differentiation. Moreover, individual differences in hub-level deviations were associated with cognitive profiles in ASD.

Conclusions Our findings demonstrate that morphometric similarity deviations in ASD are highly individualized yet converge within specific cortical networks and molecular pathways.

Keyword: Morphometric similarity; autism; normative modelling; network neuroscience; heterogeneity



ID: 318574

Multiclass Segmentation and Intelligent T-staging of Prostate Cancer MRI Images Using Deep Learning

Rutao Fan Shanshan Xu
Army Medical University

Manual segmentation of prostate lesion on MRI is highly important for 3D visualization, diagnosis and treatment planning but is time-consuming and laborious. An intelligent tool that can accurately segment and locate lesions is urgently needed. To solve these problems, first, we collected MR images of pathologically confirmed prostate cancer patients from Shanxi Cancer Hospital, Xinqiao Hospital and PROSTATE_X. Second, Vgg-Attention-Unet model (VAU) was trained to segment the peripheral zone (PZ), transitional zone (TZ), central zone (CZ), anterior fibromuscular stroma (AFMS), tumor, rectum, bladder, seminal vesicle (SV) and urethra. Finally, the Swin Transformer (SwinT) model was used for intelligent T-stage diagnosis with intelligently segmented lesions. Two thousand and nine patients were enrolled (70 years $\pm$ 9). VAU achieved DSCs of 0.783, 0.789, 0.392, 0.563, 0.583, 0.824, 0.938, 0.738, and 0.613 for intelligent segmentation of PZ, TZ, CZ, AFMS, tumor, rectum, bladder, SV, and urethra in internal test cohort and 0.787, 0.755, 0.349, 0.587, 0.487, 0.852, 0.931, 0.667, and 0.639 in external test cohort, respectively. Additionally, SwinT achieved an accuracy of 0.733 and an AUC of 0.827 for differentiating between T1-T2 and T3-T4 with segmented masks in internal test cohort, respectively. In conclusion, Deep learning was able to accurately segment prostate zones, tumors and adjacent structures, and performed well in T-stage diagnosis of prostate cancer.

Keyword: Artificial intelligence, Prostate cancer, Segmentation, Deep learning, MR imaging

ID: 320126

A Comprehensive Classification of The Thyrocervical Trunk: A CTA 3D Study

Ruiyang Wang Bingqi Xu Han Meng Lifeng Yu Wenli Wang Xinyu Du Ping Wang
Tarim University School of Medicine

Objective The thyrocervical trunk (TCT), a short branch of the subclavian artery, shows considerable anatomical variation that is not fully understood. This study introduces a classification of TCT branching patterns and provides precise measurements of each branch's external diameter at its origin.

Methods We conducted a retrospective analysis of head-and-neck computed tomography angiograms from 200 adult participants (149 males, 51 females; mean age 54.2 ± 12.6 years) without a history of tumors or trauma. Volume rendering was applied using 3D Slicer. For each of the 400 sides, we documented the presence of the TCT and its branches, measuring external diameters at their origins.

Results The TCT was visualized in 295 of 323 sides (91.3%), with non-visualization cases attributed to occlusion. Branching patterns and morphometrics (occurrence rate; mean diameter) were as follows: (1) Inferior thyroid artery (85.0%; 2.00 ± 0.56 mm); (2) Transverse cervical artery (83.0%; 2.56 ± 0.46 mm); (3) Suprascapular artery (46.8%; 1.89 ± 0.49 mm); (4) Ascending cervical artery (43.4%; 1.39 ± 0.35 mm). Infrequent branches included the internal thoracic artery (5.0%; 2.63 ± 0.50 mm) and deep cervical artery (1.6%; 1.97 ± 0.42 mm).



Conclusion This study comprehensively delineates the anatomical spectrum of the TCT. These findings aim to improve preoperative vascular mapping and help minimize iatrogenic risks during surgical or endovascular procedures.

Keyword: Ascending cervical artery, CTA, Thyrocervical trunk, Transverse cervical artery

ID: 340503

Radiographic Observation of Cervical Immature Epiphyseal Ring

Xie Siyuan Lin Yuanxun Zhang Yunaolong Feng Ziyu Li Yikai
School of Traditional Medicine, Southern Medical University

Objective This study aims to investigate the normal development process of the human cervical epiphyseal ring (ER), providing a basis for the diagnosis of diseases and the determination of treatment.

Methods We retrospectively analyzed lateral cervical radiographs from 250 patients. The inferior ERs of C2-C7 were classified into four developmental stages (cartilaginous, ossification, fusion, mature). During the ossification stage, the ring's height, length, and its distances from the vertebral margins (AP and CC distances) were measured and analyzed for correlation with age.

Results The earliest ossification of the inferior apophyseal ring was observed in a 3-year-old child. All inferior ERs had begun to ossify in patients over 15 years old. The anterior ER inferior to C7 was the first to ossify. Ossification of the anterior rings generally preceded the posterior rings, but the posterior rings fused with the vertebral body earlier. In the 25-year-old group, 20% of the apophyseal rings had not yet completely fused. The average height of the ER during the ossification stage was 0.7 ± 0.3 mm, the length was 2.8 ± 1.6 mm, the AP distance was 1.3 ± 0.6 mm, and the CC distance was 0.4 ± 0.2 mm. There was no significant correlation between these parameters and age.

Conclusion This study observed the normal developmental process of the cervical ER in children through lateral cervical spine radiographs, providing a reference for the clinical evaluation of individual development and guidance for the diagnosis and treatment of diseases.

Keyword: Children; Cervical Vertebrae; Epiphyseal ring

亚太 A3-129-0002

Development of a Model for Measuring Sagittal Plane Parameters in 10–18-year Old Adolescents with Idiopathic Scoliosis Based on RTMpose Deep Learning Technology

Zhijie Kang¹, Guopeng Shi², Haiyan Wang³, Xiaohe Li⁴ (798242742@qq.com)
Department of Human Anatomy, Graduate School, Inner Mongolia Medical University, Hohhot 010010, China

Purpose The study developed a deep learning model using RTMpose technology to automate full-spine X-ray measurements in Adolescent Idiopathic Scoliosis (AIS) patients, addressing the



challenges of manual measurement time and variability.

Methods A retrospective multicenter study used 560 full-spine sagittal plane X-ray images from five hospitals. The model was trained on 500 images, validated on 60 external images, and evaluated for keypoint annotation consistency, prediction accuracy, and measurement accuracy compared to manual methods.

Results Key point annotation consistency among physicians and the model was 90-97% within 4 mm. Model prediction accuracy for key points was 91-100% within 4 mm. The model showed high consistency with experienced physicians for 15 anatomical parameters (intraclass correlation coefficients 0.892-0.991). Mean absolute errors were 1.16 mm for SVA and 0.22°-3.32° for other parameters. Data format variability was addressed through augmentation techniques, and the model measured parameters in 9.27 seconds per image.

Conclusion The RTMpose-based model enhances clinical efficiency by accurately measuring sagittal plane parameters in AIS X-rays, matching manual measurements by experienced physicians and serving as a valuable diagnostic tool.

Keywords: Adolescent idiopathic scoliosis; RTMpose; Deep learning; Sagittal plane

亚太 A3-129-0003

Real-Time and Rapid Quantitative Measurement of Female Anal Sphincter Complex in ultrasound images based on deep learning model

Shanshan Xu ^{1,2}, Qingfang Gong ^{1,2}, Yi Yang ¹, Yangyun Wang ³, Yongjian Nian ¹,
Rutao Fan ^{1,2}, Li Duan ^{*4}, Yi Wu ^{*1,2}.

¹ Department of Digital Medicine, College of Biomedical Engineering and Medical Imaging, Army Medical University (Third Military Medical University), Chongqing, 400038, China.

² Yu-Yue Pathology Research Center, Jinfeng Laboratory, Chongqing 401329, China.

³ Department of Urology, Shanghai Fifth People's Hospital, Fudan University, Shanghai, 200240, China.

⁴ Department of Ultrasound, Shanghai Fifth People's Hospital, Fudan University, Shanghai, 200240, China.

Objective To develop a real-time, reproducible, and automated method for automatic segmentation and measurement of female anal sphincter complex (ASC), which can quickly and accurately diagnose the location and degree of damage to the anal sphincter complex.

Methods This was a retrospective, observational single-center study of female pelvic floor ultrasound images. A Lightweight Hybrid model called MNUv3 was employed for automatic segmentation of the female ASC, including anal mucous layer (AML), internal anal sphincter (IAS), conjoint longitudinal muscle (CLM), external anal sphincter (EAS), and levator ani (LA). To enhance segmentation efficiency and accuracy by minimizing interference from irrelevant structures, image cropping was applied. Finally, the model's performance was evaluated by comparing the automatic segmentation Results against the gold standard using the Dice similarity coefficient (DSC) and Hausdorff distance (HD) as metrics.

Results In total, 470 female patients were included and 929 preoperative ultrasound images were analyzed. The DSC values of the MNUv3 for intelligent segmentation of AML, IAS, CLM, EAS, and LA have reached 0.966 (95% CI: 0.963, 0.969), 0.903 (95% CI: 0.896, 0.901), 0.821 (95% CI: 0.813, 0.828), 0.779 (95% CI: 0.769, 0.789), and 0.835 (95% CI: 0.822, 0.848), respectively. The 95% HD values are 3.912mm (95% CI: 3.408, 4.417), 4.446mm (95% CI: 4.039, 4.853), 8.476mm (95% CI: 7.543, 9.409), 5.723mm (95% CI: 5.135, 6.312), and 18.331mm (95% CI: 16.917, 19.746), respectively. While demonstrating comparable segmentation accuracy to both VGG16-UNet (1.09 ± 0.18 fps) and ResNet50-UNet (1.79 ± 0.38 fps) architectures, the MNUv3 model exhibits a 10.0-16.4× acceleration in inference speed, achieving 17.89 ± 1.48 frames per second (fps) on identical hardware configurations. Eight intelligent measurement points (72.7%) showed no significant



difference compared to the manual measurements.

Conclusion The MNUv3 model, based on transperineal sonography, enables rapid and automatic segmentation of the ASC with superior performance, significantly reducing the clinician's workload while increasing the diagnostic accuracy of pelvic floor muscle. In addition, this model is suitable for fast and intelligent ultrasound diagnosis, especially when using portable ultrasound devices.

Key Words: Image Processing, Computer-Assisted, Anal Canal, Ultrasonography, Muscle, Skeletal, Models, Theoretical, Sensitivity, Specificity, Pelvic Floor Disorders.

亚太 A3-129-0004

Aging Pattern of the Brainstem Based on Volumetric Measurement and Optimized Surface Shape Analysis

Hu Minqi, Xu Feifei, Liu Shizhou, Liu Shuwei, Tang Yuchun(tyc@sdu.edu.cn).

Department of Anatomy and Neurobiology, Shandong Key Laboratory of Digital Human and Clinical Anatomy, School of Basic Medical Sciences, Cheeloo College of Medicine, Shandong University, Jinan 250012, Shandong, China

Objectives To measure the volume and surface area of the brainstem and assess the effects of age and gender on the morphology of the brainstem and its sub-regions.

Methods Volumetric measurement and optimized surface shape analysis were performed to investigate age- and sex-related differences in global, regional and local structure of the brainstem using the structural MRI data of 187 healthy adults (ranging in age from 18 to 70 years).

Results Our Results showed a significant negative age effect on the volume of the two major components of the brainstem: the medulla oblongata and midbrain. The shape analysis revealed that atrophy primarily occurs in specific structures, such as the pyramid, cerebral peduncle, superior and inferior colliculi. Surface area and shape analysis showed a trend of flattening in the aging brainstem. There were no significant differences between the sexes or sex-by-age interactions in brainstem structural measures.

Conclusions These findings provide a systematic description of age associations with brainstem structures in healthy adults and may provide a reference for future research on brain aging and neurodegenerative diseases.

Keywords Magnetic resonance imaging, Aging, Brainstem, Morphometry

亚太 A3-129-0009

Intelligent Segmentation and Visualization of Hippocampal Formation

Shuwei Liu(liusw@sdu.edu.cn), He Bai

Department of Anatomy and Neurobiology, Institute of Sectional Anatomy and Digital Human, School of Basic Medical Sciences, Shandong University Cheeloo College of Medicine, Jinan 250012, China

Objective To create an accurate automated segmentation method of hippocampal head, body, and tail, to visualize the morphological structures and volume values of the hippocampal head, body, and tail, and to explore the advancement, validity, and generalization of the method of this study, which will provide a reference for clinicians in the diagnosis of neurological and psychiatric diseases.

Methods In this study, a robust algorithm for hippocampal intelligent segmentation is proposed,



and two modules and strategies are innovatively proposed. One is the space-frequency feature fusion module, which introduces frequency domain data into the space domain feature extraction process, and performs convolution in the frequency domain in order to filter the features that are not useful for segmentation, including all kinds of artifacts and noise information in MRI data. This module eliminates the negative impact of such information on the network feature extraction and improves the feature extraction capability of the network and the hippocampal segmentation results. The second is the inter-class edge enhancement strategy, which makes the network focus more on learning the contextual information of the edges and the edges of the classes by increasing the weight of the inter-class edge regions in the loss function, so as to alleviate the problem of imprecise segmentation of the edge regions. This strategy enhances the network's ability to learn the edge regions between the hippocampal head, body, tail, and background, dramatically improving and enhancing the segmentation of the edge regions.

Results In comparison with eight segmentation methods, the method proposed in this study achieved superior Results on the task of segmenting the hippocampal head, body, and tail, achieving 88.68%, 86.39%, and 85.82% DSC accuracy for these three categories, respectively, on the adolescent brain MRI dataset. And the improvement in accuracy was confirmed to be statistically significant by five-fold cross-validation and paired t-test at $p < 0.05$. The ablation experiments also exemplify the effectiveness of the space-frequency feature fusion module and the inter-class edge enhancement strategy in the hippocampal segmentation process. In the comparison experiments on the medical image segmentation decathlon challenge hippocampus dataset, the method proposed in this study still achieves the top performance, confirming its strong robustness and generalizability. Finally, this study designed a website for brain hippocampus visualization system, in which the proposed segmentation method is embedded, which can flexibly display the morphological structures of the hippocampal head, body, and tail segmented from brain MRI images, and intuitively give quantitative metrics such as the volume and surface area of each part.

Conclusions This study proposes an automated and intelligent method for segmenting the hippocampal head, body, and tail, which contains an innovative space-frequency feature fusion module and inter-class edge enhancement strategy, and provides a visualization scheme for the morphological structures and volume values of the hippocampal head, body, and tail. This study can help clinicians to observe the morphological structures of the hippocampal head, body and tail in a more detailed way and obtain accurate volume information, which can assist clinicians to accomplish more accurate diagnosis of neurological and psychiatric diseases. This research uses computer technology to achieve auxiliary diagnosis of diseases and promotes the development and progress of the intersection of medicine and engineering.

Key words: hippocampal formation, automated intelligent segmentation, visualization

● 亚太 A3. Radiological Anatomy and Imaging ● Poster

ID: 318268

Cortical Morphometric Network Reorganization Across the Adult Lifespan: A Gene-Expression Informed Study

chenyiyong1 Lin Li2 Yizhi Zuo2
1.Ningbo University
2.Nanjing Medical University

Objectives Age-related changes in cortical morphology and network architecture have been well documented. However, age-associated changes in cortical morphometric similarity through



Morphometric Inverse Divergence (MIND) network are not well understood. Additionally, these changes links to gene expression have yet to be investigated.

Methods In this study, using structural magnetic resonance imaging data of healthy participants, we built MIND matrices for each subject based on five features. The regional morphometric similarity values were calculated by averaging all the connections of the cortical areas. We examined the correlations between the regional morphometric similarity and age. In addition, partial least squares regression was conducted to examine the associations of gene expression profiles with the age-related changes.

Results We found profound age-related morphometric similarity changes, increased in bilateral pericalcarine, left cuneus and right lingual, but generally decreased in most of cortical areas, specially in bilateral inferior temporal gyrus (correlation coefficient left $r = -0.51$, right $r = -0.40$), bilateral fusiform (left $r = -0.45$, right $r = -0.35$) and left rostral anterior cingulate ($r = -0.40$). Changes in morphometric similarity showed significant spatial correlation with the expression of age-related genes that enriched to cellular response to organic cyclic compound, intracellular receptor signaling pathway and cellular response to hormone stimulus, likely accounting for cortical development, aging, and cognitive plasticity.

Conclusion Taken together, these findings deepen our understanding of adaptive changes of the human brain with advancing age, which may account for age-related variations in behaviors and cognition.

Keyword: Morphometric Inverse Divergence (MIND) network, Lifespan, Gene Expression

亚太 A3-129-0006

Cortical Morphometric Network Reorganization Across the Adult Lifespan: A Gene-Expression Informed Study

Yiyong Chen¹, Lin Li², Yizhi Zuo²

¹ School of Basic Medical Sciences, Health Science Center, Ningbo University

² Human Anatomy Department, Nanjing Medical University

Objectives Age-related changes in cortical morphology and network architecture have been well documented. However, age-associated changes in cortical morphometric similarity through Morphometric Inverse Divergence (MIND) network are not well understood. Additionally, these changes links to gene expression have yet to be investigated.

Methods In this study, using structural magnetic resonance imaging data of healthy participants, we built MIND matrices for each subject based on five features. The regional morphometric similarity values were calculated by averaging all the connections of the cortical areas without applying any thresholding. We examined the correlations between the regional morphometric similarity and age. In addition, partial least squares regression was conducted to examine the associations of gene expression profiles with the age-related changes.

Results We found profound age-related morphometric similarity changes, increased in bilateral pericalcarine, left cuneus and right lingual, but generally decreased in most of cortical areas, specially in bilateral inferior temporal gyrus (correlation coefficient left $r = -0.51$, right $r = -0.40$), bilateral fusiform (left $r = -0.45$, right $r = -0.35$) and left rostral anterior cingulate ($r = -0.40$). Changes in morphometric similarity showed significant spatial correlation with the expression of age-related genes that enriched to cellular response to organic cyclic compound, intracellular receptor signaling pathway and cellular response to hormone stimulus, likely accounting for cortical development, aging, and cognitive plasticity.

Conclusion Taken together, these findings deepen our understanding of adaptive changes of the human brain with advancing age, which may account for age-related variations in behaviors and



cognition.

Key Words: Morphometric Inverse Divergence (MIND) network, Lifespan, Gene Expression

● 亚太 A3. Radiological Anatomy and Imaging ● Abstract

亚太 A3-129-0001

The optimal slice to quantify the volumes of subcutaneous adipose tissue and skeletal muscle on chest CT as imaging marker for body composition estimation

Linlin Lang, Liping Zuo, Kai Dou, Jinlei Fan, Donglai Li, Yuqing Tang, Weiwei Ji, Dexin Yu
Department of Radiology, Qilu Hospital of Shandong University, Jinan, China.
Dexin Yu, PhD, corresponding author, Tel: 18560081629, E-mail: yudexin0330@sina.com
Weiwei Ji, corresponding author, E-mail: jiweiwei1637@163.com
Linlin Lang, first authorship, E-mail: lll13165102379@163.com
Liping Zuo, first authorship, E-mail: zuoliping2020@163.com

Objectives This study aims to investigate the relationship between the cross-sectional areas of subcutaneous adipose tissue (SAT) and skeletal muscle (SM) at various anatomical levels on chest computed tomography (CT) and their respective total volumes. Additionally, it seeks to identify the optimal anatomical site for a single CT slice that best predicts the total thoracic SAT and SM volumes.

Methods Chest CT scans were conducted on 58 healthy Chinese subjects, aged 24 to 77 years. Cross-sectional areas of SAT and SM were measured at each mid-thoracic vertebra level from T2 to T12, as well as at the midclavicular line, aortic arch, and tracheal prominence levels. Total thoracic SAT and SM volumes, spanning from the clavicle entrance to the lower border of T12, were calculated using 3D Slicer software. Spearman's correlation coefficients were then computed between the SAT and SM areas at different single-slice levels and their respective total volumes.

Results The cross-sectional areas of SAT and SM measured at each anatomical site were significantly correlated with total thoracic SAT and SM volumes across the entire study population ($r = 0.720-0.941$). The SAT area measured at the T4 level ($r = 0.888$, $P < 0.01$) demonstrated the strongest correlation with total thoracic SAT volume, while the SM area at the aortic arch level ($r = 0.941$, $P < 0.01$) showed the highest correlation with thoracic SM volume. The combined Spearman's correlation coefficients reached their highest sum (1.816) at the aortic arch level.

Conclusion Considering both measurement simplicity and accuracy, the aortic arch slice was identified as the optimal single slice for predicting total thoracic SAT and SM volumes.

Key Words: the optimal slice, chest CT, body composition estimation

亚太 A3-129-0008

Application of automated measurements to the assessment of ventricular volumes of the brain

Xue Zhang, Xiaotong Yu, Xiu Zhang, Shulin Liu, Fu Ren
Shenyang Medical College
z2238956355@163.com

Objective Accurate segmentation and calculation of ventricular volume are essential for



neuroscience research and diagnosing neurological diseases. In resource-limited settings, free and open-source automated tools can provide accessible solutions. However, comparative studies evaluating these tools are lacking, limiting their application and broader adoption. This study aims to identify reliable, high-performing free tools for automated ventricular volume measurement to support their use in clinical and research settings.

Methods MRI data from 150 healthy adult participants were collected with informed consent. Ventricular volumes were segmented and calculated using three open-source automated tools—3D Slicer, FreeSurfer, and ITK-SNAP—with manual measurements serving as the reference standard. Pearson's correlation coefficient, intraclass correlation coefficient (ICC), and Bland-Altman analysis were used to assess the tools' correlation, reliability, and agreement with manual measurements.

Results All three automated tools showed significant correlations with manual measurements ($P < 0.01$). ITK-SNAP had the highest Pearson correlation and ICC values, followed by 3D Slicer, while FreeSurfer had the lowest. All tools demonstrated strong reliability, with ICCs greater than 0.9. Bland-Altman analysis showed ITK-SNAP had the closest agreement with manual results, again followed by 3D Slicer, with FreeSurfer performing least consistently.

Conclusion ITK-SNAP demonstrated superior accuracy, reliability, and agreement in measuring ventricular volume compared to 3D Slicer and FreeSurfer. It is recommended as the most effective free automated tool for ventricular volume analysis and can help promote wider use of accessible neuroimaging tools in both research and clinical practice.

Keywords ventricular system,volumetric measurements,automated measurement methods,method comparison,open source software

● 亚太 A4. Anatomy in Arts and Sports ● Podium

ID: 317411

What Did the Historical Chinese Beauties Look Like? An Analysis of Portrait and Biography of 100 Beauties (1792)

Kun Hwang Sang Su Park Seung-Ho Han
Ewha University

Objective To elucidate the appearance of historical Chinese beauties by analyzing Portrait and Biography of 100 Beauties.

Methods The 103 women who appear in this work were categorized as historical or mythological figures, and the reason for their inclusion was classified as beauty, talent, or both. Descriptions of beauties were classified as general literary descriptions or specific descriptions of their appearance.

Results Among them, 42.7% were depicted as both beautiful and talented, while 42.7% were only described as beautiful. The remainder were included because of their talent only. Almost four-fifths were described as chaste, while the remaining one-fifth were presented as licentious. About half were queen consorts, princesses, imperial concubines, or palace women. Courtesans and singing girls and concubines of influential officials and scholars followed. Forty-six women had specific descriptions of their appearance, most often of their face (33.5%), followed by their body (16.5%), manners, fragrance, and clothes. The most frequent descriptions of specific attributes were found for the hair (7.4%), eyebrows (6.7%), eyes (5.5%), skin and body shape. Among the 114 talents possessed by 59 beauties, the most celebrated talents were entertaining skills (42.1%), followed by literary skills (27.2%), and intelligence (21.1%). Three women were included owing to their



r make-up skills. Chaste beauties were depicted as more likely to have a happy fate than licentious beauties (OR: 16.8).

Conclusion This analysis might be helpful for understanding the concept of beauty throughout Chinese history.

Keyword: Beauty, China, History

亚太 A4-129-0000

Anatomical analysis of motor functions of vocalization and pronunciation

Hongyu Liu

Institute of Sport and Exercise Medicine, North University of China, Taiyuan 030051, China

E-mail: lhyxian@nuc.edu.cn

Re-recognition of vocalization, pronunciation and singing. Human respiratory and oral organs are language organs, and even singing instrument.

Speaking, pronunciation, and singing are forms of exercise. They are the specific movements of some functional muscles: respiratory muscles, laryngeal muscles, pharyngeal muscles, oral muscles, face muscles, neck muscles, and so on.

Functional analysis on singing movement.

There is a difference between vocalization and pronunciation. Vocalization originates from the laryngeal organs, pronunciation from the oral organs, and the upper respiratory tract and other body cavities are responsible for sound resonance. Resonance acquires bel canto or musical sounds, especially in singing exercise, speech or recitation, which also requires resonance. The resonance mechanism can be summarized into two categories: material and structure, culture and spirit. The lower respiratory tract mainly provides respiratory power, creating high pressure in the subglottic space and forcing the vocal cords to vibrate. The thoracic and abdominal diaphragms are the main power sources to obtain an adequate amount of gas and maintain the volume, intensity, continuity and rhythm of the airflow. All the above-mentioned movement actions are finely regulated by the central nervous system. The proprioception of the respiratory tract and oral organs makes the function of the music-motor central circuit more precise.

The contribution of Chinese pronunciation Methods to language and singing.

The pronunciation and articulation Methods of the Chinese language are unique, making special contributions to speech and singing: each character has its own sound, and the syllables are clear, which rhymes in harmony.

Mandarin Chinese has four tones, namely Yin Ping (the first tone), Yang Ping (the second tone), the rising tone (the third tone), and the falling tone (the fourth tone).

In traditional Chinese medicine theory, there are five sounds: shouting, laughing, singing, crying and moaning.

In ancient Chinese, the Five-tone theory of music (宫 gōng、商 shāng、角 jué、徵 zhǐ、羽 yǔ) corresponds to the Five-element (Metal 金、Wood 木、Water 水、Fire 火、Earth 土) materialistic view of philosophy.

Welcome to the fields of Chinese linguistics and modern music science, and also to the study of the motor functional anatomy of vocalization and pronunciation!



亚太 A4-129-0001

In Vivo Dynamic Monitoring of the Musculoskeletal System's Anatomy and Functional Assessment by SWIR Luminescence Imaging

Jun Chen (biochenjun@fudan.edu.cn)
Sports Medicine Institute of Fudan University
Department of Sports Medicine
Huashan Hospital
Fudan University
Shanghai 200040, P. R. China

Objectives To develop a SWIR luminescence imaging technique based on PbS quantum dots to provide high-resolution, real-time imaging of the musculoskeletal system.

Methods Balb/C nude mice and C57 mice were inhaled isoflurane (Isothesia, 1.5% – 3% concentration) to induce and maintain anesthesia. PbS quantum dots were injected via the tail vein to obtain SWIR fluorescence images of skeletal structures and blood vessels, and compared with traditional imaging results. Additionally, subcutaneous injection of PbS quantum dots into the tails and hind limbs of mice was performed to image lymphatic vessels. Histological and biochemical analyses were conducted to assess the biocompatibility and metabolic properties of PbS quantum dots. After the experiments, mice were euthanized by an overdose of anesthesia to death.

Results Compared with traditional imaging, PbS quantum dots enabled real-time monitoring of blood perfusion and higher-resolution skeletal images, clearly displayed lymphatic morphology and revealed lymphatic pump activity as segmental contractions (≈ 1 cm) within the vessels. Histological and biochemical analyses showed good biocompatibility and metabolic properties of PbS quantum dots.

Conclusion The SWIR luminescence imaging technique provides real-time, comprehensive, and high-resolution structural and functional assessments of the musculoskeletal system, offering potential for advancing sports medicine.

Key Words: Musculoskeletal System, Quantum Dots, SWIR

亚太 A4-129-0002

The Art and Beauty of Anatomy in Plastic Surgery

Qi Xiangdong
Department of Plastic Surgery, Zhujiang Hospital of Southern Medical University, No.253. Gongye Middle Avenue, Haizhu District, Guangzhou City, Guangdong Province, China, 510280

The intricate relationship between art, anatomy, and medicine has shaped scientific and artistic understanding of the human form for centuries. Before modern imaging technologies, anatomical knowledge was disseminated through detailed illustrations, as seen in Leonardo da Vinci's studies and Andreas Vesalius' 16th-century anatomical texts. The Renaissance humanist movement spurred collaborative dissections, enabling artists like Dürer and Arce to explore anthropometry and proportion through mathematical and lifelike depictions. Leonardo's profound anatomical investigations, though unpublished, influenced later treatises.

Facial reconstruction, a modern interdisciplinary practice, merges anatomical science and artistic skill for forensic and archaeological purposes. The process involves three stages: anatomical modelling, where muscle variations and bone structure inform facial musculature; morphology



determination, which defines features like eye position (linked to orbital anatomy), nasal shape (based on aperture proportions), lip form (tied to dental occlusion), and ear placement (guided by mastoid processes); and depiction, where tissue-depth datasets and surface details (skin texture, color, hairstyle) are applied. Critical studies by Gerasimov and Whitnall underpin Methods for reconstructing nasal and ocular anatomy, while modern imaging informs tissue-depth standards. Recognition relies heavily on artistic choices in surface details, emphasizing the fusion of anatomical precision, aesthetic mathematics, and color science. This synergy of art and anatomy continues to bridge historical inquiry, forensic identification, and scientific visualization.

ID: 317474

Meningeal Architecture of Meckel's Cave and its Surgical Implications: A Study Using Epoxy Sheet Plastination and Three-dimensional Reconstruction

Xulu^{1,2} Xuzhaoyang²

1.Chengdu Medical College

2.Anhui Medical University

Objective This study aims to utilize sheet plastination technology to reveal the detailed meningeal architecture of Meckel's Cave (MC) and its anatomical relationships with the trigeminal ganglion (TG), nerve roots, branches, and the internal carotid artery (ICA).

Methods Ultrathin plastinated slices were prepared and examined in coronal, sagittal, and transverse planes. Three-dimensional reconstructions were generated to analyze the composition of MC's dural walls and their association with the TG, its nerve roots and branches, and the alignment of the ICA. Particular attention was given to the medial wall of MC and the variations in ICA trajectories.

Results The study identified distinct regions within MC, highlighting the composition of the superolateral, medial, and inferior walls. The arachnoid mater was shown to enclose the trigeminal rootlets and contribute to the formation of the perineurium in motor roots. Four different ICA trajectories in relation to the medial wall were classified, each influencing the configuration of the quadrangular space (QS). These variations were found to have implications for surgical planning, particularly in endoscopic endonasal approaches. The study also demonstrated key differences in the structural relationships affecting invasive tumor growth pathways.

Conclusions The findings of this study provide new insights into the microanatomy of MC and its relationships with the TG and ICA. These Results offer a foundational basis for surgical planning and may help refine strategies for accessing lesions in this complex anatomical region.

Keyword: Meckel's cave; epoxy sheet plastination; three-dimensional reconstructions; internal carotid artery; quadrangular space



ID: 318341

Three-Dimensional Anatomy of the Trigeminal Motor Root: A Plastinated Sectional Study

Sheng Cheng¹ 徐柳² 徐朝阳¹

1. Anhui Medical University

2. Chengdu Medical College

Objectives The trigeminal motor root is commonly described as coursing superomedially to the sensory root. Rhoton noted aberrant sensory roots and anastomotic branches, yet their precise relationships with the motor root remain underexplored. Clarifying these relationships may improve understanding of trigeminal neuralgia. This study aims to analyze the detailed course of the motor root in relation to aberrant sensory roots and the main sensory root.

Methods Serial ultrathin plastinated sections were used to track the trigeminal motor and aberrant sensory roots, with associated structures reconstructed in three dimensions.

Results In the pontine segment, the motor root consists of a superior and an inferior group, both superior to the main sensory root. In the cisternal segment, two aberrant sensory roots appear: a superior group near the superior motor group and an inferior group near both the inferior motor group and the main sensory root. An “aberrant motor root” (previously termed an anastomotic branch) detaches from the main sensory root, merging with motor groups. At the trigeminal porus, the motor root groups mix together, the inferior aberrant sensory root mixes into the main sensory root, and the superior aberrant sensory root integrates superiorly. In Meckel’s Cave, the motor root courses inferolaterally and, upon exiting, acquires fibers from the dural wall, periosteum, and petrolingual ligament. At the foramen ovale, it shifts from medial to anterior relative to the mandibular root.

Conclusion This study elucidates the detailed anatomical relationships of aberrant sensory and motor roots, offering insights into trigeminal neuralgia pathogenesis and treatment.

Keyword: Trigeminal motor root, epoxy sheet plastination, Three-dimensional reconstruction, Aberrant sensory roots, Aberrant motor roots

ID: 318410

"Exploring the three-dimensional mesoscopic structure of the Tectorial Membrane: Epoxy Sheet Plastination and Multi-Photon Confocal Microscopy study"

Megan Papp

University of Otago

Cervicogenic headaches may arise due to irritation of the upper three cervical spinal nerves, which supply the dura, tectorial membrane and craniocervical junction deep ligaments. Gray’s Anatomy describes the TM as an extension of the posterior longitudinal ligament; however, their anatomical relationship is often inconsistently reported. This study aims to define the three-dimensional fibrous configuration of the TM and its relationship to the dura and cruciate ligament.

Sixteen cadavers were prepared into sets of epoxy-plastinated sections. These sections were examined using stereoscopy and two different multi-photon confocal systems.

Results The TM consists of two layers. The interior layer of transverse fibres blends with the dura proper. The exterior layer of tile-like overlapping fibrous bundles segmentally reinforces the interior.



ior and anchors onto the deep craniocervical junction ligaments, the periosteum of the occipital bone and C1-C2 vertebrae. Finally, it contributes to the perivascular fibrous sheath of the vertebral arteries and veins, terminating at the level of the lower C2 body and is not continuous with the PLL.

Conclusion The different configurations of the two TM layers provide the anatomical basis for two main functions. The interior layer blends with the dura proper inferiorly, forming a peridural membrane along the dural sac, contributing to dural protection. The exterior layer intermingles with the cruciform ligament anchoring onto the periosteum, terminating at mid-C2 level, thus contributing to CCJ stabilisation. These Results may help the clinical management of CCJ injuries as well as the understanding of cervicogenic headache pathogenesis.

Keyword: Tectorial membrane, Peridural membrane, Anterior craniocervical junction, Mesoscopic anatomy, Cervicogenic headache

亚太 A5-129-0003

The Sectional Imaging Anatomy and Three-dimensional Visualization of the Hypoglossal Nerve

Haiyan Tang

Shandong Digihuman Technology Co., Inc, Jinan, China

Objectives In order to make clear imaging and effective differential diagnosis of hypoglossal nerve injury, we must understand the normal anatomical structure of hypoglossal nerve and its main branches.

Methods By comparing the sectional specimens, magnetic resonance images and three-dimensional reconstruction images of the hypoglossal nerve, the hypoglossal nerve was carefully segmented and the landmark structure was defined. These Results can be used to identify the hypoglossal nerve during the operation and provide certain anatomical and imaging basis for reducing the iatrogenic complications during the operation.

Results This study found that the 3D-SPACE sequence has obvious advantages in the display and imaging diagnosis of the hypoglossal nerve. In this study, software was used to segment the hypoglossal nerve and its surrounding structures on a continuous thin layer specimen to obtain a complete three-dimensional reconstruction of the hypoglossal nerve. Three-dimensional visualization can reconstruct the detailed anatomical features and complex peripheral structures of the hypoglossal nerve, which plays an important role in the diagnosis and treatment of hypoglossal nerve related diseases.

Conclusion The lesions of the hypoglossal nerve often need to be observed at different levels by a variety of methods. The 3.0T MRI scanned by SPACE sequence can clearly show the hypoglossal nerve. Three-dimensional reconstruction of the hypoglossal nerve is helpful to describe the hypoglossal nerve surrounded by the vascular structure, fully understand the overall course and key structure of the hypoglossal nerve, and provide anatomical and imaging basis for identifying and protecting the hypoglossal nerve during the operation.

Key Words: hypoglossal nerve; sectional anatomy; MRI; 3D visualization



ID: 318345

Amyloid- β Detoxification and Proteostasis Modulation by *Holothuria leucospilota* Extract in *Caenorhabditis elegans* Model of Alzheimer's Disease

Salinthip Thongdechsri¹ Chanathip Kamonnat¹ Nakorn Niamnont² Krai Meemon¹

1. Department of Anatomy, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

2. Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi,
Bangkok 10140, Thailand

Given that amyloid- β (A β) oligomer is the most toxic protein, which triggers A β proteotoxicity in Alzheimer's disease (AD), the main goal for AD therapy is to prevent or degrade its aggregation. The protein quality control system (PQC) is the proteostasis mechanism against protein aggregation, such as the ubiquitin-proteasome system (UPS) and the autophago-lysosomal pathway (ALP).

Objectives To explore the anti-AD effects of *H. leucospilota* extract and the mechanism on A β oligomer aggregation and toxicity in *C. elegans*.

Methods A β deposition and oligomerization were quantified by X-34 staining and Western blotting. The A β -induced oxidative stress was assessed by intracellular ROS assay. The A β -induced behavioral disorders were investigated by paralysis and chemotaxis assays. The mechanisms underneath these effects were explored by RNA-sequencing, RT-qPCR, SKN-1 and DAF-16 nuclear localization, and fluorescence detection of their downstream genes.

Results The ethyl acetate extract (HLEA) attenuated A β deposition and oligomerization in AD worms. Correspondingly, HLEA suppressed A β toxicities, including oxidative stress, A β -induced paralysis behavior, and A β -induced chemotaxis defect. These anti-AD effects of HLEA were mediated by facilitating PQC due to upregulation of UPS and ALP genes. Moreover, HLEA promoted SKN-1 and DAF-16 activities, which are the key transcription factors responsible for stress resistance and proteostasis, resulting in antioxidant gene upregulations in AD worms.

Conclusion HLEA attenuated A β oligomer aggregation and toxicity by facilitating protein quality control systems and SKN-1 and DAF-16 pathways in *C. elegans* AD model.

Keyword: Alzheimer's disease, Amyloid- β , *Caenorhabditis elegans*, *Holothuria leucospilota*, Protein quality control system



ID: 318372

Effective Connectivity between Brain Networks can Impact Pain Interference and Physical Function in Painful Knee Osteoarthritis; a Neuroimaging Investigation

Luke Bialostocki^{1,2} Divya Bharatkumar Adhia² Dirk De Ridder² Ramakrishnan Mani³ Jerin Mathew¹

1.School of Biomedical Sciences, University of Otago

2.Dunedin School of Medicine, University of Otago

3.Centre for Health, Activity, and Rehabilitation Research (CHARR), School of Physiotherapy, University of Otago

Objectives Connectivity between brain regions and networks involved in pain processing has been found to influence individual pain perception. However, the directional flow of these connections, known as effective connectivity (EC), may play a more significant role in amplifying the overall pain experience. The overarching aim of this study was to investigate electroencephalogram (EEG)-based EC within the triple-network (TN)—Default Mode Network (DMN), Salience Network (SN), and Central Executive Network (CEN)—in individuals with knee osteoarthritis (KOA) compared to healthy controls (HC) and to assess its relationship with clinical pain outcomes.

Methods Resting-state EEG and clinical pain outcomes from 59 individuals with KOA and 59 matched HC were analysed. EEG data was decomposed into distinct frequency bands for 10 proxies of the TN, and EC was assessed using Granger causality. Between-group statistical comparisons were performed using the Wilcoxon Signed-Rank test. Spearman's correlation analysis was conducted to explore the relationship between EC and clinical pain outcomes.

Results The comparison between groups revealed significant differences, primarily between the DMN and CEN regions ($p \leq 0.0001$), with reduced connectivity observed in the KOA group compared to HC. Additionally, these disrupted connections were associated with pain interference ($p \leq 0.01$; $r_s = 0.04$) and physical function outcomes ($p \leq 0.001$; $r_s = 0.04$).

Conclusion The findings highlight the significant role of the DMN and other TN regions in chronic painful KOA. The identified disruptions in connectivity may serve as potential targets for future neuromodulation interventions aimed at pain management.

Keyword: persistent pain, arthritis, brain networks, neuromodulation, granger causality, effective connectivity

ID: 320115

Top-down Neural Mechanisms of Feeding Regulation

Yu Fu

Institute of Molecular and Cell Biology

Hypothalamic neurons regulate a broad range of innate behaviors and physiologic functions, including feeding and body weight. Whether and how different types of hypothalamic orexigenic neurons regulate different aspects of feeding are still illusive. We established contextual feeding conditioning by pairing environmental context with the activation of specific hypothalamic orexigenic neurons, so that environmental context can lead to food consumption in satiated mice. We found that different hypothalamic orexigenic neurons lead to different outcomes in contextual feeding conditioning paradigm, and different top-down inputs mediate the outcomes. While activating tuberal nucleus somatostatin neurons leads to conditioned feeding, such feeding could be rapidly extinguished; on the other hand, the conditioned feeding resulted from activating zona incerta GABAergic neurons.



urons is much more resilient to extinction procedure, indicating a compulsive feeding phenotype. Further analysis showed the involvement of mPFC inputs. Our Results started to reveal functional specification of different hypothalamic orexigenic neurons.

Keyword: hypothalamus, feeding regulation, neural circuits, obesity

ID: 320364

The Role of Peripheral ApoE in Alzheimer's Disease

Chen Feng Fu Yuan

The First Affiliated Hospital, Zhejiang University School of Medicine

Objectives Alzheimer's disease (AD) is a progressive neurodegenerative disorder and the leading cause of dementia globally. Its pathological hallmarks include the accumulation of amyloid- β (A β) plaques and the aggregation of hyperphosphorylated tau protein. Apolipoprotein E (ApoE), a glycoprotein involved in lipid transport, exists in distinct central and peripheral forms, separated by the blood-brain barrier. The APOE gene encodes three allelic variants (APOE2, APOE3, and APOE4), with APOE4 being the strongest genetic risk factor for late-onset AD. While extensive research has elucidated the role of brain-derived ApoE in AD, the contribution of peripheral ApoE remains incompletely understood. This study aims to summarize recent advances in understanding how peripheral ApoE influences AD progression.

Methods A literature search was conducted using PubMed to identify studies published from 2013 to 2025 investigating the mechanisms by which peripheral ApoE contributes to AD pathogenesis.

Results 1, Peripheral ApoE4 impairs cognitive function and synaptic plasticity. 2, Peripheral ApoE disrupts cerebrovascular integrity, leading to blood-brain barrier breakdown, altered cerebrovascular tone, reduced vascular density, and decreased cerebral blood flow. 3, Mechanistic pathways linking peripheral ApoE4 to AD pathology include dysregulation of A β metabolism, tau aggregation, lipid transport abnormalities, altered cellular metabolism, and immune system modulation. 4, Cross-talk between peripheral and central ApoE isoforms synergistically drive AD pathologies, although the underlying mechanisms warrant further investigation.

Conclusion Peripheral ApoE isoforms critically influence Alzheimer's disease progression through multiple pathological pathways. Targeting peripheral ApoE may offer a promising therapeutic avenue for mitigating AD development and progression.

Keyword: Alzheimer's disease, peripheral ApoE, cerebrovascular function



亚太 B1-129-0003

Beta-amyloid protein deposition in cerebral amyloid angiopathy and its neuropathological relationship with Alzheimer's disease.

Ting Jiang (jiangting8220@163.com), Xuechao Fei, Naili Wang, Di Zhang, Zhen Chen,
Xiaojing Qian, Wenying Qiu, Chao Ma.

Institute of Basic Medical Sciences Chinese Academy of Medical Sciences, School of Basic Medicine Peking
Union Medical College, Beijing 100005.

Objectives Cerebral amyloid angiopathy (CAA) is characterized by the deposition of beta-amyloid (A β) protein in small- and medium- sized blood vessels within the brain and pia mater. Research has revealed that due to the similar neuropathological features of amyloid related imaging abnormalities, CAA has a high probability of comorbidity with Alzheimer's disease (AD). However, the pathogenic mechanism of CAA remains unclear, and there is an urgent need to explore how A β plaques deposit into blood vessels.

Methods In this study, based on postmortem human brain banks, we aimed to investigate the correlation between the accumulation of A β plaques in CAA positive blood vessels in the occipital lobe of the brain and AD related neuropathological and cognitive changes. We analyzed 152 cases of human brain tissue, and for each tissue, 10 CAA positive blood vessels in the visual cortex were counted. Neuropathological changes related to AD were measured using the "ABC" scoring system, and a daily cognitive internal questionnaire was used to assess cognitive abilities.

Results It was found that the cumulative degree of A β plaques in CAA positive blood vessels was inversely proportional to the vessel diameter.

Conclusion Our research findings indicate a positive correlation between the severity of CAA and AD related neuropathological and cognitive changes.

Key Words: Cerebral amyloid angiopathy, Alzheimer's disease, CAA positive blood vessels.

亚太 B1-129-0004

The Role of Nucleus Basalis of Meynert Cholinergic Neurons in Sleep-Wake Regulation

Kaiying Zhang (annazky1999@163.com), Yuanjun Yang, Yinuo, Liu, Xiangshan, Yuan

Department of Anatomy and Histoembryology, School of Basic Medical Sciences, Fudan University, Shanghai
200032, China

Objectives The basal forebrain (BF), a key regulator of sleep-wake dynamics, enables cortical activation and behavioral state transitions through its cholinergic neurons. The nucleus basalis of Meynert (NBM), as a major cholinergic nucleus of the BF, plays pivotal roles in arousal and sleep regulation. Previous studies highlight BF's role in modulating cortical desynchronization during wakefulness; however, the specific contribution of NBM remains unclear. This study investigates the role of cholinergic neurons in the NBM in modulating sleep-wake dynamics and their influence on cortical desynchronization during sleep.

Methods Using chemogenetic techniques, viral vectors (AAV-DIO-hM3Dq/hM4Di) were injected into the NBM of ChAT-Cre mice. These mice were implanted with EEG and EMG electrodes to record the sleep-wake behavior. CNO was later administered to modulate NBM activity and evaluate changes in sleep phenotypes.

Results Chemogenetic activation of cholinergic neurons in the NBM led to a significant increase in the duration of wakefulness during the inactive phase in mice. Interestingly, there was a marked



reduction in delta power within non-rapid eye movement (NREM) sleep, indicative of decreased sleep depth. Moreover, activation of the NBM cholinergic neurons altered the overall architecture of sleep, further emphasizing their pivotal role in modulating sleep-wake states.

Conclusion Our findings demonstrate that chemogenetic activation of cholinergic neurons in the NBM significantly disrupts sleep homeostasis by promoting wakefulness during inactive phases and reducing the depth of NREM sleep, as evidenced by decreased delta power. These **Results** highlight the critical role of NBM cholinergic neurons in regulating the balance between wakefulness and sleep, providing new insights into the neural mechanisms underlying arousal and sleep depth modulation.

Key words Nucleus basalis of Meynert; Sleep; Delta power

亚太 B1-129-0005

The distinct top-down and bottom-up role of mPFC-claustrum interconnectivity in the encoding and retrieval of methamphetamine reward memory

Xiaowei Guan*

Department of Human Anatomy and Histoembryology, Nanjing University of Chinese Medicine, Nanjing 210023, China

Objectives Methamphetamine (METH) addiction or dependence is primarily driven by its effects on the reward and impulsive control. Emerging evidence highlights that both claustrum (CL) and medial prefrontal cortex (mPFC) are pivotal in drug addiction and the reinforcing effects of conditioned drug-associated cues. Although these two regions are anatomically and functionally interconnected, the precise neural circuit governing their role in addiction remains poorly understood.

Methods Here, we employed viral neural tracing, in vivo fiber photometry, chemogenetics, optogenetics and electrophysiology, alongside a METH conditioned place preference (CPP) experimental model, to dissect the structural and functional properties of the CL-mPFC circuit.

Results 1) The CL-mPFC circuit consists of two relatively independent neural pathways, incorporating both direct and indirect projections. 2) Under physiological conditions, the indirect pathway exerts strong feedforward inhibition, but this inhibition diminishes during METH CPP. 3) The mPFC-CL pathway primarily facilitates communication between the left and right hemispheres of the brain, while the CL-mPFC pathway predominantly connects regions within the ipsilateral hemisphere. 4) The CL-mPFC circuit plays distinct roles in associative memory processes, with the CL-mPFC pathway facilitating memory retrieval and the mPFC-CL pathway driving memory formation.

Conclusion These findings provide novel insights into the structural and functional organization of the CL-mPFC neural circuit, elucidating the circuit-level mechanisms underlying METH-induced associative learning, offering a foundation for targeted interventions in addiction treatment.

Key words: Claustrum; CL-mPFC Circuit; Medial Prefrontal Cortex; Methamphetamine; Rewarding Effects



亚太 B1-129-0010

Voluntary Exercise as a Therapeutic Intervention for Traumatic Brain Injury: Evidence of Gut Microbiota Remodeling and Improved Cerebral Blood Flow

Faisal Yaqoob¹, Wu Hanxi¹, Hu Xiaoxuan¹, Wang Xinyi¹, Ma Kaige¹, Lu Haixia^{1*},
¹ Institute of Neurobiology, School of Basic Medical Sciences, Xi'an Jiaotong University
* Corresponding to: hxl01@mail.xjtu.edu.cn

Traumatic brain injury (TBI) is a debilitating condition associated with neurological dysfunction and systemic complications, including disrupted gut microbiota homeostasis. Emerging evidence suggests TBI induces acute bacterial dysbiosis, characterized by a decline in beneficial microbes and proliferation of harmful taxa, which may exacerbate secondary brain injury. This study proposes voluntary exercise as a novel therapeutic intervention to restore gut microbial balance, cerebral blood flow and improve neurological recovery post-TBI. Six mice groups were evaluated: TBI and sham controls at 24 hours (TBI-0d) and 7 days post-injury, with (TBI-7d-Ex) or without 7-day voluntary exercise (TBI-7d). Motor coordination (beam walk), and neurological deficits (NSS) were assessed on 1st, 4th and 7th day of post-TBI, followed by cerebral blood flow measurement on 1st and 7th day. Fecal samples were analyzed via 16S rRNA sequencing to evaluate microbial composition and diversity. Results demonstrated that TBI-Ex-7d exhibited significant neurological function recovery and improved cerebral blood flow compared to TBI-7d mice. Concurrently, TBI-7d mice exhibited significant gut dysbiosis, marked by reduced alpha diversity, increased beta diversity divergence, and enrichment of harmful taxa, while beneficial genera were depleted. In contrast, TBI-Ex-7d mice showed restored microbial diversity, with beneficial taxa dominance resembling sham levels. Improved microbial balance may enhance metabolic energy allocation to brain repair processes, supporting cerebral perfusion and functional recovery. These findings underscore the therapeutic potential of voluntary exercise as a non-pharmacological intervention to promote neurological functional repair, potentially by enhancing metabolic energy allocation through the mitigation of TBI-induced gut dysbiosis.

亚太 B1-129-0011

Modulation of comorbid depression of neuropathic pain by dopamine input from VTA to the ventral hippocampus

Yuanyuan Ji^a, Juan Shi^{b*}, Jinlian Li^{a*}

^aDepartment of Anatomy, School of Medicine, Northwest University, Xi'an, China

^bDepartment of Human Anatomy, Histology and Embryology & K. K. Leung Brain Research Centre, Preclinical School of Medicine, Fourth Military Medical University, Xi'an, China
Yuanyuan Ji (First author), Email: amino0510@163.com

Objectives Chronic pain syndrome is a devastating disorder with poor clinical treatment. The circuitry and molecular mechanisms are unclear. We characterized the projection from the ventral tegmental area (VTA) to the ventral hippocampus (vHPC) and assessed the functional significance of the pathway in chronic pain-induced depressive comorbidity.

Methods A neuropathic cuff model was discriminated against the susceptible and resilient groups with or without depression-like behaviors. The anatomical feature and function of the VTA-vHPC pathway were assessed by neural tracing, immunofluorescent staining, chemogenetics, optogenetics, and electrophysiology.

Results Medially-located dopaminergic (DAergic) neurons constituted the major projection from



the VTA to the vHPC. The activity of vHPC-projecting DAergic neurons was downregulated in the susceptible group but not in the resilient, as manifested by the decreased expression of tyrosine hydroxylase (TH), TH/FOS double-labeling, and excitability in retrogradely labeled VTA neurons. Chemogenetic activation of the pathway improved depression rather than pain phenotype, but caspase 3-based ablation induced depression. Optogenetic activation of the VTADA-vHPC pathway produced similar anti-depressant effects in cuff animals in an equally D1 or D2 receptor-dependent manner. FISH and Western blotting disclosed a low-segregated expression of the D1 receptor in the pyramidal neurons and a highly-segregated expression of the D2 receptor in GABAergic neurons in vHPC.

Conclusion Our Results demonstrate a medially dominant VTADA projection to the vHPC. Reinforcement of this pathway can reverse the depression without affecting pain, thus providing insights into a connectivity-based strategy in the treatment of comorbid depression.

Keywords: ventral tegmental area, ventral hippocampus, depression, chronic pain, dopamine receptor

亚太 B1-129-0012

The study of the S1BF-Sp5C descending circuit for orofacial hyperalgesia modulation in trigeminal neuralgia rat model.

Wang Yiqian, Liao Xinyue, Wang Feng, Luo Daoshu (luods2004@163.com)

Laboratory of Clinical Applied Anatomy, School of Basic Medical Sciences, Fujian Medical University; Key Laboratory of Brain Aging and Neurodegenerative Diseases of Fujian Province, Fuzhou, 350122, China

Objective The rodent barrel field of primary somatosensory cortex (S1BF) corresponding to the orofacial area would have functional changes during facial pain, and the spinal trigeminal nucleus caudalis (Sp5C) is the second order neurons of the nociceptive pathway of the face. Whether the S1BF-Sp5C descending circuit involved in the orofacial hyperalgesia modulation in trigeminal neuralgia (TN) has not been reported. Therefore, the modulation of the S1BF- Sp5C circuit in TN model is investigated in this study.

Methods A rat model of TN was established by chronic compression of TREZ. The fiber connections of the S1BF-Sp5C neural circuit were verified by viral tracing, and functional regulation was assessed by combining animal behavioral test, optogenetics/chemogenetics and fiber-optic recording.

Results TN model exhibited elevated c-Fos and enhanced synchronized calcium activity in S1BF, with co-activated CaMKII⁺(excitatory) and GABA⁺(inhibitory) neurons, indicating excitatory-inhibitory imbalance.

Activating S1BF CaMKII⁺ neurons amplified pain behaviors (increased scratching and calcium signals), while inhibition suppressed pain. Conversely, GABA⁺ neuron activation raised pain thresholds (analgesia), while their inhibition exacerbated pain.

Viral tracing identified monosynaptic S1BF to Sp5C projections mediated mainly by CaMKII⁺ neurons.

Calcium signaling in S1BF to Sp5C CaMKII⁺ projections was increased in TN.

The S1BF to Sp5C pathway reduced pain thresholds and elevated calcium signals, whereas inhibition normalized these parameters, consistent with local circuit modulation.

Conclusions This study highlights the S1BF-Sp5C descending circuit playing an important role in the modulation of orofacial hyperalgesia in TN. Meanwhile, the S1BF CaMKII⁺ neurons promote pain via enhanced Sp5C excitatory transmission, and GABA⁺ neurons suppress pain through inhibition.



Keywords: Trigeminal neuralgia; S1BF; Sp5C; Neural circuit

亚太 B1-129-0023

Medial preoptic CCKAR mediates anxiety and aggression induced by chronic emotional stress in male mice

Meng-Yu Tang^{1,2,3}, Yan-Yi Zhang^{1,3}, Lin Lin^{1,3}, Xiao-Ming Li^{1,3*} & Hong Lian^{1,2,4*}

¹Department of Neurology and Department of Psychiatry, the Second Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China. ²Nanhu Brain-computer Interface Institute, Hangzhou, China. ³NHC and CAMS Key Laboratory of Medical Neurobiology, MOE Frontier Center of Brain Science and Brain-machine Integration, School of Brain Science and Brain Medicine, Zhejiang University, Hangzhou, China. ⁴Research Center of System Medicine, School of Basic Medical Sciences, Zhejiang University, Hangzhou, China.

*Corresponding author. E-mail: lixm@zju.edu.cn; honglian@zju.edu.cn

These authors contributed equally to this work

Anxiety disorders frequently accompany aggression, with their co-occurrence predicting greater functional impairment and poor prognosis. Nevertheless, the underlying neural mechanisms remain elusive, primarily due to a lack of appropriate animal models. Here, we designed a chronic conspecific outsider stress (CCS) model in which male mice underwent perceived social threats and exhibited increased anxiety-like behaviors accompanied by aggression. CCS led to Fos activation and hyperexcitability of GABAergic neurons in the medial preoptic area (mPOA). Inhibition of mPOA GABAergic (mPOAGad2) neurons rescued CCS-induced anxiety-like and aggressive behaviors, whereas activating these cells induced susceptibility to CCS. Moreover, CCS upregulated the mRNA and protein expression of the sexual-dimorphic gene, cholecystokinin A receptor (CCKAR)-encoding Cckar gene in the mPOA. Importantly, the knockdown and overexpression of CCKAR in the mPOAGad2 neurons had alleviating and promoting effects on anxiety-like and aggressive behaviors, aligning with decreased and increased excitability by the anxiolytic CCKAR antagonist MK-329 and the anxiogenic CCKAR agonist A71623 in mPOAGad2 neurons, respectively. Overall, our study characterizes a novel mouse model of anxiety disorders accompanied by aggression and the neuronal subpopulation and molecular mediator of the aberrant behaviors provide potential targets of intervention for anxiety disorders with aggression.

亚太 B1-129-0024

Investigation of the Neuroprotective Mechanisms and Therapeutic Potential of Innovative Intranasal Drug Delivery in an Amyotrophic Lateral Sclerosis (ALS) Model

Ni Wang, Ruiyun Guo, Jun Ma(junmahmu@163.com), Huixian Cui(huixiancuihmu@163.com)
Department of Anatomy, Hebei Medical University, Shijiazhuang, Hebei Province, China

Objectives Amyotrophic lateral sclerosis (ALS) lacks effective treatments. Intranasal drug delivery (INDD) bypasses the blood-brain barrier with minimal systemic effects, yet its efficacy in ALS rodent models remains unassessed systematically. This study evaluates INDD's impact on ALS progression and survival through a meta-analysis.

Methods We searched PubMed, Web of Science, Embase, and Cochrane Library for controlled INDD studies in ALS, assessing disease progression, survival, and motor function. Data extraction used GetData Graph Digitizer(v2.26). Study quality was evaluated via SYRCLE risk-of-bias tool, and meta-analysis conducted using RevMan 5.4.

Results Motor function (fixed-effects model): INDD-treated mice showed significant improvement



compared to controls (SMD = 19.57, 95%CI 11.32–27.83, $I^2=45\%$, $P<0.00001$). Survival (fixed-effects model): INDD-treated mice had prolonged survival versus controls (SMD = 4.05, 95%CI 1.37–6.73, $I^2=0\%$, $P=0.003$). Motor neuron survival (random-effects model): INDD-treated mice exhibited higher motor neuron preservation than controls (SMD = 5.91, 95% CI 4.08–7.74, $I^2=79\%$, $P<0.00001$). NMJ innervation (fixed-effects model): INDD-treated mice had more innervated NMJs than controls (SMD = 14.69, 95%CI 10.36–19.01, $I^2=0\%$, $P<0.00001$). Astroglia (random-effects model): INDD-treated mice showed reduced astrocyte activation versus controls (SMD = -156.65, 95%CI -293.88 to -19.43, $I^2=96\%$, $P=0.03$).

Conclusion INDD enhances motor function, survival, neuron preservation, NMJ maintenance, and reduces astroglia in ALS mice, supporting its potential for clinical translation.

KeyWords: Intranasal drug delivery, Amyotrophic lateral sclerosis, Neuroprotection, Systematic review and meta-analysis

亚太 B1-129-0026

Bioinformation Analysis of Mechanisms for abnormalities of the the Anterior Cingulate Cortex and Depression.

Yang Yihui (47730237@qq.com) Xiong Liulin.

Department of Anesthesia, The Third Affiliated Hospital of Zunyi Medical University, Zunyi 563000

Objectives Depression is a growing public health concern worldwide, characterized by abnormalities of the Anterior Cingulate Cortex. The present study investigated the molecular mechanisms linking Depression and abnormalities of the Anterior Cingulate Cortex using network pharmacology to identify key targets and pathways.

Methods "Anxiety" and the "Prefrontal Cortex" (PFC) were retrieved from the GeneCards database and overlapping targets were identified by Venn diagrams. the STRING database、Cytoscape software were used to construct a protein–protein interaction (PPI) network, Key genes were screened with MCC algorithm. Then bubble plots and "Emotion-Region-Key Target-Pathway" network were conducted to visualize.

Results A total of 147 intersection targets between Depression and the the Anterior Cingulate Cortex were screened in GeneCards database. a protein–protein interaction (PPI) network were constructed and the top 10 core targets including BDNF、CREB1、TH、NTRK2、NPY、DRD2、CRH、GAD1、CRHR1、HTR1A were identified. 401 Biological process、96 Cellular component and 96 Molecular function were identified with Gene Ontology (GO) enrichment analysis, the top 5 of GO enrichment analysis were listed. 126 notable pathways were selected, the top 10 of them were involved in AGE-RAGE signaling pathway in diabetic complications、Adipocytokine signaling pathway, MAPK signaling pathway, C-type lectin receptor signaling pathway, Circadian entrainment, Alcoholism, Prostate cancer, Fluid shear stress and atherosclerosis. The integrated network illustrated in intersection targets, PPI network and "emotion-region–key target–KEGG pathway" were visualized.

Conclusion Molecular Mechanisms and Core Targets between depressive disorder and abnormalities of the Anterior Cingulate Cortex were screened, and the integrated "emotion-region – key target – KEGG pathway" network were established, thereby providing potential antidepressant therapies in the future.

Keywords Depression; the Anterior Cingulate Cortex; Protein-Protein Interaction Network; Gene Ontology (GO) Enrichment Analysis.



● 亚太 B1. Neural Circuits for Behaviors and Diseases ● Poster

ID: 317357

Multimodal Regulation of Motor Neuron Plasticity Post-Spinal Cord Injury: Mechanistic Insights into the NYAP1-POU6F1-JNK/c-Jun Signaling Axis

Yi Li^{1,2} Shu-Ying Wang^{1,2} Jin-Ying Hu^{1,2} Wen-Yuan Li^{1,2} Ying Wang^{1,2}

1. Mudanjiang Medical University

2. Mudanjiang Collaborative Innovation Center for development and application of Northern Medicine Resources

Objectives To elucidates the molecular mechanisms underlying NYAP1-mediated neural plasticity following spinal cord injury (SCI).

Methods Utilizing a dual-model approach combining in vivo SCI paradigms (intraperitoneal anesthesia with 40 mg/kg ketamine and 5 mg/kg xylazine) with in vitro oxygen-glucose deprivation/reoxygenation (OGD/R)-induced motor neuron injury models, we systematically examined NYAP1's therapeutic potential through AAV-mediated gene manipulation integrated with behavioral, molecular, and morphological analyses.

Results NYAP1 overexpression via AAV transduction significantly enhanced MN survival and neurite outgrowth under OGD/R conditions ($P < 0.001$). Compare to control group, SCI rats with NYAP1 overexpression demonstrated significant improved BBB, rotarod latency locomotor recovery at 4 weeks post-SCI, spared tissue volume, axonal regeneration (GAP-43, 5-HT+ fibers and TH+ projections+ fibers) (all $P < 0.05$). Confocal microscopy confirmed NYAP1-POU6F1 colocalization in neuronal perikaryal, complementary molecular docking studies revealing stable binding interactions between NYAP1 and POU6F1, western blot revealed NYAP1-mediated activation of Phospho-JNK1/2 levels and c-Jun ($P < 0.01$).

Conclusion This work establishes the NYAP1-POU6F1-JNK/c-Jun axis as a master regulatory pathway for post-SCI neuroplasticity, demonstrating multimodal therapeutic effects ranging from neuroprotection to enhanced axonal regeneration. Our findings provide a mechanistic foundation for developing precision interventions targeting neural circuit reorganization in SCI rehabilitation.

Keyword: NYAP1; neural plasticity; spinal cord injury

ID: 317358

Therapeutic Potential of Retrograde POU6F1 Transport in SCI Recovery

Shu-Ying Wang^{1,2} Yi Li^{1,2} Wen-Yuan Li^{1,2} Ying Wang^{1,2}

1. Mudanjiang Collaborative Innovation Center for development and application of Northern Medicine Resources

2. Institute of Neural Tissue Engineering, Mudanjiang Medical University, Mudanjiang

Objective This study investigates the therapeutic role of POU domain class 6 transcription factor 1 (POU6F1) in remodeling lumbar motor circuitry and promoting functional recovery following spinal cord injury (SCI).

Methods SCI models were established in rats, and transcriptome sequencing, differential gene analysis, and functional enrichment analyses were performed on the spinal lumbar segment (SLS) across post-SCI time points. We assessed the regulatory role of POU6F1 in spinal cord neurons



(SCN) and motoneuron (MN) through AAV-POU6F1 and AAV-negative control (AAV-NC) transduction under oxygen-glucose deprivation/re-oxygenation (OGD/R) conditions, combined with JNK inhibitor (SP600125) treatment *in vitro*. Additionally, retrograde delivery of AAV-POU6F1 to lumbar MNs in a T9 contusion SCI model was evaluated through various behavioral and histological assessments.

Results POU6F1 was highly expressed in SLS after SCI, with its role confirmed in axonal regeneration. AAV-POU6F1 transduction enhanced SCN and MN proliferation and dendrite outgrowth under OGD/R conditions *in vitro*. Mechanistically, POU6F1 activated JNK1/2 and c-Jun phosphorylation, with SP600125 (JNK inhibitor) attenuating these effects. *In vivo*, retrograde transport of AAV-POU6F1 to lumbar MNs significantly increased axonal growth of descending propriospinal tract (dPST) axons, alleviated SCI-induced MN dendritic atrophy, promotes the tibialis anterior (TA) neuromuscular reinnervation, and improved electrophysiological and behavioral recovery.

Conclusion Our findings identify POU6F1 as a pivotal regulator of lumbar MN circuitry remodeling post-SCI, acting through the JNK/c-Jun signaling pathway to enhance functional recovery.

Keyword: POU6F1; JNK/c-Jun signaling pathway; neural plasticity; spinal cord injury

ID: 318279

FABP3 Regulates Inhibitory Synapse Formation and GABAergic Signaling in the Medial Prefrontal Cortex

Yui Yamamoto Yuji Owada
Tohoku University Graduate School of Medicine

Introduction Fatty acid-binding proteins (FABPs) are crucial for the uptake, transport, and storage of long-chain fatty acids. FABP3, which binds to n-6 polyunsaturated fatty acids, is widely expressed in neurons of the cerebral cortex. We previously showed that FABP3 is strongly expressed in interneurons of specific regions, such as the dorsal striatum and medial prefrontal cortex (mPFC), in adult mice. FABP3 expression begins shortly after birth, but its role in interneurons across the lifespan is unclear.

Methods We collected the brains of wild-type and FABP3 KO mice at postnatal days (P) 7, 14, 21, and in adulthood under anesthesia, and examined the expression pattern of FABP3 in the mPFC by immunostaining.

Results FABP3 is highly expressed in parvalbumin-positive inhibitory interneurons of the mPFC in adult mice. FABP3 KO mice showed abnormal exploratory behavior and increased local GABA concentration in the mPFC due to overexpression of GABA-synthesizing enzyme. Even during the neonatal period, FABP3 was strongly expressed in inhibitory interneurons. FABP3 expression peaked at P21, around the time of weaning. Furthermore, in the mPFC of FABP3 KO mice at P21, excessive formation of inhibitory synapses was also observed.

Conclusion FABP3 is highly expressed in inhibitory interneurons of the mPFC throughout life. Loss of FABP3 leads to excessive inhibitory synapse formation and altered GABAergic signaling, contributing to behavioral abnormalities. FABP3 is crucial for the proper development and regulation of inhibitory circuits in the mPFC.

Keyword: FABP3, GABAergic signaling, Inhibitory interneuron, mPFC



ID: 318448

Dysregulation of Low Density Lipoprotein Receptor Associated with Skeletal Muscle Atrophy in ALS

Sien Yan
山东第二医科大学

Objectives Amyotrophic lateral sclerosis is a fatal neurodegenerative disease with progressive skeletal muscle atrophy, while the underlying regulatory mechanisms remain unclear. Emerging research showed that dysregulated cholesterol metabolism caused skeletal muscle dysfunction, and imbalanced cholesterol homeostasis was observed in ALS patients. This study aims to reveal the dynamic expression profile of low-density lipoprotein receptor, a key cholesterol transport mediator in the gastrocnemius muscle of ALS transgenic mice, providing new therapeutic targets for ALS.

Methods RNA sequencing data of ALS mice skeletal muscle were acquired from GEO public datasets, and differentially expressed genes were identified by DESeq2. hSOD1^{G93A} mutant transgenic ALS mice and littermates wild-type (WT mice) were euthanized with 1.5% sodium pentobarbital, and gastrocnemius muscle were collected at initial stage (70 days), middle stage (95 days), late stage (108 days), and terminal stage (122 days). The samples were subsequently subjected to RT-qPCR analysis, Western blotting, and immunofluorescence staining.

Results RNA-seq analysis revealed dysregulation of lipid metabolism-related processes, with a downregulation of Ldlr expression in ALS mice. Compared to WT mice, RT-qPCR analysis validated that Ldlr mRNA levels were reduced and Western blotting further demonstrated a downregulated trend in LDLR protein expression in the ALS group. Immunofluorescence staining corroborated these findings, showed a progressive decline in LDLR fluorescence intensity within skeletal muscle of ALS mice as the disease advanced.

Conclusion These findings demonstrate that LDLR is down-regulated in ALS skeletal muscle, potentially contributing to cholesterol dysregulation and atrophy of ALS skeletal muscle.

Keyword: ALS; Skeletal muscle; Cholesterol metabolism; LDLR

ID: 320587

A candidate of the center for body fluid homeostasis in a novel model fish mudskipper: Comparative anatomy of the OVLT in vertebrates.

Mukuda Takao Matsuda Risa Hamasaki Sawako Fukuda Kazuya Koyama Yuka Kaidoh Toshiyuki
University

The organum vasculosus lamina terminalis (OVLT) is a circumventricular organ allowing hormones to act on brain neurons due to physiologically lacking the blood-brain barrier (BBB). In mammals, the OVLT is well known to be responsive to change of plasma osmolality and systemic hormones such as a dipsogen angiotensin II (Ang II), and aware of thirst and salt appetite. The OVLT is found in almost all vertebrate forebrain; however its functional significance in fish has not yet been fully understood. Thus, using a novel model fish, mudskipper, we examined whether the OVLT is responsible for maintaining body fluid homeostasis. Evans blue (EB), a fluorescent dye impermeable to the BBB, was injected intraperitoneally, the dye leaked into the OVLT, together with the neurohypophysis, pineal body and area postrema. This indicates that the OVLT lacks the BBB. In addition, in situ hybridization showed gene expression of Ang II receptor in the OVLT neurons. When



n fluorescence-conjugated Ang II was injected intraperitoneally, OVLT neurons were stained with the fluorescence. These suggest that OVLT neurons can receive blood Ang II via its receptor. To examine whether the OVLT was responsive to osmotic stimuli, mudskipper were exposed to hyperosmotic water. The number of cFos-expressing neurons was increased in the OVLT in the dehydrated condition, suggesting that the OVLT was activated to hyperosmolality in body fluid. Taken together, the mudskipper OVLT fulfills the criteria for the center for thirst and salt appetite. This work is supported by JSPS KAKENHI Grant Number 24K09558.

Keyword: OVLT, thirst, salt appetite, mudskipper, angiotensin II, osmolality

ID: 320619

The role of angiotensin II and its type 1 receptors on the hippocampal neurogenesis promoted by short-term heat exposure.

Yuka Koyama Takao Mukuda Sawako Hamasaki Toshiyuki Kaidoh
Tottori University

Objectives Adult hippocampal neurogenesis occurs in mammals and is promoted by moderate exercise. We reported that transient increase in systemic angiotensin II (Ang II) plays an important role in mediating exercise-induced neurogenesis. Ang II is a hormone that increases during fluid loss and acts on its type 1 receptor (AT1R). In this study, we examined the effects of short-term heat exposure, which is expected to induce fluid loss like exercise on hippocampal neurogenesis.

Methods Rats were exposed to heat (36.0 ± 0.1 °C) or normal (25.0 ± 0.8 °C) conditions for 1 hour once a day for 7 days. Candesartan, an AT1R blocker, was given orally. To examine the direct effect of systemic Ang II on the hippocampus, fluorescently labeled Ang II was administered intravenously via the catheter 5 times a day. Implantation of the catheter and fixation were performed under anesthesia with thiamylal sodium.

Results After short-term heat exposure, the number of doublecortin immunoreactive newborn neurons in the hippocampus increased 1.4-fold and Vascular endothelial cell growth factor (VEGF), one of the neurotrophic factors, was increased in the hippocampus compared with that in controls exposed to normal conditions. Candesartan abolished this effect. Fluorescently labeled Ang II administered intravenously detected in the hippocampus.

Conclusion These Results suggest that short-term heat exposure enhances hippocampal neurogenesis by increasing newborn cell survival brought by VEGF. This effect possibly due to the direct action of systemic Ang II on the hippocampus via activating AT1R.

Keyword: angiotensin II, angiotensin II type 1 receptor, heat exposure, hippocampal neurogenesis, vascular endothelial cell growth factor



ID: 320630

The role of receptor tyrosine kinase ErbB4 in intestinal epithelial lesions of ulcerative colitis

彭琳茜
广西医科大学

Ulcerative colitis (UC) is a common inflammatory disease. Studies have shown that CGRP is involved in inflammatory progression, suggesting a regulatory interaction between intestinal epithelium, nerve cells, and receptor-mediated signal transduction, which is a potential therapeutic target for intestinal inflammation. We explore the potential role of the NRG1-ErbB4 signaling system in UC. C57BL/6 mice were randomly divided into 4d 3%DSS group, 7d 3%DSS group and 18d 3%DSS group to establish UC models at different stages. Through immunohistochemical staining and WB experiments, we observed the expression changes of molecules in the NRG1-ErbB4 signaling system in the colon tissues of the peripheral nervous system, as well as the changes in inflammatory factors and the mucosal barrier in the colon tissues. Then, we used the Cre/LoxP system to construct ErbB4 knockout mice and conditional knockout mice Vil1-Cre; ErbB4^{-/-}. We observed the expression changes of molecules in the NRG1-ErbB4 signaling system in the colon tissues of the peripheral nervous system, as well as the changes in inflammatory factors and the mucosal barrier in the colon tissues under the UC model. The expression of ErbB4 increased to varying degrees and the ulcerative colitis in Vil1-Cre; ErbB4^{-/-} mice worsened secondarily in the 7-day DSS group and the 18-day DSS UC models. **Conclusion** NRG1-ErbB4 signaling system in the peripheral nervous system plays an important role in the occurrence and development of UC, providing new clues for the prevention and treatment of UC.

Keyword: NRG1-ErbB4 signaling system, Intestinal epithelium, Ulcerative colitis

亚太 B1-129-0006

Comparative study on the distribution of Pacinian corpuscles in the pancreas

Ke Ren¹, Xiangquan Chen¹, Ting Yang², Taku Toriumi³, Rujia Li⁴, Jun Li⁵, Shuang-Qin Yi²

¹Faculty of Physical Education, Qu Jing Normal University, Yun Nan, China

²Department of Frontier Health Sciences, Graduate School of Human Health Sciences, Tokyo Metropolitan University, Tokyo, Japan

³Department of 1st Anatomy, Nippon Dental University School of Life Dentistry at Niigata, Niigata, Japan

⁴Department of Hepatobiliary Surgery, Gansu Provincial Hospital, Lanzhou city, China

⁵State Key Laboratory of Oncogenes and Related Genes, Shanghai Cancer Institute, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China

Objectives Pacinian corpuscles (PCs) are pressure- and vibration-sensitive mechanoreceptors found in hairless skin, external genitalia, joints, ligaments, lymph nodes, prostate, bladder, etc. The actual presence of PCs in the normal pancreas remains speculative.

Methods The present study therefore investigated the distribution of PCs in the normal human pancreas and compared the findings with those in several other animal species.

Results PCs were found in the pancreas of five human cadavers (n=74), one *Cynictis penicillata* (n=3), one *Saguinus mystax* (n=2) and one *Felis domesticus* (n=1) but not in *Suncus murinus*.



The PCs varied in size, ranging from 0.2 to 0.7 mm. PCs in the pancreata of *C. penicillata*, *S. mystax*, and *F. domesticus* were more numerous and denser than those in the human pancreas, and they were mainly typical oval shapes, whereas PCs in the human pancreas were mostly irregular in shape. In addition, we found that PCs in animals and human pancreata had similar structures, with consistent expression of protein gene product 9.5, in axonic profiles, and diffuse vimentin immunoreactivity in the inner core, outer core, and capsule.

Conclusion This study confirmed the existence of PCs in the pancreas of healthy humans and some animals. The number, distribution characteristics, and morphology of PCs in the pancreata of animals and humans are quite different; however, their structures and immunohistochemical profiles are similar. The presence of PCs in the normal human pancreas is also a mystery, and the physiological role of PCs in the human pancreas requires further clarification.

Ethics statement: All study procedures were approved by the Study Security and Ethics Committees of Tokyo Metropolitan University (No.18051), Nippon Dental University in Tokyo (NDU-T-2016-29), and Niigata (No. 23823).

Keywords: Pancreas, Pacinian corpuscles, vibration-sensitive mechanoreceptor, pressure mechanoreceptor, *Cynictis penicillata*, *Saguinus mystax*

亚太 B1-129-0008

Mechanism of CRHergic pathway from CeA to vIPAG participating in the regulation of itch

Xinyi Zhu, Hui Li

Air Force Medical University, Xi'an, China, 2316625699@qq.com

Objectives Corticotropin-releasing hormone (CRH) has been demonstrated to participate in itch regulation across multiple studies. The central amygdala (CeA) contains abundant CRH-positive neurons, and our previous research identified substantial neural projections from CeA to the ventrolateral periaqueductal gray (vIPAG). This study aims to clarify the mechanisms of CRHergic pathway from CeA to vIPAG [(CeA→vIPAG)^{CRH}] participating in the regulation of itch.

Methods We observed the activity of CeA^{CRH} neurons by using fibre photometry during mice scratching. Using viral-based neural tracing techniques to verify the exist of (CeA→vIPAG)^{CRH}, and then utilizing optogenetic/chemogenetic interventions combined with behavioral paradigms (scratching behavior detection, open field test and elevated puzzle maze experiment) to reveal the dynamic functions of (CeA→vIPAG)^{CRH} pathway in acute itch modulation.

Results Time-locked recordings showed an increase in CeA^{CRH} neuron activity coinciding with scratching. Both chemogenetic/optogenetic activation and inhibition of this pathway consistently promoted pain responses while suppressing itch behaviors. Subsequent optogenetic activation of this pathway with concurrent inhibition of either GABAergic or glutamatergic neurons in vIPAG revealed: ① Following activation of CRH-positive GABAergic neurons in CeA, the activity of GABAergic neurons in vIPAG was suppressed. This disinhibition facilitated anti-pruritic effects. ② Optogenetic activation of CeA CRH-positive GABAergic neurons inhibited glutamatergic neuronal activity in vIPAG, resulting in pro-pruritic effects.

Conclusion In this study, we delineated the regulatory role of the (CeA→vIPAG)^{CRH} pathway on itch, demonstrating its capacity to exert both pro-pruritic and anti-pruritic effects through distinct GABA/glutamate-mediated synaptic mechanisms, and providing theoretical basis for developing CRH pathway-targeted anti-pruritic therapies.

Key Words: CeA, CRH, Itch, vIPAG



亚太 B1-129-0013

SAAs play dual roles in organizing behaviors across different timescales

Jing Huo^{1,2} (huoj1126@sdsu.edu.cn), Tianqi Xu², Mahiber Polat², Xiaoqian Zhang², Quan Wen².

1. School of Basic Medical Sciences, Shandong Second Medical University, Weifang, 261054;

2. Division of Life Sciences and Medicine, University of Science and Technology of China, Hefei, 230027.

Objectives To investigate the neural circuit mechanisms and algorithms underlying motor sequence generation across long and short timescales in *Caenorhabditis elegans*, aiming to reveal how the organism organizes its complex and hierarchical spatiotemporal behaviors.

Methods Employed a combination of behavior tracking, optogenetics, calcium imaging, light-inducible cell ablation, and genetic approaches.

Results A class of putative proprioceptive sensory neurons (SAA) plays a dual role. On a long timescale, SAA shows large calcium transients during backward-turn transitions and facilitates reversal termination via inhibitory cholinergic synaptic transmission to RIM neurons. On a short timescale, SAA stabilizes and regularizes rhythmic bending activity by interacting with head motor neurons during forward movements.

Conclusion The findings uncover circuit principles for organizing behaviors across different timescales in *C. elegans*.

Keywords: Hierarchical behavior; Behavior organizing; *C. elegans*; Feedback inhibition

亚太 B1-129-0014

Substance P protects against intestinal barrier disruption and anxiety-like behavior in ulcerative colitis

Jing Lan, Jiaqi Wang, Chenyu Li, Yunfei Ma* (yunfeima@cau.edu.cn)

College of Veterinary Medicine, China Agricultural University, Beijing 100193, China.

Objectives Ulcerative colitis (UC) is a typical type of inflammatory bowel disease, which is accompanied by an increased risk of anxiety-related psychological symptoms. Neuropeptide substance P (SP) has been found to participate in multiple physiological processes, including cell proliferation, immune modulation, and inflammatory responses. In this study, we explored the role of SP in colitis and linked anxiety-like behavior.

Methods We established a mouse model of dextran sodium sulfate (DSS)-induced colitis and injected intravenously with SP in a dose of 5 nmol/kg. Behavioral assays, qRT-PCR, Western blotting, and other molecular biology techniques were employed.

Results We found that administration of SP substantially alleviated DSS-induced gross symptoms, such as weight loss, disease activity index, and colon shortening. SP also protected against intestinal barrier disruption by restoring the number of mucus-producing goblet cells and intestinal permeability and significantly reduced the expression of inflammatory factors in colon tissue. Furthermore, SP effectively mitigated anxiety-like behavior of mice, the pathological lesion of neurons, and loss of Nissl body in hippocampus tissue. Also, SP decreased pro-inflammatory cytokine levels but elevated anti-inflammatory cytokine levels to improve neuron-inflammatory responses. We further revealed that SP prevented colitis-induced mitochondrial impairment in the intestinal epithelium, impeding mitochondrial DNA (mtDNA) leakage into the cytosol and subsequent activation of the cyclic GMP-AMP synthase-stimulator of interferon genes (cGAS-STING) pathway.



Conclusion Collectively, we unveil that SP protects against intestinal epithelium damage via suppressing the mtDNA-cGAS-STING pathway and exerts anxiolytic and neuroprotective effects in colitis, indicating SP could be a promising alternative for UC treatment.

Key Words: Anxiety-like behavior; Colitis; Intestinal epithelial barrier; Inflammatory response; Substance P

The experimental procedures were approved by the Committee for the Care and Use of Experimental Animals, China Agricultural University (AW92303202-2-1).

This work was financially supported by the Beijing Municipal Natural Science Foundation (6232021), National Key Research and Development Program of China (2022YFD1801105), and the 2115 Talent Development Program of China Agricultural University (Grant no. 00109015).

亚太 B1-129-0017

Dysregulation of Low Density Lipoprotein Receptor Associated with Skeletal Muscle Atrophy in ALS

SiEn Yan, YiHui Sun, HaoYun Zhang, QiuPeng Yan(yanqiupeng@sdsu.edu.cn)
School of Basic Medicine, Shandong Second Medical University, Weifang 261053, China

Objectives Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease with progressive skeletal muscle atrophy, while the underlying regulatory mechanisms remain unclear. Emerging research showed that dysregulated cholesterol metabolism caused skeletal muscle dysfunction, and imbalanced cholesterol homeostasis was observed in ALS patients. This study aims to reveal the dynamic expression profile of low-density lipoprotein receptor (LDLR), a key cholesterol transport mediator in the gastrocnemius muscle of ALS transgenic mice, providing new therapeutic targets for ALS.

Methods RNA sequencing data of ALS mice skeletal muscle were acquired from GEO public datasets, and differentially expressed genes were identified by DESeq2. hSOD1^{G93A} mutant transgenic ALS mice (ALS mice) and littermates wild-type (WT mice) were euthanized with 1.5% sodium pentobarbital, and gastrocnemius muscle were collected at initial stage (70 days), middle stage (95 days), late stage (108 days), and terminal stage (122 days). The samples were subsequently subjected to RT-qPCR analysis, Western blotting, and immunofluorescence staining.

Results RNA-seq analysis revealed dysregulation of lipid metabolism-related processes, with a downregulation of Ldlr expression in ALS mice. Compared to WT mice, RT-qPCR analysis validated that Ldlr mRNA levels were reduced and Western blotting further demonstrated a downregulated trend in LDLR protein expression in the ALS group. Immunofluorescence staining corroborated these findings, showed a progressive decline in LDLR fluorescence intensity within skeletal muscle of ALS mice as the disease advanced.

Conclusion These findings demonstrate that LDLR is down-regulated in ALS skeletal muscle, potentially contributing to cholesterol dysregulation and atrophy of ALS skeletal muscle.

Key Words: ALS; Skeletal muscle; Cholesterol metabolism; LDLR

Animal ethics approval number:2024SDL446

Fund Project: This work was supported by the Natural Science Foundation of Shandong Province, China (Grant No. ZR2024QH628); Shandong Province Medical and Health Science and Technology Project (202402010641).



亚太 B1-129-0018

Disease- and Sex-Specific Changes in Hypothalamic Oxytocin and Vasopressin in Bipolar Disorder: A Postmortem Study

Hong Tan^{1,2*}; Yu-Ting Hu^{3,4*}; Alyssa Goudswaard⁵; Yong-Jian Li²; Rawien Balesar⁵; Dick Swaab^{5#}; Ai-Min Bao^{1,2,4,6#}

1 Department of Neurobiology and Department of Neurology of the Second Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China

2 NHC and CAMS key laboratory of Medical Neurobiology, Zhejiang University School of Brain Science and Brain Medicine, Hangzhou, China

3 Center for Basic and Translational Research of the Second Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China

4 National Health and Disease Human Brain Tissue Resource Center, Zhejiang University, Hangzhou, China.

5 Netherlands Institute for Neuroscience, an Institute of the Royal Netherlands Academy of Arts and Sciences, Amsterdam, BA, the Netherlands

6 The State Key Lab of Brain-Machine Intelligence, Zhejiang University, Hangzhou, China

Objectives Bipolar disorder (BD) and major depressive disorder (MDD) share some common characteristics in stress-related brain circuits, but they also exhibit distinct symptoms. Our previous postmortem research on the immunoreactivity (ir) levels of neuropeptide oxytocin (OT) in the hypothalamic paraventricular nucleus (OT^{PVN}) and some clinical research on plasma OT levels suggested that increased levels of OT is a potential trait marker for BD. However, dysregulation of the related neuropeptide arginine vasopressin (AVP), that often shows opposite effects for stress responses compared to OT has not been investigated in BD. Moreover, it remains so far unknown what the contribution may be of OT produced in the hypothalamic supraoptic nucleus (SON), another major source of OT (OT^{SON}).

Methods In the present postmortem study, alterations in levels of OT-ir and for the first time in AVP-ir were determined in the SON and PVN among patients with BD, MDD, and matched controls.

Results We observed a significantly increased OT^{PVN}-ir but relatively stable AVP^{PVN}-ir in male BD, and a significantly decreased AVP^{PVN}-ir but relatively stable OT^{PVN}-ir in female BD patients. A significantly increased ratio of OT-ir/AVP-ir was observed only in BD patients in both, the PVN and SON. No significant changes in OT-ir or AVP-ir were found in MDD patients compared with controls.

Conclusion Our data illustrate a clear disease- and sex-specificity of the OT and AVP changes in BD. In addition, since increased AVP-ir was observed in female BD patients with lithium nephropathy, increased AVP may have a direct effect on symptoms of BD.

Key words: arginine vasopressin, bipolar disorder, major depressive disorder; oxytocin; paraventricular nucleus; supraoptic nucleus.

亚太 B1-129-0022

Pinprick stimulation causes sleep disturbances via activation of insular cortex

LanCao(caolan3@mail2.sysu.edu.cn) Boyu-Jiao Junting-Huang

Department of Human Anatomy and Physiology, Zhongshan School of Medicine, Sun Yat-sen University
Guangzhou 510080

Objective Pain and sleep disturbances frequently co-occur, with 67%–88% of patients with chronic pain reporting disrupted sleep. Moreover, poor sleep is known to exacerbate pain chronification, highlighting a bidirectional relationship. The insular cortex (IC), a critical hub for pain processing,



shows increased functional connectivity in individuals with insomnia, implicating it in pain-related sleep disruption. However, the precise mechanisms by which the IC modulates this interplay remain poorly understood.

Methods Here, we establish a mouse model of pain-induced sleep deprivation (PSD) by applying pinprick stimulation to the plantar surface in C57BL/6j mice, mimicking clinically relevant pain-related sleep disturbances.

Results Nine hours of PSD resulted in a significant reduction in rapid eye movement (REM) sleep and increased sleep fragmentation during the subsequent light phase. PSD also induced anxiety- and depression-like behaviors. Neural circuit mapping revealed that the IC receives direct glutamatergic input from the basolateral amygdala (BLA). Chemogenetic inhibition of the BLA–IC pathway restored REM sleep following PSD.

Conclusion These findings identify a critical role for the BLA–IC circuit in mediating pain-induced sleep disturbances and suggest a potential therapeutic target for the treatment of comorbid pain and sleep disorders.

Key words: Basolateral amygdala, Insular cortex, Pain, Sleep Deprivation

● 亚太 B1. Neural Circuits for Behaviors and Diseases ● Abstract

亚太 B1-129-0001

Multimodal Regulation of Motor Neuron Plasticity Post-Spinal Cord Injury: Mechanistic Insights into the NYAP1-POU6F1-JNK/c-Jun Signaling Axis

Yi Li^{1,2}, Shu-Ying Wang^{1,2}, Jin-Ying Hu^{1,2}, Wen-Yuan Li^{1,2*}, Ying Wang^{1,2*} (yingwang770224@163.com)

¹ Mudanjiang Collaborative Innovation Center for development and application of Northern Medicine Resources, Mudanjiang 157011, China

² Institute of Neural Tissue Engineering, Mudanjiang Medical University, Mudanjiang, Heilongjiang Province, China;

Objectives To elucidates the molecular mechanisms underlying NYAP1-mediated neural plasticity following spinal cord injury (SCI).

Methods Utilizing a dual-model approach combining in vivo SCI paradigms (intraperitoneal anesthesia with 40 mg/kg ketamine and 5 mg/kg xylazine) with in vitro oxygen-glucose deprivation/reoxygenation (OGD/R)-induced motor neuron injury models, we systematically examined NYAP1's therapeutic potential through AAV-mediated gene manipulation integrated with behavioral, molecular, and morphological analyses.

Results NYAP1 overexpression via AAV transduction significantly enhanced MN survival and neurite outgrowth under OGD/R conditions ($P < 0.001$). Compare to control group, SCI rats with NYAP1 overexpression demonstrated significant improved BBB, rotarod latency locomotor recovery at 4 weeks post-SCI, spared tissue volume, axonal regeneration (GAP-43, 5-HT+ fibers and TH+ projections+ fibers) (all $P < 0.05$). Confocal microscopy confirmed NYAP1-POU6F1 colocalization in neuronal perikaryal, complementary molecular docking studies revealing stable binding interactions between NYAP1 and POU6F1, western blot revealed NYAP1-mediated activation of Phospho-JNK1/2 levels and c-Jun ($P < 0.01$).

Conclusion This work establishes the NYAP1-POU6F1-JNK/c-Jun axis as a master regulatory pathway for post-SCI neuroplasticity, demonstrating multimodal therapeutic effects ranging from neuroprotection to enhanced axonal regeneration. Our findings provide a mechanistic foundation for developing precision interventions targeting neural circuit reorganization in SCI rehabilitation.



Key word: NYAP1; neural plasticity; spinal cord injury

亚太 B1-129-0002

Therapeutic Potential of Retrograde POU6F1 Transport in SCI Recovery

Shu-Ying Wang^{1,2}, Yi Li^{1,2}, Wen-Yuan Li^{1,2*}, Ying Wang^{1,2*} (yingwang770224@163.com)

¹ Mudanjiang Collaborative Innovation Center for development and application of Northern Medicine Resources, Mudanjiang 157011, China

² Institute of Neural Tissue Engineering, Mudanjiang Medical University, Mudanjiang, Heilongjiang Province, China;

Objective This study investigates the therapeutic role of POU domain class 6 transcription factor 1 (POU6F1) in remodeling lumbar motor circuitry and promoting functional recovery following spinal cord injury (SCI).

Methods SCI models were established in rats, and transcriptome sequencing, differential gene analysis, and functional enrichment analyses were performed on the spinal lumbar segment (SLS) across post-SCI time points. We assessed the regulatory role of POU6F1 in spinal cord neurons (SCN) and motoneuron (MN) through AAV-POU6F1 and AAV-negative control (AAV-NC) transduction under oxygen-glucose deprivation/re-oxygenation (OGD/R) conditions, combined with JNK inhibitor (SP600125) treatment in vitro. Additionally, retrograde delivery of AAV-POU6F1 to lumbar MNs in a T9 contusion SCI model was evaluated through various behavioral and histological assessments.

Results POU6F1 was highly expressed in SLS after SCI, with its role confirmed in axonal regeneration. AAV-POU6F1 transduction enhanced SCN and MN proliferation and dendrite outgrowth under OGD/R conditions in vitro. Mechanistically, POU6F1 activated JNK1/2 and c-Jun phosphorylation, with SP600125 (JNK inhibitor) attenuating these effects. In vivo, retrograde transport of AAV-POU6F1 to lumbar MNs significantly increased axonal growth of descending propriospinal tract (dPST) axons, alleviated SCI-induced MN dendritic atrophy, promotes the tibialis anterior (TA) neuromuscular reinnervation, and improved electrophysiological and behavioral recovery.

Conclusion Our findings identify POU6F1 as a pivotal regulator of lumbar MN circuitry remodeling post-SCI, acting through the JNK/c-Jun signaling pathway to enhance functional recovery.

Key word: POU6F1; JNK/c-Jun signaling pathway; neural plasticity; spinal cord injury



亚太 B1-129-0007

The Changes of GAD67 and MOR receptor in thalamus reticular nucleus after thalamus hemorrhage in rats

Wang Wei¹, Shi Suqin², Cai zhiping³, Cong Wei³; Gao Tianyi³, Li Liang³, Zhang Baifeng³
(1. The First Affiliated Hospital of Baotou Medical College, Baotou 014010, China; 2. The Second Affiliated Hospital of Baotou Medical College, Baotou 014030, China; 3. Baotou Medical College, Baotou 014040, China.)

Objective To explore the expression changes of glutamate decarboxylase 67 (GAD67) and m-opioid receptor (MOR) in thalamic reticular nucleus (TRN) after rat intracerebral hemorrhage model (ICH).

Methods The right ventrolateral thalamic nucleus (VPL) was injected with type-IV collagenase under the stereotaxic apparatus to establish the rat thalamus hemorrhage model. The same volume of normal saline was injected at the same position as the control group. The morphology of neurons around VPL was observed by Nissl staining, and the changes of GAD67 and MOR contents in TRN were observed by immunofluorescence staining.

Results No obvious abnormality of motor function was found in the thalamic hemorrhage model of VPL injection; Nissl body necrosis, atrophy and vacuolar degeneration of neurons in VPL of model group; In the control group, the number of MOR in TRN was (77.77 ± 9.45) , decreased to (30.00 ± 4.90) at 7 days after ICH ($P < 0.05$), (23.30 ± 2.05) at 14 days after ICH ($P < 0.05$), and (10.50 ± 2.87) at 28 days after ICH ($P < 0.05$). The number of GAD67 positive cells in the control group was (78.67 ± 7.77) , which was (27.00 ± 5.35) at 7 days after ICH ($P < 0.05$), (41.67 ± 5.44) at 14 days after ICH ($P < 0.05$), and (26.00 ± 6.13) at 28 days after ICH ($P < 0.05$).

Conclusion VPL injection of type IV collagenase in rats can successfully make the thalamus hemorrhage model. The motor function of rats in the model group has no significant change. The GAD67 protein in the TRN of rats in the model group is reduced, and the number of MOR is reduced.

KEY WORDS: Ventral posterior lateral nucleus; Thalamic reticular nucleus; Intracerebral hemorrhage; Glutamate decarboxylase 67; m-opioid receptor

亚太 B1-129-0020

Acute sleep deprivation induces pain via activation of pyramidal neurons in the ACC

Yanhan Wu, Yuting Wang, Ruizhen Huang, Junting Huang
1. Department of Human Anatomy and Physiology, Zhongshan School of Medicine, Sun Yat-sen University

Background Sleep disorder impairs physical and mental health and has a strong correlation with pain. Pain disrupts normal sleep rhythms, and vice versa sleep deprivation (SD) increases the perception of pain in both animals and human.

Objective However, the underlying circuit mechanisms remains poorly understood. More knowledge of brain regions of pain is needed. To investigate neural circuits for SD-induced pain hypersensitivity

Methods Here, we established a 9-hour sleep deprivation mouse model using stand-alone SD (SASD) paradigm, where a sweeping bar continuously pushes the mice to disrupt their sleep. During this period, we ensure that the mice have water and food.

Results We found that 9h-SASD model kept mice awake (90% wake during SASD) while acute



sleep deprivation triggers a substantial sleep rebound. Whole brain immunofluorescence staining showed that the number of c-Fos in anterior cingulate cortex (ACC) increased significantly. Hyperactivity of the ACC has been observed in both rodent models and human patients with chronic pain. Then we demonstrated that activating ACC-CaMK II α neurons in naive mice induced pain, and conversely, inactivation of the ACC-CaMK II α neurons leads to pain relief in SASD. Additionally, we demonstrated that sleep deprivation sensitized ACC-CaMK II α neurons using fiber photometry. In addition, we used retrograde tracing and immunofluorescence (IF) techniques to explore the activity of several brain regions projecting to ACC in the sleep deprivation model, which provides a research basis for elucidating the central circuit mechanism of SASD-induced hyperalgesia.

Conclusion Taken together, these findings consistently demonstrate that the hyperactivity of excitatory neurons in anterior cingulate cortex (ACC) plays an important role in SASD-induced hyperalgesia possibly. ACC can be used to further study the neural circuit mechanism of pain.

亚太 B1-129-0021

PVN 神经元编码检索胃炎免疫反应

刘娥 (liue@bjmu.edu.cn) 孙晋浩 山东大学神经生物与解剖系 济南 251000

大脑能够编码外周炎症信号，但其对胃部特异性免疫信息的存储与检索机制尚不明确。本研究揭示了下丘脑室旁核（PVN）中 Fos 阳性神经元通过形成 Fos^{PVN}-迷走神经背核（DMV）-胃神经环路和 HPA 轴调控胃炎的新机制。通过活性依赖的遗传标记、化学遗传学和光遗传学技术，我们发现这些 Fos^{PVN} 神经元是胃炎进展的必要条件，且能被应激激活，并驱动慢性炎症。单核 RNA 测序显示，超极化激活环核苷酸门控通道 1（HCN1）在胃炎过程中于 Fos^{PVN} 神经元显著上调，抑制 HCN1 可降低神经元兴奋性并缓解胃部病理损伤。重要的是，Fos^{PVN} 神经元的反复激活会形成特异性“炎症记忆”导致疾病迁延，而应激可通过这部分 Fos^{PVN} 神经元引起胃部炎症。这些发现阐明了大脑编码胃部炎症的中枢神经机制，并确立了 HCN1 作为胃炎炎症性疾病神经调控治疗的潜在靶点。

亚太 B1-129-0025

The projection relationship between the motor cortex M1, M2 regions and the hippocampus.

Shiwen-Xue¹, Qiyu-Chen¹, Yongmin-Niu¹, Tinghua-Wang^{1*}.

1. Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;

*Corresponding author: Tinghua-Wang, 1168 West Chunrong Road, Yuhua Avenue, Chenggong District, Kunming, Yunnan, China; Email: wangtinghua@vip.163.com

Objective The main focus of this study is to verify whether there is a direct projection relationship between the motor cortex M1, M2, and the hippocampus in mice.

Methods Twelve adult male C57 mice were randomly divided into four groups, with three mice in each group (n=3). Using stereotaxic brain mapping technology, the following injections were made: in the M1A group, an anterograde, non-transsynaptic tracer virus was injected into the M1 area of the motor cortex; in the M1R group, a retrograde, non-transsynaptic tracer virus was injected into the M1 area of the motor cortex; in the M2A group, an anterograde, non-transsynaptic tracer virus was injected into the M2 area of the motor cortex; and in the M2R group, a retrograde, non-transsynaptic tracer virus was injected into the M2 area of the motor cortex. The injection sites for M1 and M2 were determined based on the mouse brain atlas. Each group received 100 nl of



virus. After three weeks, when viral expression peaked, the brains were perfused, fixed in 4% paraformaldehyde, cryoprotected, and frozen for sectioning. The slices were then stained with DAPI and examined under a fluorescence microscope.

Results Based on the analysis of the frozen section results, a clear tract was observed above the injection site, and strong positive signals were detected at the injection site, indicating that there were no issues with virus expression. After registration with the brain atlas, the Results were accurate. Upon further continuous section observation, positive signals were found in brain regions such as A1C, but no positive signals were detected in the hippocampus.

Conclusion The injection of non-transsynaptic viruses via stereotactic brain injection confirmed that there is no direct first-order projection connection. The projection connection between the motor cortex and the hippocampus is likely an important reason for exercise-related cognitive decline prevention. This study provides significant support for understanding the neural circuit mechanisms behind exercise-induced cognitive decline reduction.

Keywords: Neurocircuit, Hippocampus, Motorcortex.

● 亚太 B2. Sensory and Motor System Anatomy ● Podium

ID: 318739

Spatio-temporally Deciphering Peripheral Nerve Regeneration in Vivo after Extracellular Vesicle Therapy under NIR-II fluorescence Imaging

Wang Yueming¹ Sheng Huaixuan² Cong Meng³ Chen Jun² Feng Sijia² Wo Yan¹

1. Department of Anatomy and Physiology, Shanghai Jiao Tong University School of Medicine, Shanghai 200025, China;

2.Sports Medicine Institute of Fudan University, Shanghai 200040, China;

3.Co-Innovation Center of Neuroregeneration, Nantong, JS 226001, China.

Objectives Limited understanding of extracellular vesicle (EV) dynamics hinders effective peripheral nerve injury (PNI) treatment. This study develops a non-invasive method using glucose-conjugated quantum dot (QDs-Glu) labeled EVs and near-infrared fluorescence imaging for real-time in vivo tracking to enhance PNI therapeutic strategies.

Methods EVs were labeled with QDs-Glu and injected into a rat sciatic nerve injury model. EV migration from the uninjured to the injured nerve site was tracked using near-infrared (NIR-II) fluorescence imaging.

Results Injected EVs migrated from the uninjured to the injured nerve site, with increased fluorescence signals 4-7 days post-injection, indicating content release. Immunofluorescence and behavioral tests showed EV therapy promoted nerve regeneration and functional recovery at 28 days. A correlation was found between functional recovery and NIR-II fluorescence intensity patterns, supporting the therapeutic effect of EVs.

Conclusion A novel in vivo NIR-II imaging approach enables real-time monitoring of EVs in PNI treatment, providing insights into the therapeutic mechanisms and efficacy of EV therapy on peripheral nerve regeneration. This approach offers a translational pathway for improved PNI treatment strategies through real-time monitoring of EV dynamics.

Keyword: Extracellular Vesicles, Near-Infrared Imaging, Nerve Regeneration, Peripheral Nerve Injury, Quantum Dots



ID: 318784

Metabolic Heterogeneity of Peripheral Nerve Injury in Different Anatomical Sites Revealed by NIR-II Imaging

Shao Kemeng¹ Peng Yu¹ Li Huizhu² Ogura Shingo¹ Yang Yu¹ Wang Yueming¹ Chen Jun² Wo Yan¹

1.Department of Anatomy and Physiology, Shanghai Jiao Tong University School of Medicine, Shanghai, China
2.Sports Medicine Institute of Fudan University, Department of Sports Medicine, Huashan Hospital, Fudan University, Shanghai, China.

Objectives In examination of the literature, it is seen that studies on peripheral nerve injury primarily focus on sciatic nerves and neglect microenvironmental heterogeneity across anatomical sites. Previous research rarely systematically compared metabolic differences in injured nerves at distinct anatomical locations. Here, we aimed to visualize spatially resolved metabolic variations following peripheral nerve injury using NIR-II in vivo imaging.

Methods In this study, lead sulfide quantum dots (QDs) were injected into facial, brachial plexus and sciatic nerve injury rat models under isoflurane anesthesia. Then, fluorescence signals were acquired through longitudinal monitoring over 14 consecutive days post-injection by NIR-II live imaging.

Results NIR-II live imaging revealed distinct nerve-specific metabolic patterns: QDs exhibited the shortest retention in the facial nerve, followed by the brachial plexus, with the longest retention observed in the sciatic nerve. These findings highlight metabolic heterogeneity across anatomical sites.

Conclusion NIR-II imaging could precisely identify the degradation rate of QDs in nerve. Moreover, the degradation rate exhibit significant variations across different anatomical regions post-injury, with the facial nerve exhibiting the highest metabolic activity, followed by the brachial plexus, and the sciatic nerve displaying the slowest metabolic rate.

Keyword: Anatomical sites, Metabolic Heterogeneity, NIR-II live imaging, Peripheral nerve injury

ID: 325810

Orexigenic Lateral Hypothalamus-anterior Cingulate Cortex Circuit Alleviates Chronic Stress-induced Anxiety-like Behaviors.

Liu Danlei Guo guoqing*
Medical College of Jinan University

Objectives We identify and characterize an orexinergic (Orx) circuit from lateral hypothalamus (LH) projecting to the anterior cingulate cortex (ACC) that regulates chronic stress-induced anxiety-like behaviors via orexin 2 receptor (OX2R).

Methods We used behavioral, patch-clamp electrophysiology, chemogenetic, and optogenetic approaches to clarify the response of the LH and ACC to stress, confirmed the structural connection between the LH and mPFC, and investigated the role of the LHOrx-ACC pathway in chronic stress-induced anxiety-like symptoms.

Results We found that LHOrx neurons were significantly suppressed in stress-induced anxiety-like behaviors. Chemogenetic activation of LHOrx neurons alleviated anxiety-like behaviors in CUMS mice. Furthermore, LHOrx neurons projected to the ACC glutamatergic neurons which were also inhibited following CUMS. In addition, activation of the LHOrx-ACC pathway or exogenous application of orexin to the ACC significantly alleviated CUMS-induced anxiety-like behaviors, where



as pharmacologically blocking OX2R but not orexin 1 receptor (OX1R) in the ACC prevented the anxiolytic effects of LHOrx-ACC activation.

Conclusion Taken together, our study reveals the critical role of orexigenic LH-ACC circuit in chronic stress-induced anxiety-like behaviors, providing potential therapeutic target for anxiety and stress-related disorders.

Keyword: Anterior cingulate cortex, Anxiety, Chronic unpredictable mild stress, Lateral hypothalamus, Orexin

亚太 B2-129-0003

Acid sensing ion channels alleviate ischemic brain injury by promoting collateral circulation

Jian-Fei Lu; Xin Qi; Yu-Wen Sun; Lu-Yang Wang; Tian-Le Xu
Department of Anatomy and Physiology, Shanghai Jiao Tong University School of Medicine,
Shanghai 200025, China.

Stroke is the leading cause of human mortality and disability without effective treatments. Ischemic stroke frequently occurs in the leptomeningeal arteries on the brain surface and deprives deep tissue of blood supply that Results in neuronal excitotoxicity. Acidosis in ischemic infarct activates acid sensing ion channels (ASICs) to mediate cell death, and indeed genetic deletion of ASIC1 reduces infarct volume. Surprisingly, we found knockout (ASIC3) enlarges ischemic infarct volume in mouse stroke model, opposite to the effect of ASIC1 knockout. We discover ASIC3 is uniquely positioned at the trigeminal nerve endings to sense acidosis and release calcitonin gene related peptide (CGRP) to dilate leptomeningeal collaterals (LMC) during stroke. Optogenetic activation or inhibition of CGRP positive trigeminal neurons bidirectionally regulates LMC and infarct volume while direct activation of ASIC3 with an agonist alleviates ischemic injury. These findings rationalizes ASIC3 and its specific control of LMC circulation by trigeminal neurons as an innate mechanism to be exploited for neuroprotection in stroke.

亚太 B2-129-0004

The role of receptor tyrosine kinase ErbB4 in dorsal root ganglion in inflammatory pain

Ying Fu, Zhongxin Guo, Qingyun Huang, Shuya Qi, Wei Zhang, Guohe Tan(tanguohe@gxmu.edu.cn)
¹ Institute of Neuroscience and Guangxi Key Laboratory of Brain Science, Department of Human Anatomy, School of Basic Medical Sciences, Guangxi Medical University, Nanning, Guangxi, China.
² Key Laboratory of Longevity and Aging-related Diseases of Chinese Ministry of Education, Guangxi Health Commission Key Laboratory of Basic Research on Brain Function and Disease, Nanning, Guangxi, China.
³ Guangxi Key Laboratory of Regenerative Medicine, Collaborative Innovation Centre of Regenerative Medicine and Medical BioResource Development and Application Co-constructed by the Province and Ministry, Nanning, Guangxi, China.
⁴ China-ASEAN Research Center for Innovation and Development in Brain Science, Nanning, Guangxi, China

Objectives Inflammatory pain is a prevalent form of pathological pain caused by tissue injury or inflammation. Whereas the dorsal root ganglion (DRG) plays a pivotal role in the pathogenesis process of inflammatory pain, the involved molecular and cellular mechanisms are still obscure so far. Here, we explore the role and mechanisms of receptor tyrosine kinase ErbB4 in DRG in



inflammatory pain.

Methods We used both formalin-induced acute models and complete Freund's adjuvant (CFA)-induced chronic models to observe ErbB4 activation by examining Nrg1 expression and ErbB4 receptor phosphorylation level in mouse DRGs. We further used ErbB4^{+/-} mutant mice to investigate the role of ErbB4 in inflammatory pain; meanwhile we generated Advillin-Cre; ErbB4^{-/-} cKO mice with selective deletion of ErbB4 in DRG small-diameter neurons to assess their mechanical and thermal pain thresholds. Finally, we performed a series of molecular and biological experiments, including PCR, Western Blot, Co-IP, to test the molecular mechanisms underlying ErbB4 function in inflammatory pain.

Results Firstly, we observed that the expression of NRG1 and the phosphorylation level of ErbB4 were both upregulated in DRG after inflammatory pain. Then we found that the pain sensitivity was reduced in ErbB4^{+/-} mutant mice. Furthermore, the pain sensitivity was reduced in mice with specific deletion of ErbB4 on advillin-positive neurons within DRGs. Finally, pilot molecular experiments showed that ErbB4 activation enhanced inflammatory pain sensitivity possibly through the calcium-related signaling pathway.

Conclusions ErbB4 in advillin-positive sensory neurons promotes inflammatory pain hypersensitivity, providing novel insights into the mechanisms underlying the pathogenesis of inflammatory pain.

Key Words: advillin; dorsal root ganglion; ErbB4; inflammatory pain

● 亚太 B2. Sensory and Motor System Anatomy ● Poster

ID: 318321

Neurotransmitter Analysis for Diagnosing Diabetic Cardiac Autonomic Neuropathy in Rodents: A Systematic Review of Biomarkers and Disease Correlation

Razif Abas¹ Mohd Amir Kamaruzzaman^{1,2} Shamala Devi Subramaniam¹ Nurul Hayati Mohamad Zainal¹

Noorkardiffa Syawalina Omar³

1.Universiti Putra Malaysia

2.Universiti Kebangsaan Malaysia

3.Universiti Teknologi MARA

Objectives Diabetic cardiac autonomic neuropathy (DCAN) is a severe complication of diabetes, leading to autonomic dysfunction and increased cardiovascular risks. This systematic review evaluates the effectiveness of neurotransmitter analysis in diagnosing DCAN in rodent models by assessing the sensitivity, specificity, and correlation of neurotransmitter levels with disease severity.

Methods A comprehensive literature search was conducted across Scopus, PubMed, EBSCOhost, and Cochrane databases, focusing on studies published up to August 2024. Inclusion criteria encompassed original research on rodent models of diabetes employing neurotransmitter analysis to assess DCAN. The Newcastle-Ottawa Scale was used for quality assessment. Data on neurotransmitter levels, diagnostic accuracy, and comparisons with alternative biochemical or physiological markers were extracted and synthesized.

Results The systematic review identified 11 relevant experimental studies that investigated neurotransmitter alterations in rodent models of DCAN. A comprehensive search yielded 3020 records, which were screened and narrowed down based on strict inclusion criteria. The selected studies examined how diabetes affects neurotransmitter levels in various cardiac regions, adrenal glands, and stellate ganglia, revealing significant changes in norepinephrine, epinephrine, and



dopamine levels over time. The findings indicate that diabetes-induced neurotransmitter imbalances vary based on disease duration, anatomical region, and diabetes model, contributing to the progression of DCAN.

Conclusion Neurotransmitter analysis presents a promising tool for diagnosing DCAN, with strong correlations to disease progression. Further research is required to standardize methodologies and validate its clinical translatability. These findings may contribute to development of early diagnostic strategies and targeted therapeutic interventions for diabetic neuropathy.

Keyword: Acetylcholine, diabetic cardiac autonomic neuropathy, neurotransmitters, norepinephrine, rodent models

亚太 B2-129-0001

Genetic Variants Underlying Differences in Facial Morphology in Chinese Healthy People and Alzheimer's disease Patients

Zhengda Lu¹, Xinghua Zhang¹, Yuling Zhang², Zhi Cheng*, ¹

¹ College of Life Sciences and Tianjin Key Laboratory of Conservation and Utilization of Animal Diversity, Tianjin Normal University, Tianjin, China

²Department of geriatric, Tianjin Beichen Traditional Chinese Medicine Hospital, Tianjin, China

* Corresponding author at: chengzhi@tjnu.edu.cn (Zhi Cheng)

Objectives Facial morphology — a conspicuous feature of human appearance — is highly associated with increased risk of cerebrovascular and cerebral nervous system diseases. We aims to explore the association between facial features and Alzheimer's disease (AD), providing novel insights for early diagnosis and therapeutic strategies by establishing craniofacial metrics as potential observational indicators.

Methods Facial morphology parameters were measured in 35 healthy cases and 35 AD cases using sliding caliper and spreading caliper (All participants provided written informed consent, and all study protocols were approved by the institutional review boards of the pertinent research institutions). Seventeen direct cephalofacial parameters and one indirect parameter for two groups were derived separately and analyzed for age correlations, inter-sex u-tests, and multiple comparisons. To investigate the molecular mechanisms of facial morphological change, we generated mRNA sequencing from the 4-month-old 5× FAD mice facial tissue.

Results Morphometric analysis demonstrated reduced lip height and increased nasal width in age-matched AD samples ($p < 0.05$). The similar phenomenon was also observed in the 5× FAD mice. Paraffin sections revealed significant epidermal cell damage in 5× FAD mice compared to wild type. Transcriptomic data identified differential expression of target genes associated with epidermal integrity in AD mice.

Conclusion Craniofacial phenotypic variations, particularly diminished lip height and expanded nasal width, correlate with AD pathogenesis. These traits may serve as biomarkers for early AD detection. Integrating craniofacial phenomics with molecular diagnostics offers a multidisciplinary approach to enhance AD risk prediction and intervention.

Key Words: Facial morphology; Alzheimer's disease; Craniofacial metrics; RNA-seq
Ethics and Morality:

The study approved by the Ethics Committee of Tianjin Beichen TCM Hospital (2023-0024KT).



亚太 B2-129-0002

Distribution of the nerves of the hepatic vein with special reference to innervation of its sphincter: Whole mount immunohistological observation in *Suncus murinus*

Ke Ren¹, Xiangquan Chen¹, Ting Yang², Shuang-Qin Yi²

¹Faculty of Physical Education, Qu Jing Normal University, Yun Nan, China

²Department of Frontier Health Sciences, Graduate School of Human Health Sciences, Tokyo Metropolitan University, Tokyo, Japan

Background Morphological and functional studies of the human cavo-hepatic junction have been widely reported. The unique spiral structure of the wall of the canine hepatic venous system, which is formed by smooth muscle bundles, and the ultrastructure of the hepatic venous sphincter of animals, especially dogs, have also received a great deal attention. However, studies on the innervation of the hepatic vein in this structure have rarely been reported.

Methods In this study, experimental animals *Suncus murinus* were subjected to pressurized perfusion and fixation. The liver was removed, and the liver parenchyma was carefully removed, leaving only the intrahepatic vasculature. Whole-mount immunohistochemical staining with a neurofilament protein (NFP) antibody was performed to identify the nerves of the hepatic vein.

Results Abundant NFP-positive nerves were present near the hepatic venous outflow tract, which were connected to the inferior vena cava nerves. However, no NFP-positive nerve fibers were found in the deep hepatic, sublobular, or collecting veins.

Conclusion Our studies on *Suncus murinus*, have shown that the nerve distribution of the hepatic vein is quite different from that of the hepatic artery, portal vein, and bile duct system entering and exiting the liver portal. The nerve distribution of the latter can extend to deeper layers of the intrahepatic artery, portal vein, and intrahepatic bile duct system. Innervation of the hepatic vein was mainly observed at the entrance of the hepatic vein into the inferior vena cava. These nerves may innervate the hepatic sphincter and control the outflow of hepatic veins.

Keywords: hepatic sphincter, spiral structure of the hepatic venous, cavo-hepatic junction, hepatic vein innervation, *Suncus murinus*

亚太 B2-129-0006

Acupoint galvanic stimulation enhances RhoGDI- α -mediated axonal regeneration and promotes sensory function recovery in spinal cord transected rats

Qiu-Xia Xiao¹, Lu-Lu Xue², Yang Xu³, Zheng Ma⁴, Jia Liu⁴, Li Chen³, Liu-Lin Xiong^{1*}, Ting-Hua Wang^{2,3,4*}

¹Department of Anesthesiology, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi 563000, Guizhou, China

²State Key Lab of Biotherapy West China Hospital Sichuan University, Chengdu 610041, Sichuan, China

³Institute of Neurological Disease, National-Local Joint Engineering Research Center of Translational Medicine, West China Hospital, Sichuan University, Chengdu 610041, Sichuan, China

⁴Institute of Neuroscience, Kunming Medical University, Kunming 650031, Yunnan, China

Objectives This study was designed to explore mechanisms underlying the recovery of sensory function from spinal cord transected (SCT) injury.

Methods Firstly, RhoGDI- α was screened out by proteomics analysis and validated in SCT rats. Furthermore, lentivirus-mediated and CRISPER/Cas9 technologies were used to evaluate the role



of RhoGDI- α in the sensory function in vivo and axonal regeneration in vitro. In addition, we examined the relationship between RhoGDI- α and COX5a through co-immunoprecipitation. Acupoint galvanic stimulation (governor vessel electroacupuncture, GEA) was performed to further enhance the regulatory mechanism determined by behavioral and Doppler tissue imaging (DTI) reconstruction tests.

Results Proteomic analysis revealed that RhoGDI- α was upregulated at 28 days after SCT. Immunofluorescence staining demonstrated that RhoGDI- α was co-expressed with synaptophysin and CGRP in the spinal cord neurons, and RhoGDI- α over-expression increased neurite length and improved neurological deficits in vitro/vivo. Contrarily, RhoGDI- α knock-out in rats inhibited the neurite outgrowth, induced cell apoptosis, and aggravated the neurological sensory deficits. The co-immunoprecipitation confirmed COX5a co-existed with RhoGDI- α . COX5a over-expression/knockdown showed similar effects to RhoGDI- α . Importantly, GEA was found to improve neurological sensory function, promote spinal nerve fiber regeneration and even upregulate RhoGDI- α expression in SCT rats, but its efficacy was weakened by RhoGDI- α knock-out.

Conclusions Our work indicated that GEA therapy contributes to neurite outgrowth and improves sensory function in SCT rats via Rho GDI α regulation.

Key words: Spinal cord injury; sensory function recovery; RhoGDI- α ; COX5a; Governor vessel electroacupuncture; axonal regeneration.

● 亚太 B3. Synapse, Neuron and Glia ● Podium

ID: 320143

Running Exercise Alleviates Chronic Social Defeat Stress-induced Depression-like Behaviors via H3K18 Lactylation of GCH1 in the Microglia in Mice

wangnan Shanshan Zhu Shuyang Chen Sijie Tan
University of South China

Objectives Depression is a common mental disorder associated with hippocampal microglial activation. Exercise therapy is a promising prevention and treatment strategy for depression, but the underlying mechanisms are not fully understood. This study aimed to explore the molecular mechanisms underlying the alleviating effects of running exercise on depression in mice.

Methods The major depression model was established using chronic social defeat stress (CSDS) in mice and the effects of wheel running exercise on depressive-like behaviors were tested. Microglial activation, GCH1 expression, and BH4 levels in the hippocampus were examined in the hippocampus. The effects and mechanism of sodium lactate on the GCH1 expression were further investigated in BV2 cells.

Results CSDS-induced depressive-like behaviors were associated with activated microglial and decreased GCH1 and BH4 in the hippocampus in mice, which were reversed by wheel running exercise. Sodium lactate upregulated GCH1 expression via increasing histone H3K18 lactylation (H3K18la) in BV2 cells. Syrosingopine, a lactate transporter inhibitor, amplified this effect by inhibiting lactate efflux. In contrast, the p300 inhibitor C646 reduced H3K18la levels and reversed the upregulating effects of sodium lactate on GCH1 in BV2 cells.

Conclusion Running exercise alleviates depressive-like behaviors by suppressing microglial activation through the lactate-GCH1-BH4 axis. These findings uncovered a novel mechanism underlying



ing the mitigating effects of running exercise on depression and provided a theoretical basis for using exercise therapy as a depression treatment.

Keyword: Depression, Exercise therapy, GCH1, Lactylation, Microglia

ID: 320164

Isoliquiritigenin exhibits neuroprotective effects in a mouse model of chronic corticosterone administration-induced mood disorders.

Wang Hao Zhu Jing Shao Shuijin

Department of Anatomy, Shanghai University of Traditional Chinese Medicine

Elevated levels of endogenous cortisol are closely associated with the occurrence and progression of various cognitive dysfunctions. With the increasing incidence of psychiatric disorders, the search for therapeutic drugs targeting central cortisol toxicity has become an urgent demand in current neuropharmacological research. In this study, male C57BL/6J mice were randomly divided into five groups: control group, 20 mg/kg corticosterone group, and corticosterone + 10, 20, and 40 mg/kg isoliquiritigenin groups. After continuous subcutaneous injection of corticosterone and intragastric administration of isoliquiritigenin for 21 days, behavioral tests were performed. Anxiety-like behaviors were evaluated using the open field test and the light-dark box test. The Y-maze test assessed short-term memory, and long-term memory was measured using the novel object recognition test. TUNEL staining and immunofluorescent histochemical staining for NeuN, GFAP, and Iba-1 were employed to observe the status of neurons and glial cells in the hippocampus of each group. We found that isoliquiritigenin can significantly alleviate short-term and long-term memory impairments and anxiety-like behaviors in mice after chronic corticosterone treatment, while also improving hippocampal neuronal apoptosis, astrocyte morphological defects, and microglial activation caused by chronic corticosterone treatment. The Results of this study demonstrate that isoliquiritigenin can significantly improve memory function and anxiety-like behaviors in a chronic corticosterone administration-induced mood disorder model in mice, exerting a neuroprotective effect. These findings contribute to future research on cognitive function.

Keyword: cognitive function, corticosterone, mood disorders

ID: 320602

P-Y705-STAT3 Mediates the Polarization of Intestinal Microglia to M1 in the Distal Colonic Myenteric Plexus of Rats with Opioid-induced Constipation

Yuqiong Zhao XiaojieRen Junping Li

Department of Human Anatomy and Histoembryology, College of Basic Medical Sciences, Ningxia Medical University

Objective Using the rat model of opioid-induced constipation (OIC), to explore the distribution characteristics of intestinal microglia in the colonic myenteric plexus and the correlation between the pro-inflammatory state of intestinal microglia and P-Y705-STAT3 in the OIC rats.



Methods The OIC rat model was established by intraperitoneal injection of loperamide hydrochloride. Immunofluorescence histochemistry was used to observe the distribution of TMEM119, Iba1 and P-Y705-STAT3 in the colonic myenteric plexus. Western Blot was used to detect the expression of P2Y12, CD86, IL-1 β and TNF- α in the colonic myenteric plexus of OIC group, naloxone (MOR antagonist) group, and AG490 (P-Y705-STAT3 phosphorylation inhibitor) group.

Results Immunofluorescence histochemistry Results showed that TMEM119 and Iba1 positive markers were distributed in the distal colonic myenteric plexus, and they co-existed with P-Y705-STAT3 and MOR positive markers, respectively. Western blot Results showed that the expression of P-Y705-STAT3 and pro-inflammatory factors such as P2Y12, CD86, IL-1 β and TNF- α were significantly increased in the distal colonic myenteric plexus of OIC rats. Naloxone and AG490 significantly inhibited the expression of P-Y705-STAT3, P2Y12, CD86, IL-1 β and TNF- α .

Conclusions There is a distribution of intestinal microglia in the distal colonic myenteric plexus of rats, and intestinal microglia are mainly M1 type in the distal colonic myenteric plexus of OIC rats, which may be related to the increase of abnormal phosphorylation of P-Y705-STAT3.

Keyword: P-Y705-STAT3; Opioid-induced constipation; Intestinal microglia

亚太 B3-129-0014

Interactions of Inhalational Anesthetics and A β on CA1 Dendritic Spines and Astrocytes

Xingxing Wang, School of Integrative Medicine, Shanghai University of Traditional Chinese Medicine, 201203, Shanghai

General anesthetics may accelerate the neuropathological changes related to Alzheimer disease (AD), of which amyloid beta (A β)-induced toxicity is one of the main causes. In our study, we investigated the interactions of inhalational anesthetics with A β on the morphology and function of the hippocampus. Results have shown that sevoflurane increased the hippocampal A β levels, downregulated the CA1 dendritic spine density, activated the astrocytes in CA1, and decreased the cell adhesion molecule-neurin3 in CA1. Moreover, inhibiting beta-site amyloid precursor protein (BACE) restored the detrimental effects of sevoflurane. Furthermore, we found that pre-exposure with A β isoforms followed by sevoflurane enhanced the loss of CA1 dendritic spines, and this was related to the MEGF10-related astrocyte-dependent synaptic engulfment, only in A β pE3 + 1.2 MAC sevoflurane and 3NTyrA β + 1.2 MAC sevoflurane condition. In summary, these Results suggest that both synapses and astrocytes are sensitive targets for sevoflurane; BACE is a promising target for the amelioration of the detrimental effects of general inhalational exposure; in the presence of 3NTyrA β , 1.2 MAC sevoflurane alleviated astrocyte-mediated synaptic engulfment and exerted a lasting effect on dendritic spine remodeling.

Key Words: Inhalational Anesthetics, A β , CA1, Dendritic Spines, Astrocytes



亚太 B3-129-0017

Microglial PCGF1 alleviates neuroinflammation associated depressive behavior in adolescent mice

Naigang Li, Jingyi Du, Ying Yang, Tiantian Zhao, Dong Wu, Fan Peng, Dongshuang Wang, Linghua Kong, Wenjuan Zhou, Aijun Hao.

Department of Human Anatomy and Histoembryology, School of Basic Medical Science, Shandong University; Childhood Psychiatry Unit, Shandong Mental Health Center; School of Nursing and Rehabilitation, Shandong University. konglinghua@sdu.edu.cn, wenjuanzhou@sdu.edu.cn, aijunhao@sdu.edu.cn

Objectives Epigenetics plays a crucial role in regulating gene expression during adolescent brain maturation. In adolescent with depression, microglia-mediated chronic neuroinflammation may contribute to the activation of cellular signaling cascades and cause central synapse loss. However, the exact mechanisms underlying epigenetic regulation of neuroinflammation leading to adolescent depression remain unclear. In this study, we detected the role and mechanism of polycomb group factor 1 (PCGF1), an important epigenetic regulator, in adolescent depression.

Methods Mouse model of depression was established by chronic unpredictable mild stress (CUMS) and multiple behavioral tests were performed. Techniques such as transmission electron microscope, Golgi staining, western blot, Flow cytometry, lentivirus, RNA-seq and ChIP-seq were utilized to investigate the roles and mechanisms of PCGF1 in adolescent depression.

Results PCGF1 was decreased both in the plasma of adolescent major depressive disorder (MDD) patients and in the microglia of adolescent depression mice. We demonstrated that PCGF1 alleviates neuroinflammation mediated by microglia in vivo and in vitro, reducing neuronal damage and improving depression-like behavior in adolescent mice. Mechanistically, PCGF1 inhibits the transcription of MMP10 by upregulating RING1B/H2AK119ub and EZH2/H3K27me3 in the MMP10 promoter region, specifically inhibiting microglia-mediated neuroinflammation. **Conclusion** These **Results** provide valuable insights into the pathogenesis of adolescent depression, highlighting potential links between histone modification, neuroinflammation and nerve damage.

Key Words: Adolescent depression, Microglia, PCGF1, Histone modification, Neuroinflammation.

亚太 B3-129-0026

Mechanisms contributing to inhibition of retinal ganglion cell apoptosis by AMPK in experimental glaucoma

Zhaolin Gao^{1,2,3,4}, Haiyang Yu^{2,5}, Tianqi Duan^{2,5}, Yanxia Huang⁵, Min Li^{2,5}, Fei Yao^{1,3}, Jufang Huang^{2,3,5*}

1 Eye Center of Xiangya Hospital, Central South University, Changsha, Hunan, China

2 Department of Anatomy and Neurobiology, Xiangya School of Basic Medical Sciences, Central South University, Changsha, Hunan, China

3 Hunan Key Laboratory of Ophthalmology, Changsha, Hunan, China

4 National clinical key specialty of ophthalmology, Changsha, Hunan, China

5 Aier Eye Institute, Changsha, Hunan, China

6 Department of Pathology, The Second Xiangya Hospital, Central South University, Changsha, China

Objectives AMPK is AMP-activated protein kinase that plays a major role in regulating energy metabolism. AMPK has attracted widespread interest as a potential therapeutic target for neurodegenerative diseases. However, its effects on glaucoma remains unclear.

Methods The Oxygen-glucose deprivation/recovery (OGD/R) model on the R28 cell line and the ischemia/reperfusion (I/R) model on the retina were established to simulate the glaucomatous injury. Retina sections were stained with hematoxylin and eosin for morphologic analysis. The loss of



retinal ganglion cells (RGCs) and the molecular changes were assessed by immunofluorescent staining. TUNEL staining was used to detect apoptosis. The levels of AMP-activated protein kinase (AMPK), phosphorylation-AMP-activated protein kinase (p-AMPK), mammalian target of rapamycin (mTOR), phosphorylated-mTOR (p-mTOR) and apoptosis-related proteins were detected by western blot.

Results OGD/R induced apoptosis. Retina I/R caused thinner retinas, RGCs loss and an increase in the number of apoptotic RGCs. A slightly increase in p-AMPK level and a significant upregulation in p-mTOR level were detected by western blot in experimental glaucoma models. Activating AMPK led to the upregulation of p-AMPK, downregulation of p-mTOR and inhibition of apoptosis. I/R induced the loss of RGCs and an increase in the number of apoptotic RGCs, which was markedly relieved by using AMPK activator. Inhibiting AMPK by Compound C reversed the effects, led to the inhibition of p-AMPK, and the upregulation of p-mTOR as well as promoting apoptosis.

Conclusion Activating AMPK attenuates RGCs apoptosis in glaucoma models via inhibiting mTOR. This study suggests that AMPK may be a novel target for glaucoma treatment.

Key Words: Glaucoma; Retinal ganglion cells; Apoptosis; AMP-activated protein kinase

亚太 B3-129-0027

Phyhip-Targeted Delivery of bFGF Platform with Dual Modulation for Enhancing Neurovascular Repair in Traumatic Brain Injury

Weihong Nie, Chunying Shi

Department of School of Basic Medicine, Qingdao University, Qingdao, Shandong Province 266071, China. E-mail: whongnie@163.com

Objectives Traumatic brain injury (TBI), a common emergency in neurosurgery, is characterized by high mortality and disability rates. However, no effective therapeutic strategies are available. Emerging evidence indicates that basic fibroblast growth factor (bFGF) exerts neuroprotective and angiogenic effects in TBI treatment, yet its targeted delivery to injured brain regions remains inefficient.

Methods AcuP-bFGF recombinant protein was constructed via genetic engineering by fusing bFGF with TBI-targeting peptide AcuP. The targeting ability of AcuP was confirmed by Enzyme-linked immunosorbent assay (ELISA) and in vivo imaging assay. Employing Immunoprecipitation-mass spectrometry (IP-MS) identified the interacting proteins with AcuP. Behavioral assessments evaluated motor function recovery in TBI rats. Histological analysis and immunofluorescence staining assessed tissue repair efficacy. RNA-seq and Western blot systematically elucidated molecular mechanisms.

Results Systemic administration of AcuP-bFGF demonstrated selective enrichment in injured brain tissue post-injection. phytanoyl-CoA 2-hydroxylase interacting protein (Phyhip) was identified as the target-interacting protein of AcuP. The engineered AcuP-bFGF system enhanced neuronal survival, accelerated angiogenesis, restored blood-brain barrier (BBB) integrity, and suppressed neuroinflammation, leading to significant motor functional recovery in TBI rats. RNA-seq and Western blot analyses systematically delineated dual mechanisms: activation of the NRG1-ErbB4-AKT neurotrophic axis for tissue regeneration, coupled with inhibition of the cGAS-STING-NFκB inflammatory cascade, thereby achieving synergistic neuroprotection and neuroinflammation modulation.

Conclusion The Phyhip-targeted AcuP-bFGF system represents an innovative TBI therapeutic strategy, leveraging dual neurovascular protection and neuroinflammatory regulation to overcome conventional treatment limitations.



Keywords: Traumatic brain injury, Basic fibroblast growth factor, Phyhip-targeted delivery, Neuroprotection, Neuroinflammation

亚太 B3-129-0028

C1q is essential for myelination in the central nervous system (CNS)

Qiang Yu¹, Ye Song¹, Jiasong Guo², Jiming Kong³

¹ Department of Neurosurgery, Guangzhou Women and Children's Medical Center affiliated to Guangzhou Medical University, Guangzhou, Guangdong Province, China

² Department of Histology and Embryology, School of Basic Medical Sciences affiliated to Southern Medical University, Guangzhou, Guangdong Province, China

³ Department of Human Anatomy and Cell Science, University of Manitoba, Winnipeg, Manitoba, Canada
Qiang Yu Email: 123521461@qq.com

Objectives Myelin sheath in the central nervous system (CNS) is essential for efficient action potential conduction. Microglia, the macrophages in the CNS, are suggested to regulate myelin development. However, the specific involvement of microglia in initial myelination is yet to be elucidated. This study aims to investigate the role of microglia in initial myelination during development.

Methods and Results Here, first, by culturing neural stem cells, we demonstrated that myelin sheath formation only occurred in the presence of a microglia-conditioned medium. Furthermore, the absence of C1q, a microglia-derived factor, resulted in myelination failure in the neural stem cell culture. Additionally, adding native human C1q protein was sufficient to induce myelination in vitro. Finally, in the C1q conditional knockout mouse model (C1q^{FL/FL}: Cx3cr1^{CreER}), C1q deficiency prior to the onset of myelination led to reduced myelin thickness and elevated g-ratio during initial myelination.

Conclusion This study uncovers the pivotal role of microglia-derived C1q in developmental myelination and could potentially pave the way for new therapeutic strategies for treating demyelinating diseases.

All the experimental procedures involving animals were approved by the Bynnatyne Campus Protocol Management & Review Committee at the University of Manitoba. This work was supported by ALS Canada and Brain Canada.

亚太 B3-129-0030

PACAP-PAC1 receptor regulates Excitation/Inhibition balance and PTZ-Induced Seizure Susceptibility

Haoran Zhang,^{1,4} Di Zhu,^{1,4} Jing Wen,¹ Qianyi Li,¹ Yuanpei Mi,¹ Bin Jiang³, Jingjing Duan^{1,2,3}✉

¹Anatomy and Neurobiology, Zhongshan School of Medicine, Sun Yat-sen University, Guangzhou 510080, China;

²Advanced Medical Technology Center, The First Affiliated Hospital, Zhongshan School of Medicine, Sun Yat-sen University;

³ Guangdong Province Key Laboratory of Brain Function and Disease, Zhongshan School of Medicine, Sun Yat-sen University, Guangzhou, 510080 China;

⁴ These authors contributed equally: Haoran Zhang, Di Zhu. email: duanj2@mail.sysu.edu.cn.

Excitation and inhibition balance (E/I balance) is crucial for normal brain function, and its disruption has been linked to several brain disorders. While the significance of activity-regulated transcription in maintaining proper E/I balance is widely recognized, the precise molecular mechanisms



underlying this process and its functional significance remain incompletely understood.

With RNA-seq and CUT&Tag analysis, we have shown that *Adcyap1*, encoding PACAP, exhibits pronounced upregulation associated with neuronal disinhibition. qPCR validation confirmed that *Adcyap1* expression was bidirectionally regulated by neuronal activity. Through stereotaxic injections of PACAP38 or PA-8 to stimulate or block PACAP type 1 receptors (PAC1Rs), we have found that PACAP38 alleviates PTZ-induced seizure, while PA-8 exacerbates the seizure susceptibility.

To investigate the effect of PAC1 receptor signaling on E/I balance at the single-cell level, we treated cultured hippocampal neurons with PACAP38 or PA-8 and found that synaptic homeostatic scaling remained unchanged. However, cell-autonomous knockdown of PAC1Rs using shRNA significantly reduced inhibitory synaptic transmission, leading to a disruption in E/I balance.

Additionally, integrative multi-omics analysis suggested that NPAS4, CBP, and CREB—transcriptional regulators known to bind activity-dependent enhancers of *Adcyap1*—may facilitate the recruitment of RNA polymerase II, thereby enhancing *Adcyap1* transcription.

Collectively, our findings reveal a previously unrecognized role for PAC1 receptor signaling in regulating E/I balance and highlight a mechanistic link between activity-dependent PACAP expression and seizure susceptibility.

亚太 B3-129-0033

PDE1A Downregulation Disrupts Oligodendrocyte Myelination and Promotes Neuropsychiatric-like Behaviors in a Rodent Model

Yanxi Chen, Linya You

Department of Human Anatomy and Histoembryology, School of Basic Medical Sciences, Fudan University, Shanghai, China.

Objectives Oligodendrocyte dysfunction has been increasingly implicated in the pathophysiology of psychiatric disorders, yet the specific contribution of PDE1A gene downregulation in the substantia nigra (SN) remains unclear. This study aimed to investigate the neurobiological and behavioral consequences of PDE1A deficiency in glial cells, with a focus on sex-specific effects and myelination abnormalities.

Methods We employed PDE1A-knockdown murine models alongside behavioral assessments (rotarod, sucrose preference, prepulse inhibition, ultrasonic vocalization) and ultrastructural analyses (electron microscopy). Immunohistochemistry was performed to quantify mature oligodendrocyte populations. Additionally, PDE1A knockdown was conducted in MO3.13 human oligodendrocyte lineage cells to assess molecular changes in myelin-related proteins.

Results PDE1A-deficient mice exhibited significant motor coordination deficits, reduced sucrose preference, and increased mania-like behavior. Male PDE1A-deficient mice showed impaired sensorimotor gating and lower ultrasonic vocalization frequency. Electron microscopy revealed disrupted myelination, including decreased g-ratios and irregular lamellar compaction. Immunohistochemistry indicated a decrease in CC1⁺ mature oligodendrocytes in the substantia nigra. In vitro, PDE1A knockdown in MO3.13 cells resulted in upregulation of CNP and MAG, suggesting compensatory myelination responses.

Conclusion PDE1A gene downregulation in glial cells leads to pronounced psychiatric behaviors and myelination disturbances in the substantia nigra. These findings highlight PDE1A as a pivotal regulator of oligodendrocyte maturation and function, offering new insight into glial contributions to psychiatric comorbidities and potential therapeutic targets.

Key Words: PDE1A, oligodendrocyte, myelination, psychiatric disease.



● 亚太 B3. Synapse, Neuron and Glia ● Poster

ID: 318444

Neuroprotective effect of hydrogen in ALS mice by inhibiting NLRP3 inflammasome activation

YihuiSun
山东第二医科大学

Objectives Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disorder targeting brain/spinal motor neurons. Neuroinflammation and oxidative stress drive ALS pathogenesis. Hydrogen (H_2), with anti-inflammatory/antioxidant effects, shows therapeutic potential in neurological diseases, but its efficacy in ALS remains unclear.

Methods hSOD1G93A mutant ALS transgenic mice and its wild-type litter mate were utilized as animal model. Mice were daily administered hydrogen-releasing magnesium boride nanoparticles (MgB₂) orally at a dose of 0.6 mg/day. Body weight was recorded twice weekly, and motor performance was assessed using the rotarod test. Both groups of mice were euthanized with 1.5% pentobarbital sodium at early (95 days) and late (about 120-125 days), and spinal cord tissue was collected and subjected to RNA sequencing (RNA-seq) and RT-qPCR, Western blot analysis.

Results Oral MgB₂ had no adverse effects on WT mice but delayed body weight loss in ALS mice and partially alleviated motor dysfunction. RNA-seq and GO functional enrichment analysis of spinal cord at end-stage revealed 503 upregulated genes and 485 downregulated genes in MgB₂-treated group versus ALS mice. The downregulated genes were enriched in inflammatory response pathways. RT-qPCR and Western blot analysis confirmed that NLRP3 and Caspase-1 mRNA transcription levels and protein translation levels in the spinal cord were down-regulated in both early and end stage of the disease.

Conclusion MgB₂, a hydrogen-releasing biomaterial, may inhibit NLRP3 inflammasome activation to protect neurons, proposing a novel multitarget therapy for ALS.

Keyword: ALS; Hydrogen molecule; inflammation

ID: 318801

Microglial Fc-epsilon-receptor I gamma of the Spinal Dorsal Horn Mediates Neuropathic Pain

Fan Liu Xiang-sha Yin Xue Wang Tao Wang Bo Yuan Chao Ma
Institute of Basic Medical Sciences Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College

Objective Neuropathic pain is difficult to treat in clinical practice, and the underlying mechanisms are insufficiently elucidated. Previous studies have demonstrated that Fc receptors may be involved in neuropathic pain. Fc-epsilon-receptor I gamma (FcεRIγ) associates with activating Fc-gamma-a-receptor and Fc-epsilon-receptor α chains on the cell surface to form a functional signalling complex and regulate immune responses. However, the mechanisms of FcεRIγ in neuropathic pain (NP) remain to be explored.

Methods Using the NP model of mice with nerve injury (CCI operation), the mechanism of FcεRIγ heterodimers in NP was studied by western blot, immunofluorescence, and pain behaviour.



Results This work first revealed that FcεR1γ was expressed in microglial cells and upregulated in the spinal dorsal horn (SDH) of a mouse model of neuropathic pain. Sciatic nerve injury persistently and significantly increases the protein level of FcεR1γ in the SDH, and knockout of the FcεR1γ-encoding gene Fcer1g in mouse microglia significantly alleviates neuropathic pain and neuroinflammation after nerve injury. Furthermore, overexpression of FcεR1γ in the microglial cells of the SDH by the adeno-associated virus (AAV)-Cx3cr1-Fcer1g-ZsGreen vector evokes pain and neuroinflammation in wild-type mice. These Results indicate that microglial FcεR1γ of the SDH plays an important role in the development of neuropathic pain in chronic constriction injury mice.

Conclusion The findings may provide novel insights into the neuroimmune responses after peripheral nerve injury and suggest potential therapeutic targets for neuropathic pain.

Keyword: Chronic Pain, Central Sensitization, Fcγ receptor

亚太 B3-129-0003

Microglial Fc-epsilon-receptor I gamma of the Spinal Dorsal Horn Mediates Neuropathic Pain

Fan Liu, Xiang-sha Yin, Xue Wang, Tao Wang, Bo Yuan, Chao Ma

Department of Human Anatomy, Histology and Embryology, Institute of Basic Medical Sciences Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College, Beijing 100005, China.

Objective Neuropathic pain is difficult to treat in clinical practice, and the underlying mechanisms are insufficiently elucidated. Previous studies have demonstrated that Fc receptors may be involved in neuropathic pain. Fc-epsilon-receptor I gamma (FcεR1γ) associates with activating Fc-gamma-receptor and Fc-epsilon-receptor α chains on the cell surface to form a functional signalling complex and regulate immune responses. However, the mechanisms of FcεR1γ in neuropathic pain (NP) remain to be explored.

Methods Using the NP model of mice with nerve injury (CCI operation), the mechanism of FcεR1γ heterodimers in NP was studied by western blot, immunofluorescence, and pain behaviour.

Results This work first revealed that FcεR1γ was expressed in microglial cells and upregulated in the spinal dorsal horn (SDH) of a mouse model of neuropathic pain. Sciatic nerve injury persistently and significantly increases the protein level of FcεR1γ in the SDH, and knockout of the FcεR1γ-encoding gene Fcer1g in mouse microglia significantly alleviates neuropathic pain and neuroinflammation after nerve injury. Furthermore, overexpression of FcεR1γ in the microglial cells of the SDH by the adeno-associated virus (AAV)-Cx3cr1-Fcer1g-ZsGreen vector evokes pain and neuroinflammation in wild-type mice. These Results indicate that microglial FcεR1γ of the SDH plays an important role in the development of neuropathic pain in chronic constriction injury mice.

Conclusion The findings may provide novel insights into the neuroimmune responses after peripheral nerve injury and suggest potential therapeutic targets for neuropathic pain.

Key Words: Chronic Pain, Central Sensitization, Fcγ receptor



亚太 B3-129-0009

Gastrodin Mitigates the Ferroptosis of Microglia in Ischemic Stroke

Shi Jinsha, Yang Shuhan, Zhang Xinglin, Gao Yuqing, Dou Xin, Zheng Huixin, Li Juanjuan
Department of Anatomy and Histology & Embryology, Faculty of Basic Medical Sciences, Kunming Medical University, Kunming 650500

Objectives Ischemic stroke (IS) accounts for approximately 80% of all stroke types and ranks as the second leading cause of death worldwide. Recent studies revealed that ferroptosis plays a critical role in the pathogenesis and progression of IS. Gastrodin (GAS), a traditional Chinese herbal compound, exhibits significant neuroprotective effects. This study aims to investigate the effects of GAS on ferroptosis in microglia during IS.

Methods Immunofluorescence staining, RT-qPCR, and Western blot were used to examine the expression changes of ferroptosis-related factors Gpx4, Sat1, and Acsl4, as well as the levels of lipid peroxidation products MDA and 4HNE, in both an in vivo middle cerebral artery occlusion (MCAO) mouse model treated with GAS and in vitro oxygen-glucose deprivation (OGD)-induced BV2 microglial cells. For the MCAO model, mice were anesthetized with isoflurane, and the middle cerebral artery was occluded using a monofilament thread.

Results In the ischemic penumbra of MCAO mice and OGD-induced BV2 microglial cells, the levels of Fe²⁺, MDA, and 4HNE were significantly elevated; the expression of the key ferroptosis factor Gpx4 was markedly reduced, while the expression of Sat1 and Acsl4 was significantly increased. Following GAS treatment, the levels of Fe²⁺, MDA, and 4HNE were significantly decreased, Gpx4 expression was upregulated, and Sat1 and Acsl4 expression was downregulated.

Conclusion GAS alleviates ferroptosis in ischemic stroke.

Keywords: Ferroptosis, gastrodin, ischemic stroke

亚太 B3-129-0010

Neuroprotective effect of hydrogen treatment in ALS mice by inhibiting NLRP3 inflammasome activation

YiHui Sun, SiEn Yan, QiuPeng Yan, YingShuai Wang, HaoYun Zhang (haoyunzh@sdsu.edu.cn)
School of Basic Medicine, Shandong Second Medical University, Weifang 261053, China

Objectives Amyotrophic lateral sclerosis (ALS) is a fatal progressive motor neuron degenerative disease. Neuroinflammation is established contributors to ALS pathogenesis. Hydrogen, with anti-inflammatory/antioxidant properties, exhibits therapeutic potential in neurological disorders, while its effects on ALS remain understudied.

Methods hSOD1^{G93A} transgenic mice (ALS mice) and its wild-type litter mates (WT mice) were used. Mice were orally administered hydrogen-releasing magnesium boride nanoparticles (MgB2) at a dose of 0.6 mg/day starting at 70 d. Body weight, rotarod test were recorded twice weekly. At disease early-stage (95 d) and end-stage (120-125 d), mice were anesthetized with 1.5% pentobarbital sodium (ip), euthanized by cervical dislocation. Spinal cords were collected, then subjected to RNA-seq and RT-qPCR, Western blot analysis.

Results Oral MgB2 had no adverse effects on WT mice but delayed body weight loss in ALS mice and partially alleviated motor dysfunction. In ALS mice, after MgB2 treatment, RNAseq and GO functional enrichment analysis revealed downregulated genes were enriched in inflammatory pathways. RT-qPCR and Western blot confirmed reduced NLRP3 and Caspase-1 mRNA and



protein levels at both time points.

Conclusion This study suggests that MgB2 treatment may exert neuroprotective effects in ALS mice by inhibiting the NLRP3 inflammasome activation. This hydrogen-releasing biomaterial raises new strategy for ALS treatment.

Key Words: ALS; Hydrogen treatment; Magnesium boride nanoparticles; Inflammasome

亚太 B3-129-0015

Presence of microplastics in Alzheimer Disease brains from Brain Bank Donors

Fu Renkui¹, Zhen Chen^{2,3}, Chao Ma^{2,3}

1 Eight-year Medical Doctor Program, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China

2 Department of Human Anatomy, Histology and Embryology, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College, 100005, China

3 National Human Brain Bank for Development and Function, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, School of Basic Medicine, Peking Union Medical College, 25 100005, China

Objectives Microplastics, defined as solid plastic particles ≤ 5 mm in size, are everywhere. With annual production surging, these pollutants have raised great concerns about their potential health implications. Despite numerous studies have detected microplastics in human tissues such as the gastrointestinal tract, liver, lung, blood, and placenta, their presence in the human brain remains a contentious issue.

Methods We employed Pyrolysis Gas Chromatography-Mass Spectrometry (Py-GCMS) to quantitatively analyze microplastic levels in several brain regions (frontal, parietal, occipital, temporal, and cerebellum) from brain bank specimens of Alzheimer's disease (AD) and non-AD donors (n=5 per group).

Results Our analysis revealed the presence of diverse microplastic polymers, including PS, PE, PP, PVC, PET, and PA66, in both AD and non-AD samples, with no statistically significant differences observed between the two groups.

Conclusion Although our findings confirm that microplastics exist within human brain tissue, the impact of their presence on AD pathology remains inconclusive and necessitates further in-depth investigation.

Key words: Microplastics, human brain, neuroscience, pollution



亚太 B3-129-0016

Grape seed proanthocyanidins ameliorate astrocyte injury in progeny under stress during pregnancy through NF-kB pathway

XiaoDan Zhou, Mengci Wang, Siyu Zhang
新疆医科大学

Objective The objective of this study was to investigate whether grape seed proanthocyanidins can alleviate hippocampal astrocyte injury caused by stress during pregnancy and play a protective role in cognitive function.

Methods 2-month-old SD females were selected to mate with males, and the gestational stress model was established by binding stress at 14-21 days of pregnancy, and the pregnant mice were fed proanthocyanidins (dose: 200mg/kg) during the gestational stress. The weight of the offspring was dynamically monitored after the pregnant rats gave birth, and the elevated cross maze, open field and Y maze experiments were performed 60 days after birth, and then the brain and hippocampal tissues of the offspring rats were taken. Firstly, the changes in the number of astrocytes in the hippocampus were detected by flow cytometry, and then the morphology, density and function of astrocytes in the hippocampus were observed by IHC and IF staining. The expression levels of astrocyte markers GFAP, IL-1 β , IL-6, TNF- α and other inflammatory factors and the activation of NF-kB inflammatory pathway in hippocampal tissues were detected by qRT-PCR and Western blotting, and the proanthocyanidins of grape seed were verified to improve the damage of progenital astrocytes caused by stress during pregnancy through NF-kB pathway.

Results The experiments of elevated cross maze, open field and Y maze showed that grape seed proanthocyanidins could improve the cognitive dysfunction of offspring caused by pregnancy stress. Flow cytometry detected that grape seed proanthocyanidins saved the decrease in the number of astrocytes in the hippocampus of the progeny under stress during pregnancy ($P<0.05$), and the Results of IHC and IF staining showed that the morphological complexity and density of astrocytes in the hippocampus of the progeny under stress during pregnancy were reduced, and the proanthocyanidins of grape seed ameliorated the above changes. The expression levels of astrocyte markers GFAP and inflammatory factors and the activation of NF-kB inflammatory pathway in hippocampal tissues were detected by qRT-PCR and Western blotting, indicating that grape seed proanthocyanidins could significantly reduce the damage of hippocampal astrocytes caused by stress during pregnancy, inhibit the overexpression of inflammatory cytokines IL-1 β , IL-6 and TNF- α ($P<0.05$), and inhibit the activation of NF-kB inflammatory signaling pathway ($P<0.05$), thereby improving the cognitive function of the offspring.

Conclusion Grape seed proanthocyanidins play a protective role in improving hippocampal astrocyte injury caused by pregnancy stress through NF-kB pathway

Keywords: grape seed proanthocyanidins; pregnancy stress; Offspring; astrocytes; NF-kB pathway



亚太 B3-129-0020

Demethylase FTO regulates m⁶A modification affecting microglia activation in ALS

HangYu Le^{1,2}, YiHui Sun^{1,2}, SiEn Yan^{1,2}, QiuPeng Yan^{1,2}, Yingjun guan^{1,2}, HaoYun Zhang^{1,2}
(haoyunzh@sdsu.edu.cn)

1 School of Basic Medicine, Shandong Second Medical University, Weifang 261053, China

2 Neurologic Disorders and Regenerative Repair Lab of Shandong Higher Education,
Shandong Second Medical University, Weifang 261053, China

Objectives Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disorder characterized by progressive degeneration of motor neurons, in which the activation of pro-inflammatory microglia exacerbates neuroinflammation. Our previous research observed the dynamic changes of m⁶A epigenetic modification during ALS progression. This study aims to investigate the expression of demethylase FTO in ALS, and the regulatory role of FTO-mediated m⁶A modification in microglial activation.

Methods hSOD1^{G93A} transgenic mice (ALS mice) and wild-type litter mates (WT mice) were anesthetized with 1.5% pentobarbital sodium (ip), then the spinal cords were obtained at 60, 95, 108, 122 d. The expression of FTO and ALKBH5 were detected by RT-qPCR, Western blot, and immunofluorescence. LPS-stimulated hSOD1^{G93A} BV2 cells underwent RNA sequencing. Expression of IL-6/IL-1 β were measured by Western blot. M⁶A modification level and FTO-mediated regulation of Lrp5 mRNA were evaluated using Dot blot, SRAMP prediction, and MeRIP-qPCR. FTO-overexpressing hSOD1^{G93A} BV2 cells were analyzed for polarization, migration, and phagocytosis.

Results Compared with WT mice, FTO/ALKBH5 mRNA/protein levels were unchanged in ALS spinal cords, FTO redistributed from neurons (NeuN⁺) to reactive glia at disease late-stage. LPS stimulated hSOD1^{G93A} BV2 cells showed increased m⁶A modification, repressed FTO expression, and significantly increased IL-6/IL-1 β levels. FTO overexpression in hSOD1^{G93A} BV2 promoted CD206 expression, inhibited IL-6/IL-1 β expression, reduced cell migration, and enhanced phagocytosis. Lrp5 mRNA has m⁶A modification sites, with FTO overexpression markedly reducing Lrp5 methylation.

Conclusion FTO modulates neuroinflammation via m⁶A-dependent microglial activation, with neuroprotection potentially achievable through Lrp5 m⁶A modification. FTO emerges as a novel epigenetic therapeutic target for ALS.

Key Words: ALS; Microglia; N⁶-methyladenosine; FTO; Neuroinflammation



亚太 B3-129-0021

The role and mechanism of CTSD in regulating cholesterol metabolism in motor neuron Degeneration of ALS

Chenchen Wang^{1,2}, Xuemei Wang^{1,2}, Xue Bai^{1,2}, Xue Zhang^{1,2}, Xueshuai Gao^{1,2}, Qiupeng Yan², Jinmeng Liu², Lingyun Zhang², Yingjun Guan^{1,2}, Yanchun Chen^{1,2} (cyc7907@163.com)

1 Department of Histology and Embryology, Shandong Second Medical University, Weifang, 261053, China
2 Neurologic Disorders and Regenerative Repair Lab of Shandong Higher Education, Shandong Second Medical University, Weifang, 261053, China

Objective Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease involving motor neuron degeneration. CTSD (Cathepsin D), a lysosomal aspartic protease, plays a pivotal role in neuronal plasticity. This study aimed to investigate the role and mechanism of CTSD in ALS pathogenesis.

Methods RNA-seq data from ALS mice and hiPSC-derived motor neurons of ALS patients were analyzed using the GEO database. hSOD1^{G93A} ALS mice and WT littermates were anesthetized with sodium pentobarbital, and spinal cords were isolated. Some mice were perfused transcardially, and spinal cord frozen sections were prepared. The expression changes of CTSD in the spinal cord of ALS mice were detected using qRT-PCR, Western blotting, and immunofluorescence. Overexpression of Cttd in hSOD1^{G93A} NSC34 cells was performed for RNA-seq detection and functional enrichment analysis. Cell viability and neurite outgrowth were evaluated via CCK-8 assay and retinoic acid induced differentiation, with rescue experiments using methyl- β -cyclodextrin (M- β -CD).

Results Compared to WT mice, CTSD was significantly upregulated in the spinal cords of ALS mice but downregulated in ALS hiPSC-derived motor neurons. CTSD mRNA and protein levels were increased in hSOD1^{G93A} ALS mice. Immunofluorescence Results demonstrated the expression of CTSD was decreased in neurons but increased in astrocytes. CTSD expression was also decreased in hSOD1^{G93A} NSC34 cells. CTSD overexpression led to cholesterol accumulation, reduced cell viability, and impaired neurite outgrowth. These phenotypes were rescued by M- β -CD.

Conclusion Abnormal expression of CTSD is closely associated with the pathogenesis of ALS. CTSD plays a critical role in ALS motor neuron degeneration by regulating cholesterol metabolism.

Keywords: Amyotrophic lateral sclerosis, CTSD, cholesterol metabolism

亚太 B3-129-0023

Fluoxetine rescues psychological behaviors in a murine PTSD model by alleviating excessive myelin formation

Chenrui Yin^{1#}, Kefei Luo^{1#}, Xinyue Zhu^{1#}, Ronghang Zheng^{1#}, Yu Wang², Guangdan Yu³, Xiaorui Wang¹, Fei Se⁴, Xiaoying Chen¹, Tao Li¹, Jingfei Chen¹, Baduojie Bian⁵, Yixun Su^{1,6*} (suyx27@mail.sysu.edu.cn), Jianqin Niu^{1*} (jianqinniu@tmmu.edu.cn), Yuxin Wang^{1,5*} (125025644@tmmu.edu.cn)

1. Department of Histology and Embryology, Third Military Medical University, Chongqing, China;
2. Department of Respiratory Diseases, Central Medical Branch of PLA General Hospital, Beijing, China;
3. China Astronaut Research and Training Center, Beijing, China;
4. Department of Emergency, the Fourth Medical Center of the Chinese PLA General Hospital, Beijing, China;
5. Army 953 Hospital, Shigatse Branch of Xinqiao Hospital, Third Military Medical University (Army Medical University), Shigatse, China,
6. Research Centre, Seventh Affiliated Hospital of Sun Yat-sen University, Shenzhen, China

Objectives Posttraumatic stress disorder (PTSD) is a complex mental disorder notable for traumatic experience memory. Although current first-line treatments, including prolonged exposure



therapy and cognitive processing therapy, are linked with clinically important symptom reduction, a large proportion of patients retained to experience considerable residual symptoms, indicating pathogenic mechanism should be illustrated further. Recent studies reported that newly formed myelin could shape neural circuit function and be implicated in fear memory preservation. However, its role in PTSD remains to be elucidated.

Methods In this study, we adopted a restraint stress-induced PTSD mouse model and characterized the behaviors in detail by contextual fear conditioning test, elevated plus maze test, forced swimming test, open field test and tail suspension test. In addition, immunohistochemistry and electron microscopy were employed to delineate changes in oligodendroglial lineage and myelin. Furthermore, oligodendrocyte precursor cells were isolated and qPCR was applied to clarify the underlying mechanisms.

Results We found that chronic restraint stress induced PTSD-related neuropsychiatric symptoms, accompanied by increased myelination in the posterior parietal cortex and hippocampus, fear memory-related brain regions. Fluoxetine, but not risperidone or sertraline, has a more profound rescue effect on neuropsychological behaviors and myelin abnormalities. Further mechanistic experiments revealed that fluoxetine could directly interfere with oligodendroglial differentiation by upregulating Wnt signaling.

Conclusion Our data demonstrated the correlation between PTSD and abnormal myelination, suggesting that the oligodendroglial lineage in the central nervous system could be a target for PTSD treatment.

Keywords: PTSD; Fear memory; Myelination; Fluoxetine; Oligodendroglial differentiation; Wnt signaling

亚太 B3-129-0025

Remyelination-oriented clemastine treatment attenuates neuropathies of optic nerve and retina in glaucoma

Kun Liu^{1,2} Yujian Yang^{1,2} Zhonghao Wu² Chunhui Sun³ Yixun Su^{2,3} Nanxin Huang²

Haoqian Wu¹ Chenju Yi³ Jian Ye¹ Lan Xiao² Jianqin Niu²

1.Department of Ophthalmology, Army Specialty Medical Center, Third Military Medical University, Chongqing, China

2.Department of Histology and Embryology, State Key Laboratory of Trauma and Chemical Poisoning, Chongqing Key Laboratory of Neurobiology, Brain and Intelligence Research Key Laboratory of Chongqing Education Commission, Third Military Medical University, Chongqing, China

3.Research Centre, Seventh Affiliated Hospital of Sun Yat-sen University, Shenzhen, China

Objectives As one of the top causes of blindness worldwide, glaucoma leads to diverse optic neuropathies. It is widely accepted that the level of intraocular pressure (IOP) is a major risk factor in human, however, clinical studies show that lowering IOP fails to prevent RGC degeneration in the progression of glaucoma. Thus, a comprehensive understanding of glaucoma pathological process is required for developing new therapeutic strategies. In recent studies, myelin pathologies were found to precede axonal loss in glaucoma. Thus, we wondered whether oligodendroglial cells can act as a new target for developing alternative therapeutic strategies for glaucoma.

Methods In this study, we constructed glaucoma mouse model by injecting microbeads into the anterior chamber. Second, we observed axon degeneration and demyelination by immunohistochemistry. Next, we verified the visual function of mice by electroretinogram (ERG) and visual evoked potential (VEP). Finally, we promoted myelination by treatment with clemastine and observed newly formed myelin by NG2-CreERT; Tau-mGFP mice.

Results 1.Early optic neuropathy precedes retinopathy in the development of glaucoma. 2.Oligodendroglial abnormalities precede axonal defects at the onset of glaucoma.



3. Clemastine promotes oligodendrocyte precursor cell differentiation and remyelination in glaucoma.

4. Clemastine-mediated remyelination improves optic nerve and retinal functional recovery in glaucoma.

Conclusion We have identified an oligodendroglia-related early neuropathological feature of glaucoma in optic nerves and found an available medication for glaucoma treatment, which implies a novel therapeutic strategy for future clinical application.

Key Words: demyelination, oligodendrocyte, oligodendrocyte precursor cell, glaucoma

亚太 B3-129-0029

Neuroprotective Effects of Glial cell line-derived neurotrophic factor in Neonatal Encephalopathy

Xiao-Xing Cai (17817648056@163.com), Ya-Qi Yang, Jing-Juan Li, Ting-Hua Wang. Institute of Neuroscience, Kunming Medical University, Yunnan, 650500

Background Neonatal encephalopathy leads to a severe neuronal damage, and glial cell line-derived neurotrophic factor (GDNF) may exert neuroprotective effects. This study investigates GDNF over expression in Neonatal Encephalopathy.

Methods After neonatal encephalopathy model was established, in rats, GDNF over expression HIV vector was injected into ventricle, neural behavior, morphology including HE and Nissle staining were evaluated. Meanwhile, the effect of GDNF administration was explored in vitro system, indicated by cell vitality and growth state. All data were subjected to statistical analysis.

Results GDNF over expression was improved significantly morphological structure, characterized with elevated with the number of neurons, and ameliorated neural behavior, especially in cognitive function. Administered effect of GDNF in vitro showed a positive increased number for cultured primary cortical neurons and cell vitality, supporting the effect of GDNF for neuronal survival.

Conclusion GDNF over expression contributes to neuroprotection encephalopathy both in vivo and in vitro, which are available to the usage of GDNF in future clinical trial, supporting gene therapy could be considered as a promising strategy for the therapy of neonatal encephalopathy.

Keywords: GDNF over expression; neonatal encephalopathy; neuroprotection; gene therapy

亚太 B3-129-0032

Vitamin D Supplementation Attenuating Chronic Pain Through Suppression of Glial-mediated Neuroinflammation

Shihong Li^a, Song Cao^{b,a,*}

^a Key Laboratory of Anesthesia and Organ Protection of Ministry of Education (In Cultivation), Zunyi Medical University, 149 Dalian Street, Zunyi 563000, Guizhou, China

^b Department of Pain Medicine, The Tenth Affiliated Hospital, Southern Medical University (Dongguan People's Hospital), Dongguan 523059, Guangdong, China

* Corresponding author: caosong4321@163.com

Objective Vitamin D exhibits therapeutic potential for pain management, but the underlying mechanism remains unclear. This study examined vitamin D's inhibitory effects on glia-mediated



inflammation in the spinal dorsal horn.

Methods Seventy-two 7-week-old C57BL/6J mice were randomly divided into six groups (n=12), stratified into two cohorts: a chronic pain group with spared nerve injury (SNI) and a normal control group. Both cohorts received standard, deficient, or high-dose vitamin D diets. Weekly measurements of food intake, body weight, and pain thresholds were recorded from weeks 1-14 post-model induction. Mechanical and thermal pain thresholds were assessed pre-intervention and at weeks 2,4,6,8,10,12,14. Serum 25-hydroxyvitamin D₃ levels were quantified via electrochemiluminescence at baseline, week 6, 12, and 14 using orbital venous plexus sampling. Brain samples were collected for 14 weeks from chronic pain mouse models to assess differential expression of the vitamin D receptor gene. Glial activation markers (IBA1, GFAP/S-100), inflammatory activation marker CD68, and cytokines (IL-1 β , TNF- α) across multiple regions: prefrontal cortex (PFC), nucleus accumbens (NAcc), hippocampus (HIP), basolateral amygdala (BLA), locus coeruleus, and spinal dorsal horn (DH) were localized, and IBA1/CD68 or IL-1 β or TNF- α co-staining identified inflammatory microglial states in examined regions.

Results In non-SNI mice, vitamin D deficiency progressively reduced thermal pain thresholds, reaching significance at 14 weeks versus standard diet (P<0.05), with no mechanical threshold differences. Whereas SNI mice showed amplified effects: deficient groups displayed steeper pain threshold declines, while high-dose vitamin D supplementation increased mechanical thresholds from week 4, peaking at week 6 (P<0.05). The level of VDR mRNA was detected in hippocampus, and vitamin D deficiency increased microglial marker IBA1 fluorescence percentage in the spinal cord, prefrontal cortex, amygdala, nucleus accumbens, locus coeruleus, and hippocampal subregions (DG+CA1, CA3) (P<0.05), and elevated GFAP staining in astrocytes from most brain regions. Co-staining of activation marker CD68 and inflammatory factors (IL-1 β , TNF- α) also increased (P<0.05). High-dose vitamin D supplementation reduced fluorescence percentages and co-localized cell counts both in microglia and astrocytes across all regions compared to the deficient group (P<0.05).

Conclusion Vitamin D-deficient mice exhibited a more pronounced reduction in both thermal and mechanical pain thresholds in an SNI-induced neuropathic pain model. Activation of microglia and astrocytes in the spinal cord, prefrontal cortex, amygdala, nucleus accumbens, locus coeruleus, and hippocampus, concomitant with the significant upregulation of the inflammatory cytokines IL-1 β and TNF- α in these regions underly the possible mechanism, and high-dose dietary supplementation with vitamin D effectively alleviated nociceptive hypersensitivity and neuroinflammation, via suppressing the glia-driving inflammatory mechanism.

Key Words: Vitamin D; Chronic pain; Microglia; Astrocytes; Neuroinflammation

● 亚太 B3. Synapse, Neuron and Glia ● Abstract

亚太 B3-129-0002

Mitochondrial Modification with P-Selectin Binding Peptide: Effects on Mitochondrial Repair after Cerebral Ischemia-Reperfusion Injury

Tong Li¹, Bensi Zhang¹, Chun Shi²

¹ Department of Anatomy, Dali University, Dali, China

² College of Dental Medicine, Western University of Health Science, Pomona, CA, USA

Corresponding author: Chun Shi, email: shiyui431@126.com

Objective This study aims to modify mitochondria with P-selectin binding peptide (PBP) and PEG-



conjugated phospholipid derivative DMPE-PEG (DPP) to assess their concentration, activity, internalization mechanism, and biological safety in vitro.

Methods Mitochondria were extracted, labeled with MitoTracker Red CMXRos, and incubated with HT22 cells to observe internalization. DPP was conjugated to mitochondria and labeled with FITC for fluorescence tracing. The endocytosis pathway was analyzed using Dynasore, a dynamin inhibitor. The effects of exogenous mitochondria on cell viability, mitochondrial complex IV activity, and ATP content were assessed using MTT, Bradford, and ELISA assays, respectively.

Results DPP-modified mitochondria exhibited high membrane potential, intact structure, and strong activity. Fluorescence microscopy confirmed successful modification and internalization via a non-reticulon-mediated endocytosis pathway. Dynasore treatment reduced MitoTracker Red fluorescence, while DPP-modified mitochondria retained fluorescence. DPP-modified mitochondria enhanced mitochondrial complex IV activity, ATP synthesis, and cell viability.

Conclusions DPP-modified mitochondria demonstrate high biocompatibility and effective targeting to ischemic injury sites. Their application enhances mitochondrial repair and function, offering a promising therapeutic strategy.

Keywords: Mitochondria, Cerebral Ischemia, Mitochondrial Repair, P-Selectin Binding Peptide, Ischemia-Reperfusion Injury.

亚太 B3-129-0004

Exosome-derived miR-124 enhances the neuroprotective effect against hypoxic-ischemic brain injury in rats by inhibiting ferroptosis

Yizhen Zhu; Jiaming Chen; Tao Huang; Dong Jiang; Junde Zhu (jdzhu73@126.com)
Department of Anatomy, Guizhou Medical University, Guizhou 561113, China

Objective This study aims to investigate brain tissue injury in rats subjected to hypoxia and ischemia, examining the pathological changes and expression of ferroptosis-related factors following treatment with exosome-derived miR-124 (miR-124). Additionally, to elucidate the protective mechanism of miR-124 against hypoxic-ischemic brain injury (HIBD) through the inhibition of ferroptosis.

Methods A hypoxic-ischemic brain injury model was established using SD rats, followed by intervention with exosome-derived miR-124. Hematoxylin-eosin staining was employed to assess pathological alterations in brain tissue. Neuronal survival was evaluated by Nissl staining. The expressions of glutathione peroxidase 4 (GPX4) and divalent metal ion transporter 1 (DMT1) were quantified using Western blotting, immunohistochemistry, and immunofluorescence techniques. Levels of reduced glutathione (GSH), lactate dehydrogenase (LDH), malondialdehyde (MDA), superoxide dismutase (SOD), and iron content in tissues were measured by ELISA assays. Mouse microglial cell lines (BV2) cultured in vitro were categorized into the control group (Ctrl), oxygen-glucose deprivation group (OGD), ferroptosis induction group (Erastin), ferroptosis inhibition group (Fer-1), miR-124 treatment group, and Erastin + miR-124 combination group. Reactive oxygen species (ROS) levels were assessed utilizing a 2',7'-dichlorodihydrofluorescein diacetate fluorescence probe. The expressions of GPX4 and DMT1 within BV2 cells were analyzed through immunofluorescence staining.

Results Compared to the Sham group, the brain tissue of the HIBD group exhibited significant nerve cell damage, characterized by a decrease in GPX4 expression and an increase in DMT1 expression. Additionally, levels of GSH and SOD were reduced, while LDH, MDA, and iron concentrations were elevated. Following intervention with exosome-derived miR-124, there was an



observed increase in GPX4 expression and a decrease in DMT1 expression compared to the Sham group. Furthermore, GSH and SOD levels increased while LDH, MDA, and tissue iron contents decreased. In BV2 cell experiments, ROS content and GPX4 fluorescence intensity were significantly higher in the OGD group than in the Ctrl group; conversely, DMT1 fluorescence intensity was also markedly elevated. When comparing the miR-124 group to the OGD group, ROS content decreased while GPX4 expression increased alongside a reduction in DMT1 expression.

Conclusion The hippocampal and cortical regions of neonatal HIBD rats exhibit severe damage characterized by decreased GPX4 expression and increased DMT1 expression. These findings suggest that ferroptosis may play a role in neonatal HIBD-related brain injury. Moreover, exosome-derived miR-124 demonstrates neuroprotective effects on both HIBD experimental animal models and BV2 cell injury models through mechanisms involving reduced iron accumulation and diminished ROS production.

Key words: hypoxic-ischemic brain injury; miR-124; ferroptosis; Neuroprotective effect

亚太 B3-129-0005

Nociceptive neuron mitochondrial VDAC1 mediate neuropathic pain via transducing ATP to cytoplasm.

Fengrun Sun, Ning Yu, Bo Yuan, Tao Wang, Chao Ma*(machao@ibms.pumc.edu.cn).
Institute of Basic Medical Sciences Chinese Academy of Medical Sciences, Department of Human Anatomy,
Histology and Embryology. Beijing 100005

Pain arises from abnormal firing of sensory neurons, a process that critically depends on adenosine triphosphate (ATP) as an energy source. ATP is synthesized in mitochondria and transported to the cytoplasm via voltage-dependent anion channel 1 (VDAC1), which is embedded in the outer mitochondrial membrane. The role of sensory neuron VDAC1 involved in neuropathic pain remains unknown. Our western blotting and immunofluorescence Results demonstrated the expression of VDAC1 in the dorsal root ganglion (DRG) of chronic compress injury (CCI) mice model was upregulated, particularly within CGRP⁺, IB4⁺ and TRPV1⁺ sensory neurons. Elevated neuronal VDAC1 expression facilitated ATP translocation from mitochondria to the cytoplasm, as inferred from the increased cytoplasmic ATP concentration following CCI. Whole-cell patch-clamp recordings confirmed that intracellular ATP directly contributed to the generation of action potentials in sensory neurons. Notably, both genetic knock-out and pharmacological inhibition of VDAC1 significantly decreased intracellular ATP levels, reduced sensory neuron excitability, and alleviated mechanical and thermal hypersensitivity in CCI mice. Subsequently, mitochondrial ATP concentration remains unchanged unless VDAC1 is inhibited by DIDS, underscoring its gatekeeping function in ATP translocation between mitochondria and the cytoplasm. These findings identify VDAC1 as a key regulator of ATP dynamics in sensory neurons, elucidating its crucial role in neuropathic pain and providing a potential therapeutic target for pain management.



亚太 B3-129-0006

Differential Microglial Activation in Human Brain Tissues Associates with Alzheimer's Disease Pathology

Xue Wang¹(wxue1003@163.com), Yakun Cao¹, Wei Wu¹, Wenying Qiu¹, Bo Yuan¹, Xiaojing Qian¹
Department of Human Anatomy, Histology and Embryology, Neuroscience Center, Institute of Basic Medical Sciences Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College, Beijing 100005, China

Objectives Microglial activation is crucial in neuroinflammation and neurodegeneration in Alzheimer's disease (AD). However, the specific contributions of different microglial subtypes to AD pathology remain unclear. This study evaluated the differential activation patterns of four microglial markers (IBA1, HLA-DR, CD163, and CD68) in postmortem human brain tissues between AD and control groups.

Methods 22 human brain samples including 11 AD cases and 11 age-matched controls (confirmed by neuropathological assessment according to NIA-AA) were analyzed. Immunohistochemistry (IHC) was performed to quantify the density of microglial subtypes expressing IBA1 (pan-microglial marker), HLA-DR (MHC-II, indicative of antigen presentation), CD163 (anti-inflammatory phenotype), and CD68 (phagocytic activity). Statistical analyses were conducted to compare microglial densities between AD and control groups.

Results IBA1+ microglia were increased in AD compared to controls, but the difference was not statistically significant. CD68+ microglia were significantly elevated in AD brains ($p < 0.01$). HLA-DR and CD163 expression showed no significant differences between groups, though trends toward higher HLA-DR in AD were observed.

Conclusion Our findings suggest that specific microglial subpopulations, particularly phagocytic CD68+ microglia cells, are more prominently activated in AD, implicating their role in disease progression. Further studies are needed to elucidate the functional implications of these microglial phenotypes in AD. (Statement: The study was approved by the Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, Approval Numbers: 009-2014 and 2022125)

Keywords: Alzheimer's Disease, Human Brain Bank, Microglia, Postmortem brain

亚太 B3-129-0007

p53 Lysine-lactylated Modification Contributes to Lipopolysaccharide-induced Proinflammatory Activation in BV2 Cell Under Hypoxic Conditions

Xuechao Fei a, Chao Ma a
a Department of Human Anatomy, Histology and Embryology, School of Basic Medicine, Peking Union Medical College, Beijing, China
e-mail: feixuechao2018@163.com

Objectives p53 has diversity functions in regulation of transcription, cell proliferation, cancer metastasis, etc. Recent studies have shown that p53 and nuclear factor- κ B (NF- κ B) co-regulate proinflammatory responses in macrophages. However, the role of p53 lysine lactylation (p53Kla) in mediating proinflammatory phenotypes in microglia under hypoxic conditions remains unclear.

Methods In the current study, we investigated the proinflammatory activation exacerbated by hypoxia and the levels of p53Kla in microglial cells. BV2 cells, an immortalized mouse microglia cell line, were divided into control, lipopolysaccharide (LPS)-induced, hypoxia (Hy), and LPS-Hy



groups. The protein expression levels of p53 and p53Kla and the activation of microglia were compared among the four groups. Sodium oxamate and mutant p53 plasmids were transfected into BV2 cells to detect the effect of p53Kla on microglial proinflammatory activation.

Results LPS-Hy stimulation significantly upregulated p53Kla levels in both the nucleus and the cytoplasm of BV2 cells. In contrast, the p53 protein levels were downregulated. LPS-Hy stimulation upregulated phosphorylated p65 protein levels in nuclear and activated the NF- κ B pathway in BV2 cells, resulting in increased expression of pro-inflammatory cytokines (iNOS, IL6, IL1 β , TNF α), enhanced cell viability, and concomitantly, increased cytotoxicity.

Conclusion p53 lysine-lactylated modification contributes to LPS-induced proinflammatory activation in BV2 cells under hypoxia through NF- κ B pathway and inhibition of lactate production may alleviate neuroinflammatory injury.

Keywords: Neuroinflammation, Lactylation, p53, Microglia, Hypoxia

亚太 B3-129-0008

Hormone Withdrawal Induced PPD in Mice: Behavioral and Molecular Insights from mPFC c-Fos and RNA-seq analysis

Xiaojiao Han ^a, Ruxuan Ding ^a, Bingqing Chen ^a, Guoxin Cao ^a, Tianhao Liu ^a, Zhengzhong Yang ^a, Duo Chen ^a, Ying Tang ^b, Shizhu Sun ^b, Yixin Fu ^b, Rao Fu ^a

^a Department of Anatomy, School of Medicine, Shenzhen Campus of Sun Yat-sen University, Sun Yat-sen University, Shenzhen, Guangdong 518106, PR China

^b Basic and Clinical Medicine Teaching Laboratory, School of Medicine, Sun Yat-sen University, Shenzhen, Guangdong 518100, PR China

Objectives Postpartum depression (PPD) represents a significant mental health challenge with profound effects on maternal well-being and infant development. Affecting an estimated 10-20% of women after childbirth, PPD is characterized by persistent low mood, anhedonia, and impaired maternal-infant bonding, leading to long-term consequences for both mother and child. This study investigates the neurobiological mechanisms underlying PPD using a hormone withdrawal model in mice, focusing on behavioral changes and molecular alterations in the mPFC.

Methods We established a hormone-withdrawal-induced PPD model in female C57BL/6J mice through ovariectomy (OVX) followed by hormone treatment, high-dose estradiol, and vehicle injections to induce withdrawal. Behavioral assessments (OFT, EPM, TST, FST, SPT, and TOR) were performed 5 days post-withdrawal. mPFC c-Fos expression and RNA-seq were used for molecular analysis.

Results Hormone withdrawal in PPD mice induced anxiety, depression-like behaviors, and cognitive deficits, as evidenced by reduced exploratory behavior in the Open Field Test, less time spent in open arms in the Elevated Plus Maze, prolonged immobility in the Tail Suspension and Forced Swim Tests, anhedonia in the Sucrose Preference Test, and cognitive impairment in the Temporal Object Recognition Test.

Analysis of c-Fos expression in the mPFC revealed significant reductions across all three subregions (cingulate cortex [Cg], prelimbic cortex [PrL], and infralimbic cortex [IL]), suggesting decreased neuronal activity. RNA-seq revealed downregulation of immune response genes (e.g., Mmp12, S100a9, S100a8) indicating neuroinflammation, and neurotransmission-related genes (e.g., Dbh, Gabrr3) suggesting disturbances in the adrenergic and GABAergic systems. Conversely, genes involved in cell repair (e.g., Exo1, Cdc20) were upregulated, which may reflect impaired neuronal repair.

Furthermore, volcano plot analysis identified Plin4 as the most significantly upregulated gene. Plin4 is a lipid droplet protective protein typically observed in astrocytes. Considering additional DEGs related to synaptic plasticity, this upregulation suggests a disruption in lipid metabolic



communication between neurons and astrocytes, potentially altering astrocytic synaptic structure and affecting neuronal excitability.

Conclusion These findings highlight the role of neuroinflammation, impaired neuronal repair, and disrupted neurotransmission in the development of postpartum depression. The reduced c-Fos expression in mPFC subregions and the gene expression changes provide valuable insights into the molecular mechanisms underlying PPD. Notably, the marked upregulation of Plin4 suggests that astrocyte-neuron lipid metabolic dysfunction may further contribute to synaptic structural changes and neuronal excitability deficits. Future research will further explore these pathways to identify potential therapeutic targets for PPD.

Keywords: postpartum depression, Hormone withdrawal, mPFC, RNA-seq, Plin4

亚太 B3-129-0011

Cannabidiol improves traumatic brain injury by activating autophagy through the PI3K/AKT/mTOR signaling pathway

Yan Cao, Xinyuan Luo, Aiping Yin, Hengxi Li, Hongyan Jiang, Haiying Wu, Ping Li (liping@kmmu.edu.cn)
Department of Human Anatomy and Histology & Embryology, Kunming Medical University, Kunming 650500;
Department of Emergency and Intensive Care Unit, the First Affiliated Hospital, Kunming Medical University.

Objectives Exploring the effects of cannabidiol (CBD) on autophagy after traumatic brain injury (TBI) and whether its neuroprotective effects involve the PI3K/AKT/mTOR pathway.

Methods The Feeney free-fall method was used to establish a TBI rat model. Neurological deficits and anxiety levels were assessed via modified neurological severity score, open field test and light-dark box test. The distribution of LC3 in neurons, microglia and astrocytes were detected by immunofluorescence staining. The mechanical scratch injury method was used to establish PC12 cell injury model. The protein expression of autophagy factors LC3, Beclin1, and P62, as well as pathway factors p-PI3K/PI3K, p-AKT/AKT, and p-mTOR/mTOR was detected in brain tissues and PC12 cells by western blot assay. The PI3K inhibitor LY294002 was used to explore CBD's mechanism.

Results CBD improved neurological function and reduced anxiety in TBI rats. LC3 was co-expressed with neuronal marker NeuN, but not co-expressed with microglia marker Lectin and astrocyte marker GFAP. Protein expression of LC3 and Beclin1 was increased in TBI rat brain tissue and injured PC12 cells, while P62 levels were decreased, and the ratios of p-PI3K/PI3K, p-AKT/AKT, and p-mTOR/mTOR were decreased. CBD treatment further increased the expression of LC3 and Beclin1, and decreased the expression of P62, and up-regulated the signalling pathway factor ratios. LY294002 reversed the effects of CBD on autophagy.

Conclusion CBD can further promote TBI-induced cellular autophagy, which may exert neuroprotective effects through the PI3K/AKT/mTOR signaling pathway.

Key Words: autophagy; cannabidiol; PI3K/AKT/mTOR; traumatic brain injury



亚太 B3-129-0012

Sestrin2/GPX4-mediated ferroptosis suppression in traumatic brain injury recovery

Yitong Li, Sujuan Liu, Heng Shao

Dept. Of Human Anatomy, Basic Medical College, Tianjin Medical University, Tianjin, China, shaoh@tmu.edu.cn

Objectives Ferroptosis is a novel form of programmed cell death that is considered a pathophysiological mechanism of traumatic brain injury (TBI). Glutathione peroxidase 4 (GPX4) is an antioxidant enzyme and is important role in ferroptosis. Sestrin2 is a highly conserved stress-induced protein. This study aims to investigate whether Sestrin2 inhibits ferroptosis after TBI by activating GPX4.

Methods The TBI mice model was established using a heavy object dropping device. The animals were immobilized with stereotactic devices and anesthetized by intraperitoneal injection of tribromoethanol. In brief, the brain was injured by a free-fall apparatus weighing 20g and standing 30cm tall. The neurobehavioral tests were performed on animals. PC12 cells were scratched to simulate TBI in vitro and then treated by overexpression of sestrin2. Finally, mice were euthanized by spinal dislocation and the brain tissues were collected. Related proteins of ferroptosis, oxidative stress, and inflammatory factors were detected.

Results Compared with the sham group, TBI mice had higher mNSS scores and more severe nerve defects. The upregulation of GPX4, 4-HNE, and Nrf2 protein expression indicates the occurrence of ferroptosis and oxidative stress after TBI, while the sestrin2 protein expression significantly decreases. The overexpression of sestrin2 in vitro led to a reduction in the levels of ferroptosis, oxidative stress and factors associated with inflammation. Sestrin2 may inhibit ferroptosis by activating GPX4 activity and alleviate oxidative stress and inflammation, thereby improving TBI.

Conclusion Sestrin2/GPX4 may mediate ferroptosis suppression in TBI recovery, which maybe a new prevention and treatment strategies for TBI.

Key Words: Ferroptosis, Neuron, Sestrin2, Traumatic brain injury

亚太 B3-129-0013

Deficient epoxyeicosatrienoic acids (EETs) signaling in the LHb contributes to microglia activation and alcohol withdrawal-induced negative affective states

Jiawei Hou ^a, Tianhao Liu ^a, Bingqing Chen ^a, Guoxin Cao ^a, Xiaojiao Han ^a, Zhengzhong Yang ^a, Duo Chen ^a, Ying Tang ^b, Shizhu Sun ^b, Yixin Fu ^b, Rao Fu ^a

^a Department of Anatomy, School of Medicine, Shenzhen Campus of Sun Yat-sen University, Sun Yat-sen University, Shenzhen, Guangdong 518106, PR China

^b Basic and Clinical Medicine Teaching Laboratory, School of Medicine, Sun Yat-sen University, Shenzhen, Guangdong 518100, PR China

Objectives Alcohol use disorders (AUDs) often co-occur with mood disorders, but the underlying mechanisms remain elusive. This study aimed to investigate whether epoxyeicosatrienoic acids (EETs) deficiency induced by chronic alcohol exposure drives microglial activation in the lateral habenula (LHb) via the NF-κB pathway, thereby contributing to anxiety- and depression-like behaviors during alcohol withdrawal.

Methods Adult male Long-Evans rats were trained to consume alcohol for over twelve weeks.



Behavior test to analyses rats Anxiety- and depression-like behaviors. Immunohistochemistry was performed to assess microglial activation markers (CD68)、EETs synthases、p-p65 expression in the LHb . qPCR and Elisa were used to assess Pro-inflammatory cytokines (TNF- α , IL-1 β , IL-6, iNOS) level. Targeted metabolomics studies to elucidates metabolic perturbations in Post-EtOH Rats. Pharmacological interventions were used to regulate microglial activation、EETs hydrolase , 14,15-EET, 11,12-EET level, and use Western blotting assay to evaluate their effects on NF- κ B signaling.

Results Post-EtOH rats showed anxiety- and depression-like behaviors, increased the LHb microglial activation, elevated pro-inflammatory cytokines, and reduced EETs levels (14,15-EET, 11,12-EET) alongside decreased CYP2J and CYP2C isoforms. Intra-LHb minocycline attenuated microglial activation, cytokine release, and ethanol intake. TPPU and 14,15-EET (but not 11,12-EET) suppressed NF- κ B activation, microglial morphological changes, CD68 expression, cytokine release, and abnormal behaviors. Conversely, 14,15-EET induced NF- κ B activation, microglial activation, and negative affective states.

Conclusion Collectively, our findings suggest chronic alcohol exposure-induced EETs deficiency might drive microglia activation in the LHb via NF- κ B signaling pathway, leading to negative affective states associated with alcohol withdrawal. Targeting EETs, NF- κ B, or microglia activation may be beneficial for AUD individuals.

Keywords: Lateral habenula; Microglia activation; Epoxyeicosatrienoic acids; Alcohol use disorder

亚太 B3-129-0018

Cannabidiol inhibits ferroptosis after traumatic brain injury via the Nrf2-GPX4 signaling pathway

Li Hengxi, Cao Yan, Jiang Hongyan, Luo Xinyuan, Zhang Leyu, Zhu Yiwei, Guo Xiaobing, Li Ping
(liping@kmmu.edu.cn)

Department of Human Anatomy and Histology & Embryology, Kunming Medical University, Kunming 650500

Objectives To investigate whether cannabidiol (CBD) regulates ferroptosis following traumatic brain injury (TBI) in rats via the Nrf2-GPX4 signaling pathway.

Methods Forty adult Sprague-Dawley rats were randomized into Sham, TBI + vehicle, TBI + CBD, and TBI + CBD + ML385 groups (n=10). TBI rat model was induced using a modified Feeney's weight-drop model under 2% pentobarbital anesthesia (2 ml/kg, i.p.). Neurological function were performed using the modified neurological severity score (mNSS), open field, and elevated plus-maze test. Histopathological analyses (HE, Nissl, Perl's staining) were performed to observe hippocampal neuronal morphology and iron deposition. Immunofluorescence staining was used to examine the fluorescence intensity of NeuN, GPX4, and Nrf2 in the hippocampus. Transmission electron microscopy was employed to assess mitochondrial ultrastructure, and molecular analyses (Western blotting, RT-qPCR, molecular docking) were conducted.

Results The mNSS scores and anxiety levels of TBI rats were significantly increased. Hippocampal neurons exhibited structural damage accompanied by prominent iron deposition. Mitochondrial ultrastructure exhibited ferroptotic alterations, including shrinkage, reduced dimensions, and intensified matrix electron density. Expression of Nrf2 and GPX4 were significantly downregulated. Molecular docking confirmed strong binding affinity between CBD and both GPX4 and Nrf2. CBD intervention ameliorated neurological deficits, abnormal behaviors, iron accumulation, and mitochondrial integrity, while upregulating Nrf2 and GPX4 expression. These protective effects were attenuated upon Nrf2 inhibition by ML385.

Conclusion CBD inhibits ferroptosis in TBI rats through the Nrf2-GPX4 pathway, thereby exerting neuroprotective effects and alleviating secondary pathological damage.



Keywords: traumatic brain injury, cannabidiol, ferroptosis, Nrf2-GPX4 signaling pathway.

亚太 B3-129-0019

CBD Attenuates Methamphetamine-Induced Neurotoxicity via Modulation of the PI3K/AKT/mTOR Signaling Pathway

Aiping Yin ,Yan Cao ,Hengxi Li , Xinyuan Luo , Hongyan Jiang , Haiying Wu , Ping Li (liping@kmmu.edu.cn)

Department of Anatomy and Histology&Embryology, Faculty of Basic Medical Sciences, Kunming Medical University, Kunming China, Emergency Department, the First Affiliated Hospital of Kunming Medical University, Kunming China.

Objective Methamphetamine (METH) is a potent central nervous system stimulant, and chronic abuse leads to severe neurotoxicity. To date, no effective therapeutic drugs are available for clinical use. Cannabidiol (CBD) has been shown to exert protective effects against drug-induced neurotoxicity. Therefore, this study aimed to establish an in vitro model to investigate the effect of CBD on autophagy in hippocampal neurons and determine whether its mechanism involves regulation of the PI3K/AKT/mTOR signaling pathway.

Methods An in vitro METH-induced cell toxicity model was established and divided into five groups: Control, METH, METH + CBD, PI3K inhibitor control (METH + LY294002), and PI3K inhibitor group (METH + CBD + LY294002). This experimental design was used to explore how CBD modulates METH-induced autophagy in HT22 cells via the PI3K/AKT/mTOR pathway.

Results The Results of immunofluorescence and immunoprotein blotting experiments indicated that the expression levels of autophagy factors LC3 and Beclin-1 increased after METH treatment, while the expression level of P62 decreased. The cell morphology showed obvious pathological damage. After CBD intervention, the molecular levels of LC3 and Beclin-1 further increased, and the expression of P62 and the cell morphology were improved. The related pathway factors decreased after METH treatment and increased after CBD intervention. The above situations were reversed after using inhibitors. The Results indicated that CBD exerted neurotoxicity inhibition by increasing autophagy, and the use of pathway inhibitors suggested that this pathway was related to CBD's neuroprotective effect.

Conclusion CBD exerts neuroprotective effects by promoting autophagy in hippocampal neurons exposed to METH, and this protective mechanism is mediated through modulation of the PI3K/AKT/mTOR signaling pathway.

Key words: Methamphetamine; Cannabidiol; Hippocampal neurons; Autophagy; PI3K/AKT/mTOR signaling pathway



亚太 B3-129-0031

Chronic pain induces neuronal injury in locus coeruleus associated with microglia derived neuroinflammation

Renyan Liu^a, Song Cao^{b,a,*}

^a Key Laboratory of Anesthesia and Organ Protection of Ministry of Education (In Cultivation), Zunyi Medical University, 149 Dalian Street, Zunyi 563000, Guizhou, China

^b Department of Pain Medicine, The Tenth Affiliated Hospital, Southern Medical University (Dongguan People's Hospital), Dongguan 523059, Guangdong, China

* Corresponding author: caosong4321@163.com

Objective Chronic pain seriously affects the quality of life and is challenging to treat. The ascending and descending pathways of locus coeruleus (LC), which can be inactivated in chronic pain, are involved in pain regulation, however, the specific mechanisms are unknown. This study aims to elucidate the role of microglial activation in the damage to LC neurons induced by chronic pain, using a model of chronic pain.

Methods The spared nerve injury (SNI) animal model of chronic pain with selective sciatic nerve branch injury and sham-operated mice were constructed. After the pain threshold of the SNI mice stabilized, the measurements were performed every two weeks for a total duration of 16 weeks. The changes in the expression of the microglial marker ionized calcium-binding adapter molecule 1 (IBA1) and tyrosine hydroxylase (TH)-positive neurons in the LC of the Sham group and SNI mice, and the co-expression of IBA1 with tumor necrosis factor- α (TNF- α), interleukin-1 β (IL-1 β), and NF- κ B/NLRP3 signaling pathway were detected by immunofluorescence staining. Enzyme-linked immunosorbent assay (ELISA) was used to detect the expression levels of IL-1 β , TNF- α , and norepinephrine (NE) in the LC. Western Blot was used to detect the expression of proteins related to the NF- κ B/NLRP3 signaling pathway. NLRP3 inhibitors and NF- κ B inhibitors was administered with intracerebral cannulation to block the NF- κ B/NLRP3 pathway.

Results Compared to the Sham group, the mechanical withdrawal threshold (MWT) and thermal withdrawal latency (TWL) in the SNI group significantly decreased starting from the first week post-surgery, and the pain sensitivity remained stable for 16 weeks. Compared to the Sham group and the SNI group at 2 weeks, the fluorescence area (%) of IBA1 in the LC of the SNI group at 8, 12, and 16 weeks significantly increased. Compared to the Sham group and the SNI group at 2 and 4 weeks, the number of TH-positive neurons in the LC of the SNI group at 12 and 16 weeks significantly decreased. Overlapping fluorescence of IBA1 with NLRP3, NF- κ B p65, and Caspase-1 was detected. Compared to the Sham group and the SNI group at 2 weeks, the number of cells co-stained with IBA1 and NLRP3, NF- κ B p65, or Caspase-1 in the LC of the SNI group significantly increased at 8, 12, and 16 weeks, suggesting that microglial activation during chronic pain may be related to the NF- κ B/NLRP3 signaling pathway. Compared to the Sham group and the SNI group at 2 weeks, the NE levels in the LC of the SNI group decreased at 8 weeks and significantly decreased at 12 and 16 weeks. In addition, the expression of TNF- α in the LC of the SNI group increased at 4 weeks and significantly increased at 8, 12, and 16 weeks. The expression of IL-1 β increased at 8 weeks and significantly increased at 12 and 16 weeks. Overlapping fluorescence of IBA1 with TNF- α and IL-1 β in LC was detected. Compared to the Sham group and the SNI group at 2 weeks, the number of cells co-stained with IBA1 and TNF- α or IL-1 β in the LC of the SNI group significantly increased at 8, 12, and 16 weeks. Western blot showed that compared to the Sham group, the expression levels of NLRP3, p-NF- κ B p65, and Cleaved Caspase-1 in the LC of the SNI group increased, indicating that chronic pain may be associated with the NF- κ B/NLRP3 signaling pathway. Lastly, after seven consecutive days of inhibiting the NF- κ B/NLRP3 signaling pathway in the LC, the pain threshold in the SNI group mice was alleviated and the reduction in NE levels and the increase in inflammatory factors in the LC caused by chronic pain were mitigated.

Conclusion Chronic pain causes a gradual reduction of noradrenergic neurons in the LC of mice, and the activation of microglia and the inhibition of NF- κ B/NLRP3 signaling pathway may alleviate microglia-derived neuroinflammation in the LC, therefore attributing to mitigation of chronic pain.



Key Words: Locus coeruleus; Chronic pain; Microglia; Neuroinflammation; Norepinephrine

● 亚太 B4. Neurodevelopment ● Podium

ID: 318244

Investigation into the Drainage Route of Cerebrospinal Fluid in Teleost Fish

Chen Yitong
Yokohama City University

The circulation of cerebrospinal fluid is important for physiological metabolism. But unlike mammals, the ventricular system of bony fish is relatively primitive. There is no cerebrospinal fluid (CSF) in the perimeningeal space outside the ventricle, and the drainage pathway of CSF is unclear. MS 222 is used for anesthesia of goldfish models, injection of rhodamine dextran amine into the ventricular cavity for labeling and analysis combined with immunostaining and plate reader. Scanning electron microscope (SEM) is used to observe the surface structure of fish medullary membrane, and transmission electron microscope (TEM) is used to analyze the special brain tissue of fish. Although the CSF that fills the ventricles in goldfish and the fluid contained in the perimeningeal space have different compositions, they are connected by a structure similar to the median foramen. Injected rhodamine was also found locally around blood vessels in the brain parenchyma, suggesting that goldfish have an excretion pathway that is very similar to the mammalian lymphatic system. The study of CSF metabolism in teleost fish has great reference value for the development and pathophysiology of human central nervous system.

Keyword: cerebrospinal fluid outflow, medullary membrane, teleost fish

ID: 320080

Changes of Cerebellar Cortex in a Valproic Acid-induced Rat Model of Autism

Asst. Professor Meltem Alpay¹ Professor Dr. Ferruh Yücel²
1.Tayyip Erdoğan University, Faculty of Medicine, Rize, Türkiye
2.Eskişehir Osmangazi University, Faculty of Medicine, Eskişehir, Türkiye

Objective Valproic acid (VPA) is used as an antiepileptic and mood-stabilising drug in humans, but when taken during the pregnancy, it causes serious neurological problems for the baby's development such as autism spectrum disorder (ASD) and lifelong learning difficulties. It was aimed to investigate the histopathological effects of VPA on the critical days for the development of cerebellar cortical neurons of male rat pups from VPA exposed mothers.

Methods Pregnant rats were exposed to valproic acid (600 mg/kg) at E15 or at E15 and (PN11) days. After the birth, 30-day-old rat pups were anesthetized by ketamine and xylazine and then sacrificed by intracardiac perfusion with phosphate-buffered saline/glutaraldehyde solution and the cerebellum of these pups were examined by using some unbiased stereological methods.

Result In both experimental groups, the numerical density of granule cells increased significantly, while the numerical density of Purkinje cells decreased significantly compared to the corresponding



ng controls. On the other hand, the numerical density of synapses and the synapse-to-neuron ratio decreased dramatically in both experimental groups compared to the corresponding controls.

Conclusion Administration of valproic acid to the pups in the prenatal or early postnatal days causes changes in the number of neurons and synapses in the cerebellum of the 30-day-old rat pups. Reduced densities of Purkinje cells and synapses may lead to delays in critical motor reflexes in children and learning impairment in tonic complex motor tasks in adults with ASD.

Keyword: Keywords: Autism, Cerebellar cortex, Stereology, Valproic acid (VPA)

ID: 320621

Mossy Fiber Expression of α SMA in Human Hippocampus and its Relevance to Brain Evolution and Neuronal Development

Zhongping Sun Xiao-Lu Cai Tian Tu
Central South University

Objectives α -Smooth muscle actin (α SMA) is best characterized as the building block of thin filaments in smooth muscle cells. We observed a clear α SMA immunolabeling in adult human hippocampal mossy fibers (MF), prompting us to explore this novel pattern in phylogenetic and ontogenic perspectives.

Methods We employed immunolabeling techniques to analyze the presence of α SMA in the hippocampal MF of human from fetuses to elderly, as well as in mice, rats, guinea pigs, cats, and Rhesus monkeys. The expression of α SMA was examined in cultured human and rat primary neurons in vitro. Using western blot, we examined α SMA protein levels in different human brain regions.

Results Through immunolabeling, we α SMA occurred distinctively at the hippocampal MF terminals in humans from infancy to elderly. Hippocampal MF α SMA immunolabeling was not observed in mice and rats, visible in CA3 in guinea pigs and cats, and prominent in CA3 and dentate hilus in Rhesus monkeys. MF α SMA immunolabeling in human hippocampus emerged and refined from the last gestational trimester to early infancy. A transient overall neuronal labeling of α SMA was observed in prenatal human brains. α SMA expression was detected in human and rat primary neuronal cultures. We detected a higher α SMA protein level in dentate gyrus lysates relative to other human brain areas.

Conclusion A novel α SMA expression in human hippocampal mossy fibers persists lifelong from early childhood. This pattern is related to hippocampal evolution among mammals and involves a refinement of neuronal α SMA expression during brain development.

Keyword: Actin isoforms, Brain development, Mammalian evolution, Synaptoplasticity, Trisynaptic circuit



亚太 B4-129-0001

Neuroprotective effects of cordycepin in the aluminium chloride induced neurodevelopmental toxicity and locomotor disorders in zebrafish embryos

Hongmei Hu^{a,b,d1}, Guanghua Xiong^{b,c,1}, Fasheng Liu^{a,b,1}, Yanqi Lin^b, Chao Chen^{a,b,d}, Yuhua Zuo^{a,b,d},
Guilan Chen^b, Wei Li^{a,b}, Xinjun Liao^{a,b}, Zigang Cao^{a,b}, Jianjun Chen^{a,d,e*}, Huiqiang Lu^{f**}

^a Affiliated Hospital of Jinggangshan University, Ji'an, 343009, Jiangxi, China.

^b Jiangxi Key Laboratory of Developmental Biology of Organs, Jiangxi Engineering Laboratory of Zebrafish Modeling and Drug Screening for Human Diseases, Clinical Research Center of Affiliated Hospital of Jinggangshan University, Jinggangshan University, Ji'an, 343009, Jiangxi, China

^c College of Biology and Food Engineering, Key Laboratory of Embryo Development and Reproductive Regulation of Anhui Province, Fuyang Normal University, Fuyang, 236041, Anhui, China

^d Birth defect group, Translational Research Institute of Brain and Brain-like Intelligence, Shanghai Fourth People's Hospital, Department of Epidemiology, School of Public Health, School of Medicine, Tongji University, Shanghai 200434, China.

^e Department of Epidemiology, School of Public Health, School of Medicine, Tongji University, Shanghai, China.

^f Center for Clinical Medicine Research, First Affiliated Hospital of Gannan Medical University, Ganzhou 341000, Jiangxi Province, China

¹ These authors contributed equally to this work.

Objectives Explore the neuroprotective effect of cordycepin on aluminum trichloride (AlCl₃)-induced neurotoxicity in zebrafish and the related molecular mechanisms, and evaluate its potential as a potential drug for treating neurodevelopmental abnormalities.

Methods Using behavioral, molecular biological and omics Methods to study the effects of low-dose AlCl₃ exposure on zebrafish embryo development (body length, heart rate) and larval locomotor behavior; analyzing the gene expression profile changes of zebrafish embryos after co-treatment with cordycepin and AlCl₃ by RNA-Seq sequencing, and using KEGG and GO enrichment analysis to determine related pathways; Through pharmacological experiments, observing the effect of IWR-1 inhibiting the Wnt signaling pathway on the neuroprotective effect of cordycepin.

Results Low-dose AlCl₃ exposure leads to shortened body length and decreased heart rate of zebrafish embryos and motor disorders in larvae. Cordycepin has a significant neuroprotective effect on AlCl₃-induced behavioral disorders in zebrafish embryos and can alleviate abnormal neurodevelopment. RNA-Seq sequencing found that 605 genes were significantly upregulated and 241 genes were significantly downregulated. KEGG and GO enrichment analysis showed that defense and inflammatory response pathways were significantly enriched. Pharmacological experiments showed that IWR-1 inhibiting the Wnt signaling pathway can significantly weaken the neuroprotective effect of cordycepin.

Conclusion phrases as 'the significance of the findings will be discussed'), AlCl₃ may induce neurotoxicity. Cordycepin shows significant neuroprotective effects in zebrafish and is expected to become a potential drug for treating abnormal neural development in the future.

Key Words: Cordycepin; aluminum chloride; neurotoxicity; neuroprotective effects; behavior disorders; zebrafish;



亚太 B4-129-0002

Neuroprotective Mechanisms of Cannabidiol in Traumatic Brain Injury: Targeting CaMKK2-Mediated Oxidative Stress and Mitochondrial Preservation

Hongyan Jiang, Hengxi Li, Yan Cao, Xinyuan Luo, Aiping Yin, Haiying Wu, Ping Li (liping@kmmu.edu.cn)
Department of Human Anatomy and Histology & Embryology, Kunming Medical University, Kunming 650500;
Department of Emergency and Intensive Care Unit, the First Affiliated Hospital, Kunming Medical University.

Objectives The study aims to elucidate the neuroprotective mechanisms of CBD in traumatic brain injury (TBI) with a specific focus on its dual regulatory effects through oxidative stress suppression and mitochondrial function preservation.

Methods To explore the mechanism of CBD targeting Camkk2 to ameliorate neurological injury after TBI by integrating proteomics, molecular docking, molecular dynamics, morphology, molecular biology, and behavioral experiments.

Results Proteomics identified Camkk2, a protein closely associated with nerve injury and oxidative stress. WB and RT-PCR showed Camkk2 was significantly decreased after TBI (* $P < 0.05$, ** $P < 0.01$). By molecular docking and molecular dynamics, it showed CBD can target on Camkk2, and CBD can increase the expression of Camkk2 after TBI (* $P < 0.05$, ** $P < 0.01$). By inhibiting Camkk2, and it was found that CBD can target Camkk2 to inhibit oxidative stress and reduce mitochondrial damage (* $P < 0.05$, ** $P < 0.01$) and reduce the volume of brain tissue defects and neuronal apoptosis, improve the scores of neurological deficits caused by TBI (* $P < 0.05$, ** $P < 0.01$), according to the analysis of brain tissue defects, morphology and behavior after TBI.

Conclusion CBD exerts protective effects by targeting Camkk2 to attenuate oxidative stress and mitochondrial damage, which provides novel therapeutic target for TBI management. This study has been approved by the Animal Experiment Ethics Review Committee of Kunming Medical University, with the code kmmu20241649. And it was supported by Yunnan Fundamental Research Projects (Grant No. 202501AS070026) and Study on the Neuroprotective Mechanism of Novel Nano-chitosan Carrying Cannabidiol, a Natural Plant Extract from Yunnan, with support for Traumatic Brain Injury.

● 亚太 B4. Neurodevelopment ● Poster

ID: 320243

The Evolution of Trigeminal Ganglion in Adults: A High-Resolution MRI Study

Wenli Wang Xinyu Du Lifeng Yu Han Meng Bingqi Xu Ruiyang Wang Ping Wang Dudu Wu
Tarim University School of Medicine

Objective The evolution of the trigeminal ganglion (TG) across adulthood is poorly understood. This study characterizes age- and sex-related changes in TG morphology.

Methods We retrospectively analyzed high-resolution magnetic resonance images from 200 adult patients, stratified by age into seven groups: ≤ 30 , 30s, 40s, 50s, 60s, 70s, and ≥ 81 years. Using HOROS software, multiplanar reconstructions were created, and TG cross-sectional areas were manually measured.

Results After excluding scans with artifacts, 146 patients were analyzed. Males had a larger TG area ($80.13 \pm 23.75 \text{ mm}^2$) than females ($74.47 \pm 22.77 \text{ mm}^2$). In males, TG area varied minimally with age, but the left TG area was smallest in the 50s group. In females, TG area declined marke



dly during perimenopause, increased over the next two decades, peaked in the 70s group, and decreased again after 80 years. In males, the right TG area was smallest in the 50s (69.86 ± 22.11 mm²), a pattern not seen on the left. Significant sex differences occurred in overall TG area for those under 30 ($p = 0.04$) and 30s ($p = 0.03$) and left-sided TG area in the 30s group ($p = 0.04$).

Conclusion Male TG area remains stable across adulthood, with a slight decline in the left ganglion during the fifth decade. Female TG area decreases during perimenopause, rebounds until the 70s, and declines after 80 years. These findings offer insights into TG morphology and may guide future studies on trigeminal nerve pathophysiology.

Keyword: Evolution, Magnetic Resonance Image, Trigeminal Ganglion, Trigeminal Neuroglia

亚太 B4-129-0004

Effect and Mechanism of Peripheral Immune Cells on Anti-aging of Macaques during Running Training

Yongmin Niu¹, Lulu Xue², Liren Huang^{fu}¹, Yanbin Xiyang¹, Liulin Xiong^{3*}, Tinghua Wang^{1,2}

1. Institute of Neuroscience, Kunming Medical University, Kunming 650500, China.

2. Institute of Neurological Disease, Translational Neuroscience Center, West China Hospital, Sichuan University, Chengdu 610000, China

3. Department of Anesthesiology, The Affiliated Hospital of Zunyi Medical University, Zunyi 563000, China

*Corresponding author: Tinghua Wang, Wangth_email@163.com.

Objectives To explore the effects of running training on the movement and cognitive ability of aged macaques, the underlying immune mechanism involving in peripheral blood cells were explored by using single-cell sequencing.

Methods The aged macaques underwent running training, up to 6 months. Motor ability was assessed by opening test and electrophysiological motor evoked potential test, memory feeding test and magnetic resonance imaging to assess cognitive ability. SOX2/LAMB1 and GFAP/SOX2 immunofluorescence staining were used to evaluate changes in hippocampal aging and neonatal neurons. Single-cell RNA(scRNA) sequencing analysis of rhesus monkey peripheral blood was performed to show significant changes in cell population and differential genes.

Results Running exercise can increase the duration of motor behavior, lower limb motor evoked potential amplitude and reduce the proportion of resting time duration of the aged macaques, and increase the accuracy of memory feeding, the connections of memory-related brain areas such as hippocampus, frontal lobe, the number of new neural stem cells in hippocampus and the expression of aging index LAMB1. The running intervention group showed significantly increased GZMA expression in CD8 T cells, as revealed by single-cell RNA sequencing.

Conclusions Exercise can effectively improve the motor and cognitive abilities of aged macaques and partially restructured the composition of immune cells. Especially, exercise may increase the number of newborn neurons by up-regulating GZMA in CD8 effector T cell and acting on astrocyte and the receptor PARD3 on inhibitory neurons, thereby slowing down the aging of macaque brain regions.

Keywords: Cognitive ability, Macaque aging, Motor ability, Peripheral blood single-cell sequencing, Running training



亚太 B4-129-0005

Single-Cell Transcriptomic Analysis Reveals Molecular Associations Between Neural Repair After Traumatic Brain Injury and Fetal Neurodevelopment

Ya-Qi Yang¹, Xiao-Xing Cai¹, Jing-Juan Li¹, Ting-Hua Wang*

1. Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;
Email: yyq1888@163.com

Objective The molecular mechanisms underlying neural repair following traumatic brain injury (TBI) and their relationship to fetal neurodevelopmental processes remain poorly understood. This study aims to systematically compare the molecular signatures of post-traumatic neural repair and fetal cortical development using single-cell transcriptomics, providing translational insights for developing regenerative strategies inspired by fetal neurogenesis.

Methods We performed single-cell RNA sequencing (10x Genomics platform) on cortical tissues from three cohorts: 4 normal adult brains, 3 post-TBI lesions from adult patients, and 8 fetal brains (17-25 gestational weeks). Cellular heterogeneity was analyzed through differential clustering and annotation using Seurat (v5.0), with rigorous quality control and batch correction.

Results Comparative analysis revealed distinct cellular landscapes across groups. Fetal brains showed significant enrichment of neural progenitor cells (NPCs) ($p < 0.001$) compared to both adult controls and TBI lesions. Conversely, TBI tissues exhibited increased proportions of reactive astrocytes, oligodendrocytes and oligodendrocyte precursor cells (OPCs), accompanied by marked NPC depletion. Pseudotime analysis identified conserved transcriptional trajectories between fetal neurodevelopment and post-TBI repair processes.

Conclusion Our single-cell atlas demonstrates partial reactivation of fetal neurodevelopmental programs during post-TBI neural repair, particularly in surviving progenitor populations. These findings suggest two potential therapeutic avenues: 1) Targeted activation of endogenous NPCs in TBI microenvironment 2) Development of NPC transplantation strategies leveraging fetal-like regenerative competence. This work establishes an evolutionary perspective for understanding neural repair mechanisms and their clinical translation.

Keywords: Neural regeneration, Single-cell transcriptome, Traumatic brain injury



● 亚太 B4. Neurodevelopment ● Abstract

亚太 B4-129-0003

Accumulation of GSK-3 β in interneurons impairs adult hippocampal neurogenesis by inhibiting GABAergic transmission

Fei Liu^{1,4*}, Jiu-Jing Cui^{1,4}, Xiao-Lin Li², Zeng-Min Zhang², Shao-Hua Liang¹, Yi Sun¹, Jing-Min Li³, Hong-Lin Qu¹, Jing Ye¹, Qi-Peng Guo², Quan Zheng², Yong-Feng Liu²

¹ Department of Human Anatomy, School of Basic Medicine, Binzhou Medical University, Yantai 264003, China

² School of Rehabilitation Medicine, Binzhou Medical University, Yantai 264003, China

³ Laboratory of Human Anatomy and Histo-Embryology, Binzhou Medical University, Yantai 264003, China

⁴ These authors contributed equally

Background Both the activation of glycogen synthase kinase 3 β (GSK-3 β) and adult hippocampal neurogenesis (AHN) deficits contribute to the progression of cognitive impairments in Alzheimer's disease (AD). GABAergic interneurons are responsible for the balance of excitation and inhibition in neural networks and modulate AHN. The objective of this study was to investigate the role of GSK-3 β in mediating AHN damage through inhibitory interneurons.

Methods vGAT-cre:Nestin-GFP mice were generated by crossing vGAT-cre mice with Nestin-GFP mice. GSK-3 β was specifically overexpressed in GABAergic interneurons of vGAT-cre or vGAT-cre:Nestin-GFP mice using adeno-associated virus, and alterations in the AHN and NSC were observed. Further studies were investigated to determine excitability of neural network and GABA release of DG. Finally, the effect of GABA receptors agonist on the AHN was examined.

Results We found that GSK-3 β was activated in GABAergic interneurons in 3 $\times$ Tg mice. The specific overexpression of GSK-3 β in GABAergic interneurons induced AHN deficits due to the activation and apoptosis of NSCs. Further studies illustrated that the specific overexpression of GSK-3 β in GABAergic interneurons resulted in a reduction in GABA release and an increase in the excitability of DG. GABA receptor agonist ameliorates AHN impairments and improve contextual memory.

Conclusion The overexpression of GSK-3 β in GABAergic interneurons impair AHN and induce NSCs apoptosis by deteriorate GABA transmission, and administration of GABAergic agonists is efficient in preserving AHN. These Results revealed novel mechanism underling the AHN impairments in AD and provided new targets for pro-neurogenic therapies.

Key words: Glycogen synthase kinase-3 β , adult hippocampal neurogenesis, interneuron, GABA transmission



● 亚太 C1. Stem Cell & Development ● Podium

ID: 318262

Oxidized SOD1 is a Causal Factor in Cellular Senescence and Biological Aging

Jiming Kong Teng Guan Ying Guo
University of Manitoba

Background Stem cells (SCs), including neural stem cells (NSCs) and bone marrow-derived mesenchymal stem cells (BMSCs), undergo cellular senescence after prolonged culture, marked by halted proliferation and reduced stemness. This process is often attributed to oxidative stress. While extensive correlative evidence supports this theory, a causal link remains elusive. Oxidized human SOD1 (hSOD1), prone to toxic misfolding, is implicated in age-related neurodegenerative disorders and may contribute to SC senescence.

Methods NSCs from transgenic mice expressing wild-type hSOD1 and human BMSCs were cultured through multiple passages. Extracellular vesicles (EVs) were isolated from the culture media at each stage. To selectively knock down oxidized SOD1 in NSCs and EVs, we used a peptide-directed chaperone-mediated protein degradation system named CT4 that we developed recently.

Results From passage 5, NSCs showed elevated oxidized hSOD1 and senescence markers, including increased P53, SA- β -Gal, and cytoplasmic HMGB1. Removing oxidized SOD1 enhanced NSC proliferation and stemness, and similarly restored BMSC function and differentiation capacity. EVs from senescent NSCs carried high levels of oxidized hSOD1, accelerating senescence in young NSCs and causing neuronal death. Eliminating oxidized hSOD1 from EVs prevented their senescence-inducing effects, while CT4 peptide blockage reduced EV toxicity to neurons.

Conclusion Oxidized hSOD1 drives SC senescence and spreads via EVs. Its removal rejuvenates NSCs, improves BMSC regenerative potential, and enhances EV quality from senescent SCs, offering a potential strategy to boost stem cell therapies.

Keyword: stem cell senescence, SOD1 oxidization, extracellular vesicles

ID: 318617

Umbilical Cord Mesenchymal Stem Cells Were Used to Treat end-stage to Early Cirrhosis in Methionine-deficient Rats by Modulating the WNT Pathway

yanxuan wen wang lan jiaxing li zhiyuan li
Department of Anatomy and Neurobiology, Xiangya School of Medicine, Central South University, Changsha, 410013, China

As one of the three classical pathways of stem cells, the WNT pathway may play a role in helping the damaged liver to exert its regenerative function, and stem cells can promote phenotypic changes in adult cells by regulating the activation or inhibition of this pathway.

The statistical method of two factors and two levels of repeated measurement data was used to analyze the experimental results. The experimental measurements before and after the intervention were compared, and the interaction was analyzed. By randomly dividing samples (total 22) into two three groups and simulating in vivo C57 black mouse animal disease models and HepG2 in vitro cell models, one of them was randomly selected from each group as model validation and stem



cell injection experiments were carried out after the verification was passed. Experiments were conducted in a completely random manner to explore the phenotype and intrinsic mechanism of M AFLD.

The within-group effects of the analysis of variance were corrected using the F-bound. In NAFLD, inflammatory fibrosis, endoplasmic reticulum stress, and mitochondrial damage are key virulent factors, and the interventional treatment of Umbilical Cord mesenchymal cell infusion three times a month (10/5 4*105/106). It has added to the understanding of the internal mechanism, the Wnt pathway plays a major role in organ and tissue regeneration ($p < 0.05$).

Overall, treating mesenchymal stem cells can inhibit the overactivation of the classical Wnt pathway and reduce the lethal effects of NAFLD and liver cirrhosis.

Keyword: Umbilical cord mesenchymal stem cell, Chronic liver steatosis, Classical wnt pathway

ID: 320137

The Molecular Mechanism of SLC25A10 Regulates Human Adipose-derived Stem Cells-osteoclasts Communication by Regulating the Dynamic Changes of Mitochondria

Liu Jiaxuan Fan Tingyu Shi Yulian Feng Ziyi Wu Guosheng Wu Haopeng Ouyang Jun Dai Jingxing
Southern Medical University

Objectives Mitochondria, as the core of cellular energy metabolism, play a key role in osteogenesis with their functional and dynamic changes (fusion/division). The abnormal expression of SLC25A10 (a member of the mitochondrial carrier family) is closely related to the disturbance of calcium and phosphorus metabolism such as ectopic calcification. We investigated the effects of SLC25A10 on mitochondrial energy metabolism and dynamic changes of osteoblasts, and the relationship between SLC25A10 and the communication between osteoblasts and osteoclasts.

Methods Human adipose stem cells (hASCs) were transfected with lentivirus to inhibit the function of SLC25A10, and hASCs were induced into bone formation and co-cultured with osteoclasts. The proportion of mitochondrial fluorescence signal and mitochondrial transfer efficiency in osteoclasts were detected by immunofluorescence technique and flow cytometry. The morphological changes of mitochondria in hASCs were analyzed by transmission electron microscopy. Oxygen consumption rate (OCR) and extracellular acidification rate (ECAR) of SLC25A10 knockout hASCs were measured by Seahorse XF96 analyzer to evaluate mitochondrial respiratory function. The expressions of OPN, RUNX2, MFN2, DRP1, OPA1 and SLC25A10 were detected by Western blot.

Results SLC25A10 colocalized with microtubules and increased with the increase of osteogenic induction. Knocking down SLC25A10 can reduce OCR and ECAR of hASCs. At the same time, the process of mitochondrial fusion and division in hASCs and the efficiency of mitochondrial transfer between osteoclasts are reduced.

Conclusions SLC25A10 can decrease OCR and ECAR of hASCs, reduce the fusion and division of mitochondria during differentiation of hASCs, and thus reduce communication between hASCs and osteoclasts.

Keyword: Human adipose stem cells (hASCs), osteoclasts, mitochondrial dynamics, mitochondrial metabolism, intercellular communication



ID: 320689

Single-cell Transcriptomics Reveals Oncostatin M-Dependent Spermatogonial Maintenance in Neonatal Testis

W Jia
Ningxia Medical University

Objectives To investigate the role of Oncostatin M (OSM) in regulating spermatogonial cell fate during early postnatal testis development in mice.

Methods We employed a combination of scRNA-seq, histological analysis, and RNA-FISH to characterize OSM expression in the testis and assess its impact on spermatogonial cell fate regulation.

Results OSM, secreted by macrophages and highly expressed in germ cells, is essential for spermatogonial maintenance. OSM deficiency resulted in a reduction of seminiferous tubule lumen cells in the testis, accompanied by nuclear morphological abnormalities, chromatin condensation, and the absence of prominent apoptosis. Single-cell RNA sequencing generated a developmental trajectory of spermatogonial cells in 10-day-old mouse testes, revealing that OSM deficiency leads to a decrease in the number of undifferentiated spermatogonial cells and inhibits SSC stemness (Klf2, Klf4) and self-renewal (Zbtb16, Gfra-1). Notably, despite the reduction in total differentiated spermatogonia, the expression of differentiation markers (Stra8, Dmc1) was upregulated, accelerating spermatogonial differentiation. Mechanistic investigations showed that OSM loss resulted in reduced JAK-STAT3 pathway activity, accompanied by cell cycle arrest and an increase in cells in the S phase. Additionally, activation of the MAPK pathway, which regulates spermatogonial differentiation, was enhanced.

Conclusion OSM regulates the balance between stemness and differentiation in spermatogonia, maintaining a stable population of undifferentiated spermatogonial cell and preventing premature differentiation.

Keyword: Oncostatin M, scRNA-seq, Spermatogonial Maintenance

ID: 321182

Cell Therapy for Parkinson's Disease

Hossein Baharvand
Royan Institute, Tehran, Iran

Objectives Parkinson's Disease (PD) is a common age-related neurodegenerative disorder with a rising prevalence. Human pluripotent stem cells have emerged as the most promising source of cells for midbrain dopaminergic (mDA) neuron replacement in PD. This study aimed to generate transplantable mDA progenitors for treatment of PD.

Methods Here, we optimized and fine-tuned a differentiation protocol using a combination of small molecules and growth factors to induce mDA progenitors to comply with good manufacturing practice (GMP) guidelines based on our clinical-grade human embryonic stem cell (hESC) line.

Results The resulting mDA progenitors demonstrated robust differentiation and functional properties in vitro. Moreover, cryopreserved mDA progenitors were transplanted into 6-hydroxydopamine-lesioned rats, leading to functional recovery. Furthermore, scalability was demonstrated via transplantation in a parkinsonian monkey model.

Conclusion We demonstrate that our optimized protocol using a clinical hESC line is suitable for generating clinical-grade mDA progenitors and provides the ground work for future translational applications.



Keyword: Parkinson's disease, Dopaminergic neuron, Cell therapy, GMP

ID: 321185

Generating Expandable Cardiac Progenitor Cells from Human Pluripotent Stem Cells for In-Vitro as well as Preclinical Studies

Sara Pahlavan* Siamak Rezaeiani Fatemeh Etezadi Adeleh Taei Hossein Baharvand
Department of Stem Cells and Developmental Biology, Cell Science Research Center,
Royan Institute for Stem Cell Biology and Technology, ACECR, 19395-4644, Tehran, Iran.

Objectives Cardiovascular diseases (CVDs) account for a significant number of mortality worldwide. Although pharmacological and surgical interventions have improved patients' outcomes, they do not address the underlying cause or fully restore heart function. Recently, there has been increasing interest in using cardiac progenitor cells (CPCs) derived from human pluripotent stem cells (hPSCs) to regenerate damaged heart tissue. However, the lack of a standardized protocol for generating expandable CPCs has limited their research and clinical application. Here, we aimed to develop an efficient protocol for producing expandable CPCs from hPSCs.

Methods We expanded hPSCs in a 3D culture and induced them into CPCs using a chemically defined small molecule (SM)-based protocol as follow: CHIR for one day, followed by a medium without the small molecule for 24 h. Differentiating cells were then treated with IWP2, SB431542, and Purmorphamine for two days. The resulting spheroids were dissociated into single cells and cultured on Matrigel-coated plates with specific factors including 0.5 μ M A83-01, 100 ng/ml bFGF, and 3 μ M CHIR, for up to 4 passages. We assessed the potential of passage 4 expandable hPSC-derived CPCs for differentiating into the three main cardiac lineage cells, by specific growth factor treatments for each lineage over 12 days.

Results Flow cytometry analysis revealed that on the 4th day of differentiation, $77 \pm 5\%$ of hPSC-derived CPCs expressed the NKX2.5. After 4 passages, expandable CPCs could differentiate into cTNT⁺ cardiomyocytes, VWF⁺ endothelial cells and SMA⁺ smooth muscle cells with high efficiency.

Conclusion This protocol might enable the generation of large scale hPSC-derived CPCs for research and clinical application.

Keyword: Cardiovascular diseases, Differentiation, Cardiac progenitor cells, Regenerative medicine



亚太 C1-129-0001

Mechanoresponsive Periosteal Stem Cells Drive Bone Regeneration in Distraction Osteogenesis

Rongjie Wu¹, Zhixian Zong¹, Gang Li³, Sien Lin^{1,2}

¹Department of Orthopaedics & Traumatology, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong, China; ²Orthopaedic Center, Affiliated Hospital of Guangdong Medical University, Zhanjiang, China;

³Institute of Biomedicine and Biotechnology, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences

Background Recent studies have identified periosteal stem cells (PSCs) as the main contributors to bone repair; however, the mechanisms by which PSCs respond to mechanical stimulation in distraction osteogenesis (DO) remain unclear. This study aimed to elucidate how PSCs respond to tensile strain and promote bone regeneration, providing new insights into the role of mechanical stimulation in osteogenesis.

Methods To identify the contribution of different progenitor cells in DO, we compared the therapeutic effect of local injection of PSCs or bone marrow-derived mesenchymal stem cells (BMSCs) in the bone lengthening model with periosteum defect at the regenerate sites. We performed an RNA-seq assay followed by qRT-PCR using the DO callus isolated from the affected femur, or PSCs and BMSCs from contralateral intact femur. In addition, single-cell RNA sequencing of the DO callus and bone defect models was employed to explore the mechanoresponses of PSCs. To validate these findings, an ex vivo mechanical stretching was conducted to assess the mechanoresponse of PSCs in DO. We further investigated the role of PI3K-AKT in bone healing outcomes in both bone lengthening model and bone transport model through applying PI3K activator or inhibitor at the regenerate sites.

Results We identified PSCs played a predominant role in DO callus formation compared to BMSCs, with a significant enrichment of the mechanotransductive PI3K/AKT pathway. Inhibition of Akt1 resulted in delayed union, whereas PI3K activation enhanced bone consolidation and increased the expression of PSC markers. Mechanistic studies further revealed an embryonic-like skeletal development phenomenon at the regenerative site. We successfully identified a subgroup of PSCs in DO highly expressing genes related to embryonic skeletal development. In vitro studies confirmed the upregulation of stemness markers, such as Grem-1, along with activation of the Wnt signaling pathway in PSCs under tensile stress stimulation.

Discussion and Conclusion PSC has been identified as a mechanoresponsive cell type indispensable for callus formation in DO. Activating the PI3K pathway in PSCs has emerged as a promising therapeutic strategy to enhance bone regeneration and mitigate nonunion. Notably, the DO regenerate regressed to an embryonic skeletal growth state, with a specific subgroup of PSCs acquiring an embryonic skeletal development signature. In conclusion, these findings provide novel insights into PSCs as the primary mechanoresponders in DO, elucidating the cellular mechanisms by which mechanical stimulation promotes osteogenesis and offering cues for reprogramming PSCs through external mechanical stimulation.

Acknowledgements This work was supported by grants from Research Grants Council of University Grants Committee Hong Kong (14119124, 14113723, 14121721, N_CUHK472/22, T13-402/17-N and AoE/M-402/20), the National Natural Science Foundation of China (82472454, 82272505, 81874000 & 82172430), Health and Medical Research Fund (HMRF) of Food and Health Bureau Hong Kong (09203436 & 08190416), and Natural Science Foundation of Guangdong Province (2023A1515011040).



亚太 C1-129-0009

Exosomes derived from microRNA-540-3p overexpressing bone marrow mesenchymal stem cells promote immune tolerance via the CD74/NF- κ B pathway in cardiac allograft

Jigang He¹, Xinxin Wu², Si Li¹, Dan Yan³, Gaopeng Xiao⁴, Fugang Mao^{5*}

1.Department of Cardiovascular Surgery, the First People's Hospital of Yunnan Province, China

2.Yunnan University of traditional Chinese Medicine, China

3.Department of MICU, the First People's Hospital of Yunnan Province, China

4.Department of Anaesthesia, the First People's Hospital of Yunnan Province, China

5.Department of ultrasonic, the First People's Hospital of Yunnan Province, China

Aims Explore immunomodulatory effects of exosomes derived from BMSCs overexpressing microRNA-540-3p (miR-540-3p) on cardiac allograft tolerance, focusing on modulating dendritic cells and T cells activity through the CD74/ NF- κ B pathway.

Methods Rat models (The rats were anesthetized use sodium pentobarbital. The cardiac transplanted into the recipient abdomen.) were used to assess the impact of miR-540-3p-enhanced exosomes on immune tolerance in cardiac allografts. MiR-540-3p expression was manipulated in BMSCs, and derived exosomes were administered to rat models post-heart transplantation. The study monitored expression levels of MHCII, CD80, CD86, and CD274 in dendritic cells, and quantified CD4⁺ and CD8⁺ T cells, T regulatory cells, and cytokine profiles.

Results Administration of exosomes from miR-540-3p-overexpressing BMSCs resulted in reduced expression of immune activation markers CD74 and NF- κ B p65 in dendritic cells and T cells. Treated rats exhibited a decreased inflammatory response and improved cardiac function, evidenced by lowered levels of pro-inflammatory cytokines (IL-1 β , IFN- γ) and increased anti-inflammatory cytokines (IL-10, TGF β 1). Additionally, miR-540-3p modified the profiles of dendritic cells and T cells towards a more tolerant state by enhancing the ratio of T regulatory cells and altering cytokine secretion to favor graft acceptance.

Conclusion Exosomes derived from BMSCs overexpressing miR-540-3p significantly promote immune tolerance and enhance the survival of cardiac allografts by modulating the CD74/ NF- κ B pathway, which regulates activities of dendritic cells and T cells. These findings highlight a promising therapeutic strategy for improving heart transplantation outcomes, potentially reducing the reliance on prolonged immunosuppression.

Keywords: BMSC; exosomes; microRNA-540-3p; cardiac allograft; immune tolerance



亚太 C1-129-0010

BMSC-derived exosome overexpressing GATA-4 suppresses H/R-induced cardiomyocyte ferroptosis through miR-330-3p regulates BAP1/SLC7A11/IP3R axis and mitochondrial permeability transition pore opening

Zhiyuan Xiao^{2, a}, Si Li^{3, a}, Xinxin Wu⁴, Xinhao Chen³, Dan Yan², Jigang He^{1, *}

¹Department of Cardiovascular Surgery, the First People's Hospital of Yunnan Province, China

²Department of Medical Intensive Care Unit, the First People's Hospital of Yunnan Province, China

³The Affiliated Hospital of Kunming University of Science and Technology, China

⁴Yunnan University of Traditional Chinese Medicine, China

^aThese authors contributed to the work equally and should be regarded as co-first authors.

Ami In this study, we assessed the mechanism of Exos^{oe-GATA-4} between mitochondrial permeability transition pore (mPTP), which has a crucial role in ferroptosis, and myocardial ischemia/reperfusion (I/R) injury in vivo.

Methods The exosome (Exos) was extracted and identified by TEM and Nanosight analysis. BMSCs and cardiomyocytes were transfected with lentivirus overexpressing GATA-4 and NC inhibitor/mimic, and miR-330-3p inhibitor/mimic, oe-/si-NC, oe-/si-BAP1, oe-/si-SLC7A11 and si-/IP3R. The cell hypoxia/reoxygenation (H/R) model was established and co-cultured with Exos. RT-qPCR and Western blot were used to detect the expression of differential expression miRNAs, keap1/Nrf2. CCK-8, RT-qPCR and Western blot assay were used to evaluate cell viability and the levels of ferroptosis and mPTP. Luciferase reporter, AgO2-RIP, CO-IP and GST pull-down assay analyzed the targeted binding and protein interaction.

Results The Exos^{oe-GATA-4} effectively suppressed H/R-induced cardiomyocytes' ferroptosis, while the effects were reversed by miR-330-3p inhibitor. MiR-330-3p targeted negative regulated the expression of BAP1. The effects of miR-330-3p inhibitor were reversed by co-transfected si-BAP1. Also, BAP1 negatively regulated the expression of SLC7A11 and reversed the effects of Exos^{oe-GATA-4} on H/R-induced cardiomyocytes' ferroptosis by down-regulating SLC7A11. Mechanistically, BAP1 interacted with IP3R and increased cardiomyocytes' Ca²⁺ level, causing mPTP opening and mitochondrial dysfunction, promoting H/R-induced cardiomyocytes' ferroptosis. In addition, hydrogen sulfide (H₂S) content was increased in the Exos^{oe-GATA-4} treated group and regulated the keap1/Nrf2 signaling pathway.

Conclusions Exos^{oe-GATA-4} effectively suppresses H/R-induced cardiomyocytes' ferroptosis by up-regulating miR-330-3p, which regulates the BAP1/SLC7A11/IP3R axis and inhibits mPTP opening.

Keywords: myocardial ischemia/reperfusion injury; ferroptosis; BMSC-derived exosome overexpressing GATA-4; BAP1; mPTP



亚太 C1-129-0011

Glial Cell Line Derived Neurotrophic Factor-Induced Directional Migration of Enteric Neural Crest-Derived Cells

Yee Lam LI^{1,2} (Eileen.Y.L.Li@link.cuhk.edu.hk), Seong Wang CHOI^{1,2*},
Martin CHEUNG³, Wood Yee CHAN^{1,2,#} (wy-chan@cuhk.edu.hk)

¹ School of Biomedical Sciences, Faculty of Medicine, The Chinese University of Hong Kong,
Hong Kong SAR, China;

² Center for Neuromusculoskeletal Restorative Medicine, Hong Kong Science and Technology Park,
Hong Kong SAR, China;

³ School of Biomedical Sciences, LKS Faculty of Medicine, The University of Hong Kong,
Hong Kong SAR, China.

*Presenting author; #Corresponding author

Enteric neural crest-derived cells (ENCCs) are precursors of enteric ganglia in the enteric nervous system of the gastrointestinal tract. Abnormal migration of ENCCs during early embryonic development may lead to congenital gut motility disorders such as Hirschsprung's disease. However, the molecular mechanism governing ENCC migration remains unclear. This study investigated the Glial cell line Derived Neurotrophic Factor (GDNF)-induced directional migration of ENCCs and its downstream signalling pathways. It was found that ENCCs migrated along an increasing gradient of GDNF in the midgut of E9.5 to E10.5 mouse embryos, and GDNF induced ENCC directional migration in vitro. Simultaneously, RhoA was expressed in migrating ENCCs. RhoA expression in ENCCs was then knocked down with small interfering RNAs (siRNAs), and the dynamic migratory behaviours were assessed in real time with time-lapse live cell imaging coupled with a Förster resonance energy transfer (FRET)-based biosensor. Changes in gene expression related to cell migration were analysed with bulk RNA sequencing. Silencing RhoA significantly changed the migration characteristics of ENCCs, with active RhoA molecules redistributing to the leading edge of migrating cells. A number of migration-related molecules, especially Igfbp5, were downregulated. Subsequent knockdown of Igfbp5 resulted in a reduced migration speed and loss of migration directionality. In summary, our Results showed the complex interplay of different signalling pathways in ENCC migration, and also unveiled the important roles of RhoA and Igfbp5 in directional migration, thus advancing our understanding of the molecular regulation of ENCC migration and providing insights into therapeutic strategies for congenital gut motility disorders.

Key

words: GDNF, RhoA signalling, enteric neural crest-derived cells, directional migration, Igfbp5



亚太 C1-129-0013

Therapeutic Effects of Cerium Oxide Nanozyme Armed Neural Stem Cell for the Treatment of Spinal Cord Injury in Mice

Zewei Fu^{1,2,3,4}, Baofeng Feng^{1,2,3,4,5}, Jun Ma^{1,2,3,4,5}, Huixian Cui^{1,2,3,4,5}

1 Hebei Medical University-Galway University Stem Cell Research Center, Hebei Medical University, Shijiazhuang, China.

2 Hebei Research Center for Stem Cell Medical Translational Engineering, Shijiazhuang, China.

3 Hebei Technology Innovation Center for Stem Cell and Regenerative Medicine, Shijiazhuang, China.

4 Hebei International Joint Research Center for Stem Cell and Regenerative Medicine, Shijiazhuang, China.

5 Human Anatomy Department, Hebei Medical University, Shijiazhuang, China. junmahmu@163.com, huixiancuihmu@163.com.

Objectives This study aimed to investigate the effects of Cerium Oxide Nanozyme (CeON) armed Neural Stem Cell (NSC) in therapeutic efficacy of Spinal Cord Injury (SCI). The study provided a new strategy for cell-based therapies for SCI. Based on our previous research demonstrating the beneficial effects of NSC therapy for SCI and the excellent antioxidative enzyme-like activity of CeON, we explored the potential of arming NSCs with CeON to enhance their therapeutic impact.

Methods NSCs were derived from induced pluripotent stem cells (iPSC) and characterized through immunofluorescence staining. The effects of different concentrations of CeON on NSC viability, migration, and resistance to oxidative stress were assessed. The protective role of CeON was analyzed under inflammatory and oxidative stress conditions. In a mouse SCI model, CeON armed NSCs (CeNSCs) were transplanted, and functional recovery, histopathological changes, and microglia polarization were evaluated using functional scoring, histological and immunofluorescent staining.

Results CeON arming significantly improved NSC viability and antioxidative capacity, reducing inflammatory cytokine levels and reactive oxygen species (ROS). In the SCI model, CeNSC enhanced motor function recovery and reduced glial scar formation and fibrosis in the injury area. A CeNSC treatment-induced transformation of the polarization phenotype of microglia was also observed.

Conclusions CeON, with their unique antioxidative and anti-inflammatory properties, significantly enhanced the survival and functional efficacy of transplanted NSC in SCI therapy. This study highlights the potential value of combining CeON with NSC for SCI treatment and provides a theoretical basis for regenerative medicine approaches to SCI.

Keywords Spinal cord injury, Neural stem cell, Cerium oxide nanozyme, Tissue repair



亚太 C1-129-0014

Safety and Efficacy of Combined Transplantation of hiPSC-NSCs and hMSCs in the Treatment of Alzheimer's Disease

Yue Yang, Zijing Zhou, Ruiyun Guo, Jun Ma(junmahmu@163.com.)
, Huixian Cui(huixiancuihmu@163.com.)

Hebei Medical University-Galway University Stem Cell Research Center, Hebei Medical University, Shijiazhuang, 050017, Hebei Province, China.

Background Alzheimer's disease (AD) is a neurodegenerative disorder characterized by progressive cognitive decline, with limited treatment options. Stem cell therapy is a promising strategy, yet the combined effects of neural stem cells (NSCs) and mesenchymal stem cells (MSCs) remain unexplored in AD models. This study evaluated the efficacy and safety of human MSCs (hMSCs), human induced pluripotent stem cell-derived NSCs (hiPSC-NSCs), and their combination in APOE4/4 transgenic AD mice.

Methods Twelve-month-old APOE4/4 mice were divided into control, hMSC, hiPSC-NSC, and combination (M&N) groups. Cells or PBS were administered via intracerebroventricular and tail vein injections. Cognitive function was assessed 4 weeks post-transplantation using novel object recognition (ORT) and Morris water maze (MWM). Synaptic plasticity, neuroinflammation, and lipid metabolism were analyzed via immunohistochemistry, transmission electron microscopy, Golgi staining, Western blot, ELISA, and immunofluorescence.

Results The M&N group showed significantly improved recognition index in ORT, shorter escape latency, and longer target quadrant retention in MWM, outperforming single treatments. Combined therapy upregulated hippocampal synapsin (SYN) and postsynaptic density protein 95 (PSD95), enhanced synaptic density, PSD thickness, active zone length, and dendritic spine count. It also suppressed microglial (IBA-1+) and astrocytic (GFAP+) activation, reduced inflammatory cytokines, and improved lipid metabolism.

Conclusion hMSC and hiPSC-NSC combination therapy safely and effectively improved cognitive function, synaptic plasticity, neuroinflammation, and lipid metabolism in APOE4/4 mice, demonstrating its potential as a novel AD treatment.

Keywords: Alzheimer's disease; Mesenchymal stem cell; Neural stem cell; Neural and mesenchymal stem cell transplantation

亚太 C1-129-0015

The Mechanistic Study of PCL Membrane Combined with Mesenchymal Stem Cells in Promoting Lymphocyte Proliferation during Spinal Cord Injury Repair.

Bao-Lei Zhang, Xin-Hui Tang, Ting-Hua Wang*

Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China.

*Corresponding author: Ting-Hua Wang, Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China; Email: wangtinghua@vip.163.com

Objective This study investigates the effects of PCL membrane combined with mesenchymal stem cell therapy on lymphocytes following complete spinal cord transection in rats, and focusing on the mechanisms involved in spinal cord injury (SCI) repair in single cell sequencing level.

Methods Rats were divided into four groups: sham (Sham group, n=3), spinal cord transection



(Transection group, n=3), spinal cord transection with PCL membrane (PCL group, n=3), and spinal cord transection with both PCL membrane and mesenchymal stem cells (MSCs group, n=3). The Sham group underwent spinal cord exposure only, while the Transection group experienced complete transection. The PCL group received a PCL membrane post-transection, and the MSCs group had both treatments. Spinal cord samples were collected after 28 days for single-cell transcriptome sequencing and analysis.

Results 13 cell types were identified, including neurons, glial cells, and immune cells, etc. The proportion of lymphocytes gradually increased in all groups, with a significant rise in MSCs vs PCL. Differential mRNA expression analysis ($p_{\text{val adj}} < 0.05$) revealed 23 upregulated genes in Transection vs. Sham, downregulated in PCL vs. Transection, and upregulated in MSCs vs. PCL, and 3 downregulated genes in Transection vs. Sham, upregulated in PCL vs. Transection, and downregulated in MSCs vs. PCL. Enrichment analysis highlighted pathways related to immune response and signal transduction. Protein-protein interaction analysis identified the Top5 core genes: Itk, Lcp2, Skap1, Cd3e, and Grap2, all involved in T-cell receptor signaling.

Conclusion Treatment with PCL membrane and MSCs enhanced lymphocyte proliferation, suggesting a potential anti-inflammatory and immune-activating mechanism in SCI repair, warranting further functional validation.

Keywords: spinal cord transection, PCL membrane, mesenchymal stem cell, single-cell transcriptome sequencing, lymphocytes.

亚太 C1-129-0016

Single-Cell Trajectory Mapping of hNESCs Following Intracerebral Transplantation Using Laser Capture Microdissection and snRNA-seq

Wenlong Zhu¹, Xiaoxing Cai², Liulin Xiong³, Tinghua Wang²

Department of Neurosurgery, Affiliated Hospital of Zunyi Medical University, Zunyi, Guizhou, 563000, China.

Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, 650500, China.

3. Department of Anesthesiology, Affiliated Hospital of Zunyi Medical University, Guizhou, 563000, China.

Email address: Wangth_email@163.com

Objective This study uses high-resolution single-cell techniques to elucidate the post-transplantation fate of human neuroepithelial stem cells (hNESCs) within the brain microenvironment. Specifically, we investigate whether hNESCs exhibit distinct differentiation trajectories in normal and bilirubin encephalopathy (BE) rat models, thereby uncovering mechanistic insights into stem cell-based neuroregeneration.

Methods hNESCs were intracerebrally transplanted into both healthy and BE model rats. At defined time points post-transplantation, brain tissue samples containing transplanted cells were harvested and subjected to Laser Capture Microdissection (LCM) to isolate target cell populations. Subsequently, single-nuclei RNA sequencing (snRNA-seq) based on the 10x Genomics platform was performed to capture gene expression dynamics at the single-cell level. Bioinformatics analyses were employed to reveal differentiation patterns and key regulatory networks, including transcriptomic clustering, lineage tracing, and trajectory inference.

Results Preliminary data suggest that transplanted hNESCs successfully integrate into host brain tissue, exhibiting dynamic gene expression profiles indicative of neuronal differentiation. Transplanted cells in BE models demonstrated higher heterogeneity and more complex fate transitions compared to those in healthy brains. Transcriptomic trajectories revealed upregulation of neurogenesis-related transcription factors and downregulation of stemness-associated genes over time. Immune evasion and reduced immunogenic markers were also observed, supporting



the favorable in vivo adaptability of hNECs.

Conclusion Our findings demonstrate the feasibility of using LCM combined with snRNA-seq to dissect the in vivo fate of hNECs at single-cell resolution. Distinct differentiation trajectories in pathological versus normal environments highlight the importance of microenvironmental context in guiding stem cell fate. This approach provides a valuable framework for optimizing stem cell therapies and deepening mechanistic understanding of neurorestorative interventions.

Keywords: hNECs, stem cell transplantation, single-nuclei RNA-seq, Laser Capture Microdissection, cell fate mapping, bilirubin encephalopathy

● 亚太 C1. Stem Cell & Development ● Poster

ID: 318430

Harderian and lacrimal gland development and degeneration in the Fgf10-deficient heterozygous mouse

Hideyo Ohuchi¹ Shiori Ikeda^{1,2} Keita Sato¹ Hirofumi Fujita¹ Tetsuya Bando¹ Hitomi Ono-Minagi¹

1.Department of Cytology and Histology, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences

2.Central Research Laboratory, Okayama University Medical School

Objectives The mouse Harderian gland (HG) is an exocrine gland that covers the posterior portion of the eyeball. The HG serves to protect the eye surface from infection with its secretions along with lacrimal glands (LGs). Many factors are involved in development of these ocular glands, one of which is Fibroblast Growth Factor 10 (FGF10). Haploinsufficiency in the FGF10 gene causes aplasia of lacrimal and salivary glands in humans and these glands were also degenerated in Fgf10^{0/+} mice, but the details of when and how they degenerate have not been clarified.

Methods In this study, phenotypes of the HGs were histologically examined in embryonic (E13.5 to E19), postnatal (P0.5 to P18) Fgf10^{0/+} mice and compared with LG phenotypes.

Results We found that more than half of the Fgf10^{0/+} mice had markedly degenerated HGs, often unilaterally. The degenerated HG tissue had a melanized appearance and was replaced by connective tissue, which was observed by P10. The development of HGs was delayed or disrupted in the similar proportion of Fgf10^{0/+} embryos, as revealed via the loss of gland marker expression. In situ hybridization showed Fgf10 was expressed in the Harderian mesenchyme and Fgf2b in the HG epithelia at E14 to 19, verifying their promoting role in HG development. In contrast, lacrimal gland primordia were found degenerated bilaterally just after birth and replaced by adipose tissue.

Conclusion These Results suggest that when and how the glands degenerate are different between HGs and LGs in the Fgf10^{0/+} mouse. (COI: None)

Keyword: FGF10, Harderian gland, lacrimal gland, mouse, haploinsufficiency



ID: 318686

Tumor suppressor FRMD3 controls mammary epithelial cell fate determination via notch signaling pathway

Ma J Sun X Gong Y
Peking University

The luminal-to-basal transition in mammary epithelial cells (MECs) is accompanied by changes in epithelial cell lineage plasticity; however, the underlying mechanism remains elusive. Here, we report that deficiency of Frmd3 inhibits mammary gland lineage development and induces stemness of MECs, subsequently leading to the occurrence of triple-negative breast cancer. Loss of Frmd3 in PyMT mice results in a luminal-to-basal transition phenotype. Single-cell RNA sequencing of MECs indicated that knockout of Frmd3 inhibits the Notch signaling pathway. Mechanistically, FRMD3 promotes the degradation of Dishevelled-2 by disrupting its interaction with deubiquitinase USP9x. FRMD3 also interrupts the interaction of Dishevelled-2 with CK1, FOXK1/2, and NICD and decreases Dishevelled-2 phosphorylation and nuclear localization, thereby impairing Notch-dependent luminal epithelial lineage plasticity in MECs. A low level of FRMD3 predicts poor outcomes for breast cancer patients. Together, we demonstrated that FRMD3 is a tumor suppressor that functions as an endogenous activator of the Notch signaling pathway, facilitating the basal-to-luminal transformation in MECs.

Keyword: FRMD3, MECs, luminal-to-basal transition, USP9x

ID: 320684

WTAP Regulates RNA m6A Methylation and Cell Fate Transition in Spermatogonial stem cells

W Jia
Ningxia Medical University

Objective To investigate the role of m6A methylation and the "writer" enzyme WTAP in the differentiation of spermatogonial stem cells (SSCs) into A1-type spermatogonia.

Methods RA-induced differentiation of SSCs into A1-type spermatogonia was used to analyze dynamic changes in m6A levels and WTAP expression. WTAP knockdown was performed, and flow cytometry assessed cell cycle and differentiation gene expression. MeRIP-seq identified key m6A-modified transcripts, followed by MeRIP-qPCR, RNA stability assays, and R-Luc assays to validate the regulatory mechanism of WTAP.

Results RA-induced differentiation of SSCs into A1 spermatogonia was linked to enhanced self-renewal and upregulation of Stra8 expression. m6A modification levels increased, with WTAP recruiting Mettl3/Mettl14 to the nucleus, forming nuclear speckles. WTAP knockdown maintained SSC stemness but caused cell cycle arrest at the S phase and blocked differentiation. MeRIP-seq showed significant downregulation of m6A peak signals, particularly in genes regulating cell cycle (e.g., Ccnb1, Cdk2) and differentiation (e.g., Dazl, Sohlh1). WTAP knockdown decreased Ccnb1 and Dazl mRNA stability. R-Luc assays confirmed that WTAP, via m6A, enhances the binding of Ccnb1 mRNA 3'UTR to YTHDF2, with mutation of m6A sites abolishing this interaction, highlighting the m6A-YTHDF2 axis in mRNA stability regulation.

Conclusion The m6A-YTHDF2 axis, regulated by WTAP, is crucial for controlling mRNA stability and modulating SSC differentiation.



Keyword: differentiation, RNA m6A Methylation, Spermatogonial stem cells, WTAP

ID: 327979

Effects of Thinner Exposure During Pregnancy on CYP19 Expression, Oxidative Stress, Testosterone Levels, and Fetal Growth in Wistar Rats

Arni Amir¹ Saka Abeiasa²

1. Universitas Andalas

2. Universitas Sumatera Barat

Thinner is a volatile organic solvent widely used in the paint industry, containing aromatic compounds such as toluene and xylene, which are known to act as endocrine disruptors and triggers of oxidative stress. Exposure to thinner during pregnancy has the potential to affect fetal development through hormonal and genetic pathways. This study aimed to examine the effects of thinner exposure on CYP19 gene expression, malondialdehyde (MDA) levels, testosterone levels, and fetal length in albino Wistar rats.

A total of 32 pregnant Wistar rats were randomly divided into four groups (n = 8): a control group (no exposure) and three treatment groups exposed to thinner for 30, 60, and 90 minutes per day from gestational day 6 to day 20. Exposure was conducted via inhalation using a nebulizer in an enclosed chamber to ensure a stable and controlled concentration of thinner in the air. The fetuses were not directly exposed but were affected through the placental transfer of thinner-derived toxicants from the mother. After delivery, the pups were humanely euthanized on day 5 using isoflurane inhalation for the purpose of body length measurement and organ collection. Liver tissue was collected for CYP19 gene expression and MDA analysis, while fetal testes were used for testosterone level measurement.

Data were tested for normality using the Shapiro–Wilk test and showed a normal distribution for all variables: fetal length (p = 0.281), CYP19 expression (p = 0.346), MDA levels (p = 0.298), and testosterone levels (p = 0.311). One-way ANOVA indicated significant differences among groups for all parameters: fetal length (p = 0.004), CYP19 expression (p = 0.001), MDA levels (p = 0.002), and testosterone levels (p = 0.003). Post hoc LSD analysis revealed that the 60-minute and 90-minute exposure groups differed significantly from the control group across all parameters, while the 30-minute exposure group showed no significant difference in fetal length (p = 0.071) but did show significant differences in CYP19 expression (p = 0.042), MDA levels (p = 0.037), and testosterone levels (p = 0.039).

In conclusion, thinner exposure during pregnancy can disrupt the endocrine system by decreasing CYP19 gene expression and testosterone levels, increasing oxidative stress, and impairing fetal growth in a duration-dependent manner. These findings highlight the need for caution regarding thinner exposure, particularly among pregnant women, to prevent toxic effects on fetal development.

Keyword: Thinner, CYP19 gene expression, Testosterone, MDA, Fetal growth



亚太 C1-129-0002

L-borneol Regulates rno-miR-127/ PODXL2 to Promote Hair Follicle Stem Cells to Repair Skin Wounds

Zike Liu, Baolin Ye, Haoxiang Ye, Qing Zhong, Jiecheng Kong, Xianxi Zhou, Chunmei Ma, Aijun Liu*
Research Centre of Basic Integrative Medicine, School of Basic Medical Sciences, Guangzhou University of Chinese Medicine, Guangzhou, Guangdong Province, People's Republic of China

*Corresponding author Aijun Liu, Research Centre of Basic Integrative Medicine, School of Basic Medical Sciences, Guangzhou University of Chinese Medicine, No. 232, East Waihuan Road, Guangzhou Higher Education Mega Centre, Panyu District, Guangzhou City, Guangdong Province 510006, People's Republic of China. Email: aijunliu@gzucm.edu.cn

Objectives Hair follicle stem cells (HFSCs) can quickly activate and migrate to the wound site, differentiating into epidermal stem cells to facilitate early epithelialization. During the wound healing process, microRNAs (miRNAs) function coordinately. Chinese medicine borneol is derived from the *Cinnamomum camphora* plant, and its principal component, L-borneol, is renowned for its potential in facilitating skin wound healing. However, it remains unclear whether L-borneol can stimulate HFSCs to differentiate into epidermal cells or whether miRNAs are involved in this process.

Methods IF, WB, RT-qPCR, CCK-8 assay, cell transfection, dual-luciferase reporter assay, and H&E staining were performed.

Results HFSCs were isolated from the vibrissae of rats and identified based on the expression of CD34, Integrin-β1 and CK15. We observed that stimulation with L-borneol significantly increased the differentiation marker K14 in HFSCs. On this basis, we transfected and confirmed that rno-miR-127 inhibitor could promote the differentiation of HFSCs. Furthermore, we demonstrated that PODXL2 is a target gene of rno-miR-127 and confirmed that the rno-miR-127 mimic could inhibit the expression of PODXL2. To further elucidate the targeting relationship, we constructed the siPODXL2 fragment using siRNA technology, demonstrating that reducing PODXL2 expression can inhibit the differentiation of HFSCs into basal layer cells. Finally, a rat full-thickness skin defect model illustrated L-borneol-mediated negative regulation of PODXL2 by rno-miR-127.

Conclusion L-Borneol promotes skin wound repair by inhibiting rno-miR-127, upregulating PODXL2, and enhancing HFSCs differentiation into basal cells, offering new therapeutic insights.

Key Words: Hair follicle stem cells; L-borneol; PODXL2; rno-miR-127; Wound healing

亚太 C1-129-0003

Leptin attenuates Hypoxia injury in NSCs by reducing oxidative stress and regulating mitochondrial homeostasis via Nrf2 pathway

Ihtisham Ul Haq¹, Wang Xinyi¹, Hu Xiaoxuan¹, Wu Hanxi¹, Ma Kaige¹, Lu Haixia^{1*}
Institute of Neurobiology, School of Basic Medical Sciences, Xi'an Jiaotong University
Corresponding to: hxl01@mail.xjtu.edu.cn

Ischemia-reperfusion injury (IRI) refers to a secondary brain injury triggered by the restoration of blood supply to ischemic tissue, representing a major cause of disability and mortality. IRI involves intricate pathological mechanisms such as excitotoxicity, apoptosis, oxidative stress, calcium overload, and mitochondrial dysfunction. Preliminarily it has been reported that leptin improve the proliferation and differentiation of NSCs; however, the mechanism underlying its neuroprotective effect on NSCs following OGD/R injury remain to be fully elucidated. Nuclear factor erythroid 2-



related factor 2 (Nrf-2) signaling is important in antioxidative stress, and the role of Nrf-2 signaling in the enhanced neuroprotection of NSCs by leptin following OGD/R injury also remains to be elucidated. In the present study NSCs were treated with leptin (100ng/mL) immediately following OGD, the survival, apoptosis and proliferation of NSCs were assessed using CCK-8, LDH assay, TUNEL staining and immunocytochemistry. Moreover, oxidative stress and mitochondrial hemostasis were investigated using fluorescence-based functional assays, western blotting, qRT-PCR, and immunocytochemistry. The findings indicate that leptin administration significantly enhanced NSCs survival and proliferation while attenuating cell death under OGD/R conditions. Mechanistically, leptin mitigates oxidative stress and calcium overload, preserve mitochondrial integrity, improved mitochondrial biogenesis and mitochondrial fusion-fission balance in NSCs. Furthermore, under OGD/R conditions leptin facilitated the dissociation of Keap1/Nrf-2, remarkably enhanced Nrf2 nuclear translocation, and promoted the binding activity of Nrf-2 with antioxidant response elements (ARE), leading to upregulation of antioxidant genes (e.g., HO-1, NQO1). Overall, these findings highlight that leptin exhibited a profound neuroprotective effect against OGD/R injury by inhibiting apoptosis, reducing oxidative stress and ameliorating mitochondrial dysfunction by activating the Nrf2 pathway.

Key words: NSCs, OGD/R, leptin, oxidative stress, mitochondrial dysfunction, NRF2

亚太 C1-129-0006

Kindlin-2 in myoepithelium controls luminal progenitor commitment to alveoli in mouse mammary gland

Zhenbin Wang[#], Lei Zhang[#], Bing Li[#], Jiagui Song[#], Miao Yu, Jing Zhang, Ceshi Chen*, Jun Zhan*, Hongquan Zhang*

Program for Cancer and Cell Biology, Department of Human Anatomy, Histology and Embryology, School of Basic Medical Sciences; Peking University International Cancer Institute; MOE Key Laboratory of Carcinogenesis and Translational Research and State Key Laboratory of Natural and Biomimetic Drugs, Peking University Health Science Center, Beijing 100191, China.

[#] These authors contributed equally *Corresponding author

E-mail: chenc@kmmu.edu.cn; zhanjun@bjmu.edu.cn; Hongquan.Zhang@bjmu.edu.cn

Objectives Myoepithelium plays an important role in mammary gland development, but less is known about the molecular mechanism underlying how myoepithelium controls acinus differentiation during gestation. Herein, we found that loss of Kindlin-2 in myoepithelial cells impaired mammary morphogenesis, alveologenesis, and lactation.

Methods Using five genetically modified mouse lines combined with single-cell RNA sequencing, we found a Kindlin-2–Stat3–DII1 signaling cascade in myoepithelial cells that inactivates Notch signaling in luminal cells and consequently drives luminal progenitor commitment to alveolar cells identity.

Results Single-cell profiling revealed that Kindlin-2 loss significantly reduces the proportion of matured alveolar cells. Mechanistically, Kindlin-2 depletion in myoepithelial cells promotes Stat3 activation and upregulates DII1, which activates the Notch pathway in luminal cells and inhibits luminal progenitor differentiation and maturation during gestation. Inhibition of Notch1 with tangeretin allowed luminal progenitors to regain commitment ability in the pregnant mice with Kindlin-2 depletion in myoepithelium.

Conclusions Taken together, we demonstrated that Kindlin-2 is essential to myoepithelium-controlled luminal progenitors to alveoli transition during gestation.

This work was supported by grants from the National Key Research and Development Program of China, the National Natural Science Foundation of China, the Beijing Natural Science Foundation, the Yunnan Fundamental Research Projects, and the Peking University grants. The authors



appreciate the academic support from the AME Breast Cancer Collaborative Group.

Key Words: Kindlin-2; Myoepithelium; Mammary gland; Notch; Stat3.

亚太 C1-129-0007

M2-type macrophage migrasomes promote the osteogenic differentiation of bone marrow mesenchymal stem cells (BMSCs) by inducing SIRT3.

Mengci Wang¹, Siyu Zhang ^{1,2}, Abudurexiti Kutibiding², Xiaodan Zhou¹, Xiaohan Tian¹, Sunqiang Yuan¹, Mengjiao Lv¹, Ruize Li^{1,2}, Aobo Men^{1,2}, Shengbing Bai ^{1*}, Yi Yang^{2*}

¹Department of Histology and Embryology, School of Basic Medical Sciences, Xinjiang Medical University, Xinjiang Uyghur Autonomous Region, 830000, China

²Department of Spinal minimally invasive and precision orthopedics, The First Affiliated Hospital of Xinjiang Medical University, Xinjiang Uyghur Autonomous Region, 830000, China

Objective This study aimed to explore the influence of migrasomes originated from M2 macrophages on the osteogenic differentiation of bone marrow mesenchymal stem cells (MSCs).

Methods Macrophages were induced by IL - 4 to polarize into the M2 type. Migrasomes were then extracted and their identification was achieved by means of electron microscopy. MSCs were co - cultured with 60 ng/mL migrasomes or the SIRT3 inhibitor (SIRT3 - IN - 1) for a duration of 72 hours. Subsequently, the expressions of RUNX2, ALP, and Bmp - 2 were detected through qRT - PCR. X - ray, MicroCT, and immunofluorescence techniques were utilized to observe the healing process of femoral fractures in mice treated with 100 µg/mL migrasomes derived from M2 macrophages and SIRT3 - IN - 1.

Results The detection of elevated expression levels of Arg - 1 and CD206 verified the successful induction of M2 macrophages ($P < 0.001$). qRT - PCR and immunofluorescence Results demonstrated that migrasomes effectively promoted the expressions of RUNX2, ALP, and Bmp - 2 in bone marrow mesenchymal stem cells ($P < 0.001$). X - ray and MicroCT findings indicated that the migrasome - treated group exhibited a significant effect in promoting fracture healing. qRT - PCR and immunofluorescence Results further suggested that migrasomes from M2 macrophages significantly enhanced the expression of SIRT3 in bone marrow mesenchymal stem cells ($P < 0.001$, $P < 0.01$). Moreover, the osteogenic differentiation capacity of BMSCs was evidently inhibited when the expression of SIRT3 was suppressed.

Conclusion Migrasomes from M2 macrophages potentially induce the osteogenic differentiation of bone marrow mesenchymal stem cells via SIRT3, thereby facilitating fracture healing.

Keywords: Migrasomes; M2 macrophages; Bone marrow mesenchymal stem cells; Osteogenic differentiation; Fracture healing



亚太 C1-129-0012

Single-cell transcriptomic analysis reveals heterogeneity of human induced pluripotent stem cell-derived Schwann cell precursors and Schwann cells, and identifies transcriptional similarities to repair mouse Schwann cells

Zhining LI (zhiningli@cuhk.edu.hk)^{1,2,*}, Tangxi XIAO^{1,2}, Tak Keung PANG^{1,2}, Man Kong NGAN^{1,2}, Chi Hang NGAI^{1,2}, Wood Yee CHAN (wy-chan@cuhk.edu.hk)^{1,2,#}

¹InnoHK Center for Neuromusculoskeletal Restorative Medicine (CNRM); ²School of Biomedical Sciences, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong SAR.

*Presenting author; #Corresponding author

Peripheral nerve injury (PNI) is a debilitating health problem that affects millions of patients every year. Despite advancements in nerve reconstruction, the limited regenerative capacity of peripheral nerves results in unsatisfactory outcomes of surgical intervention in patients with PNI. New therapeutic strategies are urgently required. Nerve regeneration is a complex multicellular response, involving diverse cell types with different roles. Schwann cells (SCs) are the most abundant glial cells of the peripheral nervous system. After PNI, they de-differentiate into repair Schwann cells which are phenotypically similar to Schwann cell precursors (SCPs) during the early development of peripheral nerves. Repair SCs, SCPs and SCs are therefore considered important cell types for promoting nerve regeneration after PNI. However, sources of these human SCs are very limited. Here, we presented a modified induction strategy for generating a stable source of SCPs from human induced pluripotent stem cells (hiPSCs). These human SCPs were able to expand and differentiate into MBP-expressing SCs that secrete neurotrophic factors. With single-cell RNA sequencing (scRNA-seq), we were able to find heterogeneity within populations of SCPs/SCs induced from hiPSCs. We then identified transcriptional similarities between induced hSCPs/hSCs and repair mouse SCs after comparing our datasets with those from mouse SCs after PNI. Our Results thus advanced our understanding of cellular identities and transcriptional characteristics of human iPSC-derived SCPs and SCs, and these induced SCPs/SCs showed similarities to repair SCs, implicating the potential use of these human iPSC-derived SCPs and SCs as therapeutic tools to improve iPSC-based therapies for peripheral neuropathy.

Key words: hiPSC-derived Schwann cell precursors, peripheral nerve injury, regeneration, repair Schwann cells, single cell RNA-sequencing



● 亚太 C1. Stem Cell & Development ● Abstract

亚太 C1-129-0004

The Mechanism and Therapeutic Efficacy of Melanin Nanoparticles in the Treatment of Skeletal Muscle Injury

Xiong Wei¹, Cao Yuanqi¹, Niu Yanmei², Shao Heng¹ (shaoh@tmu.edu.cn)

¹Department of Human Anatomy, College of Basic Medical Sciences, Tianjin Medical University, Tianjin 300070, China

²Department of Rehabilitation, School of Medical Technology, Tianjin Medical University, Tianjin 300070, China

Objective With its antioxidant and anti-inflammatory properties, nanoparticles (MNPs) have been validated in liver, kidney and other organs, but the specific mechanism of action on skeletal muscle injury still needs to be further explored.

Methods To assess the therapeutic effects of melanin nanoparticles (MNPs) on skeletal muscle contusions, we established an injury model in C57BL/6 male mice, dividing them into control (CON), skeletal muscle injury (SMI), and melanin nanoparticles (MNPs) treatment groups. Muscle samples were collected from the gastrocnemius at days 1, 3, 7, and 14 post-injury for histological analysis (HE staining) and functional assessment (rotarod fatigue testing). The injury was induced by dropping a 60 g weight from 24 cm onto the mid-belly of the gastrocnemius. Skeletal muscle injury models were established in all groups except controls (CON). At 24 h post-injury, the MNPs group received bilateral 50 μ L nanoparticle suspensions via microsyringe injection into gastrocnemius muscles, while the SMI group was administered equivalent volumes of saline.

Results HE staining revealed normal morphology in the control group, with intact muscle fiber architecture and no signs of damage. Post-injury, muscle fiber swelling and inflammation were observed, peaking at day 3. While partial recovery was evident at day 7, the MNPs-treated group showed normalized muscle fiber morphology. Rotarod testing showed significantly impaired performance in injury groups versus CON ($P < 0.05$). The MNPs group demonstrated significant functional recovery compared to SMI ($P < 0.05$).

Conclusion MNPs represent a novel nanotherapeutic modality for the treatment of muscle injury.

Key Words: Melanin nanoparticles; Motor function; Skeletal muscle injury



亚太 C1-129-0008

MSC derived small extracellular vesicles suppress cardiomyocyte apoptosis through miR-490-3p/RN7SL1 axis via RN7SL1 with complete structure

Ling Wang^{a, b, 1}, Yujie Yang^{a, 1}, Yang Zhou^{a, 1}, Aijun Sun^{a, 1}, Liang Qiao^a, Xi Zhang^a, Ting Cai^c, Ruifang Gao^d, Tengjiao Wang^{e, *}, Yue Wang^{b, d, f, g, *}, Xiangqun Yang^{a, *}

^aDepartment of Human Anatomy, School of Basic Medicine, Naval Medical University, Shanghai 200433, China

^bShanghai Key Laboratory of Cell Engineering, Shanghai 200433, China

^cUniversity of Shanghai for Science and Technology, Shanghai 200093, China

^dDepartment of Stem Cell and Regeneration Medicine, Translational Medicine Research Center, Naval Medical University, Shanghai 200433, China

^eDepartment of Medical Science Engineering Collaborative Innovation, Translational Medicine Research Center, Naval Medical University, Shanghai 200433, China

^fShanghai Institute of Stem Cell Research and Clinical Translation, Shanghai 200433, China

^gKey Laboratory of Geriatric Long-term Care (Naval Medical University), Ministry of Education, Shanghai 200433, China

¹These authors contributed equally to this work.

Objectives Ischemia reperfusion (I/R) induced myocardial injury is a difficult problem in clinical treatment. Mesenchymal stem cell-derived small extracellular vesicles (MSC-sEV) offer a new treatment option. This study aimed to investigate whether intact long-chain RNAs exist in MSC-sEV and whether their delivery exerts therapeutic effects on myocardial I/R injury.

Methods Nanopore sequencing was used to detect the presence of long-chain RNAs in MSC-sEV. Mice myocardial I/R model was used to evaluate the protective effect of MSC-sEV and isoflurane was used for mice anesthesia before modeling and cardiac sampling. AC16, HL-1, and neonatal mice cardiomyocyte were used to validate the protective effect of MSC-sEV in vitro.

Results Our study shows that RN7SL1 is highly expressed and structurally intact in MSC-sEV by Nanopore sequencing. MSC-sEV can effectively reduce apoptosis induced by myocardial I/R in vivo and reducing the expression level of RN7SL1 in MSC-sEV can weaken the therapeutic effect of MSC-sEV. Myocardial I/R increases the expression of miR-490-3p which can promote apoptosis in cardiomyocytes by reducing the expression level of Bcl2l. The transmission of RN7SL1 by MSC-sEV can decrease the percentage of apoptotic cells induced by miR-490-3p in vitro. Mechanism studies have proved that RN7SL1 has the ability to directly bind with miR-490-3p and can restore the reduced expression level of Bcl2l.

Conclusion Our findings highlight the RN7SL1, independent of signal recognition particles, can inhibit apoptosis by inhibiting the miR-490-3p/Bcl2l1 pathway. This mechanism has been validated in both human and mice cell models and has high clinical translational value.

Keywords: Cardiomyocyte; Extracellular Vesicles; Ischemia-Reperfusion Injury; Mesenchymal Stem Cells; Nanopore Sequencing



● 亚太 C2. Cell Biology ● Podium

ID: 312648

Targeting VGLL4 Maintains Extracellular Matrix Homeostasis and Mitigates Osteoarthritis

Jinlong Suo² Duo Wang³ Xianyou Zheng² Zuoyun Wang¹ Weiguo Zou^{2,3,4}

1. Department of Human Anatomy & Histoembryology, School of Basic Medical Sciences, Fudan University, Shanghai 200032, China.

2. Institute of Microsurgery on Extremities, Department of Orthopedic Surgery, Shanghai Sixth People's Hospital Affiliated with Shanghai Jiao Tong University School of Medicine, Shanghai, 200233, China.

3. State Key Laboratory of Cell Biology, CAS Center for Excellence in Molecular Cell Sciences, Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences, University of Chinese Academy of Sciences, 200031, China.

4. Hainan Medical University, Hainan, 571199, China.

Objectives Osteoarthritis (OA) is a disease closely related to aging and about 500 million people worldwide suffer from it. VGLL4 has been shown to be involved in the regulation of the differentiation and proliferation of various stem cells. However, whether VGLL4 is involved in the maintenance of extracellular matrix homeostasis is unclear, and whether VGLL4 can be used as a therapeutic target for OA.

Methods We showed that the VGLL4-TEAD-SMAD3 complex regulates extracellular matrix homeostasis in hyaline cartilage fibrosis via various methods, including single-cell sequencing analysis, structural model prediction, RNA-seq, the use of transgenic animal mice and adeno-associated virus (AAV) therapy.

Results We found that VGLL4 was highly expressed in chondrocytes and human articular cartilage. We also constructed a mouse model of tamoxifen-induced specific knockout of *Vgll4* in chondrocytes, and the Results revealed that articular cartilage fibrosis was severe in the CKO mice. Mechanistically, we found that TEAD mediated the interaction between VGLL4 and SMAD3 and that the VGLL4-TEAD-SMAD3 complex synergistically determines extracellular matrix homeostasis and promotes the collagen formation in chondrocytes. We also injected wild-type *Smad3* and *Smad3*-mutated AAVs into the joint cavity of DMM-induced OA model mice and found that AAV2/9-*Smad3* alleviated the process of OA, whereas the AAV2/9-*Smad3* mutant was ineffective for OA treatment.

Conclusion This study demonstrates the VGLL4-TEAD-SMAD3 complex in extracellular matrix homeostasis and hyaline cartilage fibrosis for the first time, providing therapeutic targets for OA.

Keyword: Hippo signaling pathway, VGLL4, Osteoarthritis, Immunoprecipitation



ID: 318305

SUMOylation of PKM2 Promotes Ferroptosis of Chondrocytes in Diabetic Osteoarthritis

Qin Zhong Xiyan Ouyang Zike Liu Haoxiang Ye Baolin Ye Dongfeng Chen, Aijun Liu
Guangzhou University Of Chinese Medicine

Objectives Diabetic osteoarthritis (DM-OA) is associated with chondrocyte ferroptosis, a regulated cell death process linked to metabolic dysfunction. Pyruvate kinase M2 (PKM2) plays a critical role in ferroptosis regulation, but whether it is modulated by Small Ubiquitin-like Modification (SUMOylation) in DM-OA remains unknown. This study investigates the role of PKM2 SUMOylation in high glucose (HG)-induced chondrocyte ferroptosis.

Methods The inflammatory infiltration and distribution of cartilage tissue were observed by HE staining and Safranin O-Fast green staining. Immunofluorescence staining was used to observe the expression of MMP13, GPX4 and PKM2 in Diabetic osteoarthritis (DM-OA) mice. The promoting effect of high glucose on ferroptosis in ADTC5 was explored by qPCR, Western blot (Wb), and flow cytometry. SiRNA interference, Co-immunoprecipitation assay (coip), chromatin immunoprecipitation-qPCR (chip-qPCR) and other Methods were used to detect the mechanism of high glucose promoting ferroptosis through PKM2.

Results Here, we show increased PKM2 levels and ferroptosis of chondrocytes in DM-OA mice, as well as high glucose (HG)-induced chondrocyte ferroptosis. Knockdown of PKM2 inhibits ferroptosis in ADTC5 cells under HG conditions. HG-induced ADTC5 cells show increased SUMOylation of PKM2 and its nuclear translocation. Moreover, we find an interaction between PKM2 and activating transcription factor 2 (ATF2), and binding of ATF2 to the ACSL4 promoter under HG conditions.

Conclusion PKM2 is regulated by SUMOylation during ferroptosis of chondrocytes in diabetic osteoarthritis and propose PKM2 as a potential therapeutic target for the treatment of diabetes-associated ferroptosis of chondrocytes.

Keyword: Diabetic osteoarthritis; Chondrocyte ferroptosis; Pyruvate kinase M2; SUMOylation

ID: 332424

Differential Microglial Activation in Human Brain Tissues Associates with Alzheimer's Disease Pathology

Xue Wang Yakun Cao Wei Wu Wenying Qiu Bo Yuan Xiaojing Qian
Institute of Basic Medical Sciences Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College

Objectives Microglial activation is crucial in neuroinflammation and neurodegeneration in Alzheimer's disease (AD). However, the specific contributions of different microglial subtypes to AD pathology remain unclear. This study evaluated the differential activation patterns of four microglial markers (IBA1, HLA-DR, CD163, and CD68) in postmortem human brain tissues between AD and control groups.

Methods 22 human brain samples including 11 AD cases and 11 age-matched controls (confirmed by neuropathological assessment according to NIA-AA) were analyzed. Immunohistochemistry (IHC) was performed to quantify the density of microglial subtypes expressing IBA1 (pan-microgli



al marker), HLA-DR (MHC-II, indicative of antigen presentation), CD163 (anti-inflammatory phenotype), and CD68 (phagocytic activity). Statistical analyses were conducted to compare microglial densities between AD and control groups.

Results IBA1+ microglia were increased in AD compared to controls, but the difference was not statistically significant. CD68+ microglia were significantly elevated in AD brains ($p < 0.01$). HLA-DR and CD163 expression showed no significant differences between groups, though trends toward higher HLA-DR in AD were observed.

Conclusion Our findings suggest that specific microglial subpopulations, particularly phagocytic CD68+ microglia cells, are more prominently activated in AD, implicating their role in disease progression. Further studies are needed to elucidate the functional implications of these microglial phenotypes in AD. (Statement: The study was approved by the Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, Approval Numbers: 009-2014 and 2022125)

Keyword: Alzheimer's Disease, Human Brain Bank, Microglia, Postmortem brain

亚太 C2-129-0004

Syncytin-1 deficiency disrupts trophoblast-endothelial crosstalk in preeclampsia via RAS and PI3K/Akt/eNOS pathways

Xue-ling Chen, Ya-nan Wang, Ju Yang, Hai-feng Zhang, Yun-shan Xue, Hai-bin Chen* (chenhb@stu.edu.cn)
Department of Histology and Embryology, Shantou University Medical College, China

Objectives Preeclampsia, a hypertensive disorder of pregnancy with multisystem involvement, is associated with placental vascular dysfunction. Syncytin-1, an endogenous retroviral envelope protein critical for trophoblast syncytialization, is downregulated in preeclamptic placentas. This study investigates how syncytin-1 deficiency dysfunctions endothelial cells and contributes to preeclampsia.

Methods The RUPP (Reduced Uterine Perfusion Pressure) model was established at E12.5 through bilateral uterine clamping under Zoletil/ xylazine anesthesia (50/10 mg/kg, i.p.). Fetuses and placentas were harvested at E17.5 under the same anesthesia. Syncytin-1 knockdown in JAR trophoblasts (siRNA targeting ERVW-1) and co-cultured HUVEC functional assays were performed.

Results RUPP mice exhibited elevated uterine artery resistive index and pulsatility index at E17.5 vs E12, accompanied by glomerular protein exudates and tubular casts. Compared to sham group, RUPP resulted in abnormal fetal development, placental labyrinth layer disorganization and fetal vascular endothelial injury. Syncytin-1 expression in RUPP placentas decreased, with concomitant ACE2/MAS1 downregulation and RAS pathway inhibition. ERVW-1 knockdown reduced JAR proliferation/migration while increasing apoptosis/ROS. Proteomic analysis of conditioned medium from syncytin-1-deficient JAR cells revealed KEGG pathway enrichment in spliceosome, HIF-1 signaling, and metabolic pathways, though functional validation remains pending. HUVECs exposed to syncytin-1-deficient medium showed impaired tube formation, increased ICAM-1/VCAM-1/SELE expression. Key RAS components (ACE2/MAS1) were downregulated with concurrent PI3K/Akt/eNOS signaling inhibition, reducing vasodilatory capacity.

Conclusion Syncytin-1 deficiency disrupts trophoblast-endothelial crosstalk through dysregulation of the ACE2/MAS1 axis, and impairment of PI3K/Akt/eNOS-mediated vasodilation. These findings position syncytin-1 as a potential therapeutic target for preeclampsia-associated endothelial dysfunction. Further studies should explore syncytin-1 supplementation strategies in RUPP models.

Keywords: Endothelial cells; PI3K/Akt/eNOS; RAS; syncytin-1; trophoblasts



亚太 C2-129-0009

Dendrobine and Erianin alleviate inflammation-induced depressive-like behaviors by targeting phosphodiesterase 4B in adolescent mice

Jiaming Shi, Jiacheng Wang, Haoran Cao, Yixian Song, Yuqing Lu, Jianning Li, Yunlong Chen, Yizhan Zhang, Liyan Wang, Aijun Hao, Yuchun Tang, Shuwei Liu, Liang Kong, Wenjuan Zhou.
Department of Human Anatomy and Histoembryology, School of Basic Medical Science, Shandong University;
Department of Clinical Laboratory, Affiliated Hospital of Shandong University of Traditional Chinese Medicine.
E-mail: wenjuanzhou@sdu.edu.cn and kongliang@sdutcm.edu.cn.

Objectives Depression in children and adolescence is highly prevalent due to current adverse circumstances like academic failure and substance abuse. Inflammation in early-life was able to evoke depressive symptoms in adolescence. Dendrobine (DEN) and Erianin (ERI) are two active constituents of *Dendrobium officinale*. However, their roles in inflammation-induced adolescent depression remain unclear. In this study, we detected the role and mechanism of DEN and ERI in adolescent depression.

Methods Inflammation-mediated depression model was induced by intraperitoneal injection of lipopolysaccharide (LPS) and multiple behavioral tests were performed in adolescent mice. Network pharmacology and molecular docking were applied to predict and select target proteins. Techniques such as transmission electron microscope, Golgi staining, western blot, Elisa, lentivirus, RNA-seq and 16S rRNA-seq were utilized to investigate the roles and mechanisms of DEN and ERI.

Results Network pharmacology analysis showed that DEN and ERI were closely associated with depressive disorder and shared 385 intersecting proteins. Administration of DEN and ERI alleviated lipopolysaccharides (LPS)-induced depression-like behaviors, and impairment of neurons and synapses in the hippocampus (HIP) and prefrontal cortex (PFC) of adolescent mice. DEN and ERI prevented microglial activation, release of pro-inflammatory cytokines, and enlargement of Toll-like receptor 4 (TLR4)/NF- κ B pathway. Importantly, phosphodiesterase 4B (PDE4B) was proved as a crucial target protein of DEN and ERI. Overexpression of PDE4B reversed DEN and ERI-reduced activation of TLR4//NF- κ B pathway and production of pro-inflammation cytokines in LPS-treated BV2 microglial cells. Besides, compared with ERI, DEN exhibited more beneficial effects on preventing LPS-induced intestinal flora disorders and intestinal epithelial cells injury via remodeling microbiota in mice.

Conclusion The protective effects of DEN and ERI in inflammation-induced depressive disorder will identify DEN and ERI-directed PDE4B/TLR4/NF- κ B pathway as a therapeutic target for treatment of adolescent patients.

Key Words: Dendrobine, Erianin, Major depressive disorder, neuroinflammation, phosphodiesterase 4B.



亚太 C2-129-0010

The Role of Gut Microbiota in the Pathogenesis of Glaucoma: Evidence from Bibliometric Analysis and Comprehensive Review

Zakir Ullah¹, Yuanyuan Tao¹, Amina Mehmood² and Jufang Huang^{1,*}

¹ Department of Anatomy and Neurobiology, School of Basic Medical Sciences, Central South University, Changsha 410017, China

² Department of Microbiology and Immunology, College of Medicine, National Cheng Kung University, Tainan 701401, Taiwan

The relationship between gut microbiota and glaucoma has garnered significant interest, with emerging evidence suggesting that gut dysbiosis, inflammation, and immune mechanisms may contribute to glaucoma pathogenesis. Understanding these interactions through the gut-retina axis offers new insights into disease progression and potential therapeutic options. This study combines bibliometric analysis and literature review to evaluate research trends and key research areas related to gut microbiota's role in glaucoma. Our data were collected from the Web of Science Core Collection and included the English original articles and reviews published between 1 January 2008, and 6 August 2024. Visual and statistical analyses were conducted using VOSviewer and CiteSpace. The analyses comprised 810 citations from leading journals, representing contributions from 23 countries/regions, 111 institutions, 40 journals, and 321 authors. Among the countries and regions involved, the USA and China were the leading contributors, publishing the most articles and being major research hubs. The Experimental Eye Research and Investigative Ophthalmology & Visual Science were the top journals in citation and co-citations that produced high-quality publications. The top 10 highly cited articles were published in high-ranking, top-quartile journals. The frequently occurring keywords were "glaucoma", "gut microbiota", "inflammation", "gut-retina axis", and "probiotics". Our study highlights the growing interest in the association between gut microbiota and glaucoma. It summarizes the possible ways gut microbiota dysbiosis, systemic and neuroinflammation, and autoimmune mechanisms contribute to glaucomatous pathogenesis. Future research should focus on mechanistic studies to elucidate the pathways linking gut microbiota to glaucoma development and progression.

Keywords: glaucoma; gut microbiota; microbiota dysbiosis; gut-retina axis; inflammation; bibliometric analysis



亚太 C2-129-0013

Testosterone delays bone microstructural destruction via osteoblast-androgen receptor-mediated upregulation of tenascin-C

Yong Xie^{1,2,3,5}, Meng Pan^{2,5}, Zeyuan Zhang^{1,5}, Licheng Zhang^{1,3}, Haotian Liu², Xia Wang²,
William W Lu⁴, Peifu Tang^{1,3}, Wei Ge²

¹Department of Orthopedics, The Fourth Medical Center, Chinese PLA General Hospital, Beijing 100853, China

²State Key Laboratory of Complex Severe and Rare Diseases, Department of Immunology, Institute of Basic Medical Sciences Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College, Beijing, 100005, China

³National Clinical Research Center for Orthopedics, Sports Medicine & Rehabilitation, Beijing 100853, China

⁴Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong 999077, China

⁵These authors contributed equally: Yong Xie, Meng Pan, Zeyuan Zhang

Objectives Bone loss and microstructural destruction in elderly men are associated with fracture and high mortality. Androgen is considered to be a possible protective factor for male bone. The aim of this study was to elucidate its underlying regulatory mechanism in bone remodeling.

Methods Bone microstructures derived from high resolution CT of 352 men from the Chinese PLA General Hospital were analyzed, and blood specimens were collected for relevant tests. The mechanisms of the testosterone (Tes)-androgen receptor (AR)-tenascin-C (TNC) pathway were investigated by in vitro and in vivo studies combining AR knockout mice with tail suspension.

Results Bone microarchitectural analysis in elderly males revealed proximal femur deterioration characterized by reduced cortical and trabecular thickness and increased porosity near the medial acetabulum. Serum testing (n=352) linked low Tes (<9.415 nmol/L) to elevated bone loss risk. Arflox/Y mice with tail-suspended recapitulated these changes, showing decreased trabecular bone, increased porosity/separation versus controls. In vitro studies showed Tes activates AR-mediated TNC upregulation during osteoblast differentiation. ColabFold analysis demonstrated the fibrinogen C-terminus of TNC inhibits osteoclastogenesis by binding integrin α V, blocking RGD-motif proteins. Pep2 exhibited osteoprotective effects in Arflox/Y mice with tail-suspended. Elevated serum vesicle APP, resulting from Tes-AR-TNC decline-induced osteoclast overactivation, emerged as bone microarchitectural destruction biomarker when combined with low Tes.

Conclusion This study reveals that Tes-AR signaling delays elderly male bone microarchitectural destruction by upregulation of the osteoblastic TNC, and highlights its potential value in clinical risk assessment and precision interventions of bone loss and nonunion.

Keywords: Bone microarchitecture; Bone loss; Testosterone; Androgen receptor; Tenascin-C



亚太 C2-129-0014

Identification and verification of lysosome related biomarkers in Alzheimer's disease

Mingyu Li^{1,2}, Hai Tang¹, Huaqiao Wang¹, Tao Luo¹.

¹Zhongshan School of Medicine, Sun Yat-Sen University, Guangzhou 510080, Guangdong, China.

²limingyu_113@163.com

Objectives To obtain lysosome related biomarkers in AD and evaluate their diagnostic potential to predict AD, in order to searching for new biomarkers for early diagnosis of AD.

Methods GSE109887 and GSE132903 datasets were obtained from the Gene Expression Omnibus database and merged into a single training cohort. Lysosome-related genes (LRGs) showing differential expression were pinpointed by overlapping the differentially expressed mRNAs from training cohort with lysosome-related genes from the Gene Ontology and GSEA databases. Using unsupervised clustering, AD patients were divided into different clusters with immune heterogeneity. The final DEGs with diagnostic potential were screened by WGCNA and machine learning algorithm (RF, LASSO regression, and SVM-RFE) together. The predictive efficiency of these genes was validated through ROC curves. Western Blot, qPCR, immunofluorescence and other experiment Methods were used to study the mechanism of the target gene.

Results From the datasets, 41 LRGs related to AD was screened out. Based on the expression profile, AD patients were divided into 2 clusters with different lysosome correlation characteristics. Combined WGCNA, machine learning algorithms screening and ROC validation, we gained 5 final DEGs with potential diagnostics effective. After verified in AD model, we obtained the target gene and discovered its influence on the level of A β and LC3.

Discussion Our study screened lysosome related DEGs in temporal lobe of AD patients for the first time, verified the expression of these genes in the AD model and studied the mechanism of the target gene in AD.

Keywords: Alzheimer's disease, lysosome, APP/PS1 mice, SY5Y-APP cells.

亚太 C2-129-0015

Oxidized SOD1 impairs MDV formation and accelerates cellular senescence

Ying Guo^{1,2,3}, Teng Guan², Qiang Yu⁴, Meiyu Li¹, Guohui Zhang^{5*}, Jiming Kong^{2**}

1. Department of Pathology, Hebei North University, Zhangjiakou, Hebei, China

2. Department of Human Anatomy and Cell Science, University of Manitoba, Winnipeg, Manitoba, Canada

3. Hebei Key Laboratory of Neuropharmacology, Hebei North University, Zhangjiakou, Hebei, China

4. Department of Neurosurgery, Guangzhou Women and Children's Medical Center affiliated to Guangzhou Medical University, Guangzhou, Guangdong Province, China

5. Department of Forensic Medicine, Hebei North University, Zhangjiakou, Hebei, China

Objectives Oxidative stress (OS) is widely recognized as a key contributor to aging, although a direct causal link between oxidative damage accumulation and aging remains to be definitively established. Superoxide dismutase 1 (SOD1), a primary intracellular antioxidant enzyme, is highly susceptible to oxidative modifications under OS, acquiring toxic properties that can disrupt cellular homeostasis. This study investigates the role of oxidized SOD1 in accelerating cellular senescence and aging.

Methods The study utilized the NSC34 motor neuron-like cell line stably expressing either the G93A mutant human SOD1 (hSOD1^{G93A}) or wild-type hSOD1 (hSOD1^{WT}). In parallel, transgenic



mice expressing hSOD1^{G93A} or hSOD1^{WT} were stratified into young and middle-aged groups.

Results Transgenic hSOD1^{G93A} mice exhibited early-onset aging phenotypes by 135 days of age, characterized by elevated expression of senescence markers p53 and p16, and reduced levels of the longevity-associated proteins SIRT1 and SIRT6, compared to age-matched hSOD1^{WT} mice. Importantly, oxidized SOD1 levels were markedly increased in both senescent NSC34^{G93A} cells and the spinal cords of 135-day-old hSOD1^{G93A} mice. Mitochondrial dysfunction was evident in both models, and while the production of mitochondria-derived vesicles (MDVs) was initially elevated in response to mild OS in young hSOD1 transgenic mice, this protective mitochondrial response declined progressively with age.

Conclusion Oxidized SOD1 contributes directly to the onset of cellular senescence and systemic aging. A declining mitochondrial adaptive response to oxidative stress may serve as a biomarker and mechanistic driver of premature aging in the context of SOD1 mutation-associated neurodegeneration.

Key Words: Cellular senescence, Superoxide dismutase 1, Oxidative stress, Mitochondrial dysfunction, Mitochondria-derived vesicles

亚太 C2-129-0016

ATP5D-mediated B cell senescence across the aging spectrum from youth to Alzheimer's disease

Lu-Lu Xue¹, Liu-Lin Xiong², Ting-Hua Wang^{3*}

¹State Key Laboratory of Biotherapy, Sichuan University, Sichuan, China;

²Department of Neurosurgery, Affiliated Hospital of Zunyi Medical University, Guizhou, China;

³Institute of Neurological Disease, Neurosurgery department, West China Hospital, Sichuan University, Sichuan, China;

*Corresponding author: Ting-Hua Wang, Institute of Neurological Disease, Neurosurgery department, West China Hospital, Sichuan University, Chengdu, China. Email: wangtinghua@vip.163.com

Objective Peripheral immunosenescence is intricately linked with the pathogenesis of Alzheimer's disease (AD), with B cell senescence emerging as a key factor in this process, but the underlying core mechanism and effective therapy is largely missing. This study aimed to investigate the potential of ATP5D-mediated B cells rejuvenation as a therapeutic strategy for AD.

Methods and Results Single-cell RNA sequencing using human peripheral blood mononuclear cells (PBMCs) and 4D-DIA protein microarray of mice B cells reveal a significant association between B cell aging and ATP5D dysregulation. Transfusion of young B cells with enhanced mitochondrial function into AD mice mitigates neuropathological hallmarks and cognitive deficits. Mechanically, ATP5D depression in young B cells abolished their neuroprotective effects, resulting in exacerbated neuronal loss and memory impairment in AD rats. Conversely, targeted enhancement of ATP5D expression rejuvenated aged B cells by restoring mitochondrial bioenergetics, thereby rescuing their immune surveillance function and promoting neuronal survival. Importantly, ATP5D downregulation in human peripheral B cells perform advantage in predicting AD with different severity.

Conclusion The findings presented in this study elucidate a critical role of B cell senescence driven by mitochondrial damage in AD pathogenesis, and highlight ATP5D as a key regulator of this process, underscoring the potential of targeting ATP5D-enhanced peripheral B cell rejuvenation as a novel therapeutic approach for AD.

Key Words: Alzheimer's disease, ATP5D, B cells senescence, Mitochondria damage, Young peripheral B cells transfusion.



● 亚太 C2. Cell Biology ● Poster

ID: 320038

Mechanism of royal jelly peptides attenuating oxidative stress and inflammatory response after myocardial ischemia-reperfusion via Nrf2/Hmox1/HO-1 pathway

Cai Hao Jia Fengjing Zuo Tao Lv Dongchao Li Xiuya Wang Lei Wang Dongyuan Shao Changle Luo Siwei Xiao Beijia
Shanghai University of Traditional Chinese Medicine

Objective To investigate the effects of Jelleine-1 (J1) on oxidative stress, apoptosis, and inflammatory responses in myocardial ischemia-reperfusion injury (MIRI) and its mechanisms.

Methods Cardiac function, tissue apoptosis, serum levels of various factors, reactive oxygen species (ROS) levels, apoptotic necrosis ratio, protein, and gene expression changes were evaluated in a rat and mouse model of MIRI, and a cardiomyocyte model of hypoxia-reperfusion (OGDR).

Results J1 significantly improved cardiac ejection fraction and shortening fraction after MIRI, decreased serum lactate dehydrogenase and creatine kinase isoenzyme levels, and decreased ROS levels, apoptotic and necrotic cell ratios in cells after OGDR. J1 increased the levels of Nrf2, HO-1, P-Akt, and Bcl-2 proteins in cardiac tissues, and the levels of nuclear Nrf2 protein and cytoplasmic HO-2 protein and cytoplasmic HO-2 in H9C2 and HL-1 cells. protein levels, cytoplasmic HO-1 protein levels, and promoted the separation of Nrf2 from Krap1.

Conclusion J1 can protect cardiomyocytes and cardiac function by decreasing the levels of reactive oxygen species, inflammatory factors, apoptosis and necrosis through Nrf2/Hmox1/HO signal pathway.

Keyword: Apoptosis; Cardiac Ischemia-Reperfusion Injury; Jelleine-1; Oxidative Stress; Royal Jelly

ID: 320089

PRAG1 Condensation Drives Cell Contraction Under Stress

Peiwu Ye
University of Macau

Objectives A proportion of biomacromolecules undergo liquid-liquid phase separation (LLPS) to form diverse, functionally specialized condensates. This phenomenon has attracted significant research interest because of its critical role in neurodegenerative disease. Nevertheless, the molecular diversity and pathological functions of the condensates in Parkinson's disease (PD) remain poorly understood.

Methods Since mitochondrial dysfunction plays a central role in dopaminergic (DA) neuronal death in PD, we used mitochondrial complex I inhibitors to establish cellular PD models. Following treatment, we purified condensate-enriched fractions for mass spectrometry (MS) analysis and screened for the differentially enriched proteins with phase-separation ability.

Results Among the proteins differentially enriched between treated and control groups, peak1-related, kinase-activating pseudokinase 1 (PRAG1)—a member of the PEAK pseudokinase family—stood out. We demonstrate that PRAG1 forms dynamic condensates in cells, driven by its α N and



α J helices. Notably, these condensates mediate cell contraction, whereas condensation-defective PRAG1 mutants lose this function. Strikingly, spherical PRAG1 condensates were observed not only in multiple cellular stress models but also in DA neurons derived from PD patients, suggesting a broader pathological relevance.

Conclusion Our findings uncover a novel mechanism by which PRAG1 LLPS drives cell contraction and propose a potential connection between dysregulated PRAG1 phase separation and DA neuronal death in PD.

Keywords: PRAG1; phase separation; cell contraction; stress; Parkinson's disease

ID: 320680

The Role and Mechanism of SIRT3-Regulated Mitochondrial Fission and Autophagy in Ameliorating Chemotherapy-Induced Granulosa Cell Apoptosis

Hanping
Ningxia Medical University

Objective To investigate the role and mechanism of SIRT3-regulated mitochondrial fission and autophagy in ameliorating chemotherapy-induced granulosa cell apoptosis, providing theoretical evidence and new intervention targets for ovarian function preservation and reducing chemotherapy-related reproductive toxicity.

Methods KGN cells were treated with cyclophosphamide to establish an in vitro apoptosis model. SIRT3 expression was upregulated and downregulated by adding SIRT3 agonists and inhibitors, respectively. The effects of SIRT3 modulation on mitochondrial function, mitochondrial fission, autophagy activity, and cell apoptosis were evaluated. Western blot, JC-1 staining, Mitotracker, and flow cytometry techniques were employed to assess SIRT3 expression, mitochondrial function, mitochondrial autophagy, and apoptosis rates.

Results Chemotherapy treatment reduced SIRT3 expression in KGN cells, accompanied by excessive mitochondrial fission, increased mitochondrial autophagy, and elevated apoptosis rates. Upregulation of SIRT3 improved mitochondrial function, promoted mitochondrial fusion, inhibited excessive mitochondrial autophagy, and significantly reduced apoptosis rates.

Conclusion SIRT3 ameliorates chemotherapy-induced granulosa cell apoptosis by regulating mitochondrial fission and autophagy activity. The underlying mechanisms are related to the restoration of mitochondrial homeostasis, inhibition of excessive mitochondrial autophagy, and excessive mitochondrial fission. These findings provide potential molecular intervention targets for preventing chemotherapy-induced ovarian damage and may offer theoretical support for developing clinical strategies for ovarian protection.

Keyword: Apoptosis, Cyclophosphamide, Mitochondria, Ovarian granulosa cells, SIRT3



ID: 320686

Mechanism of STAT3 in Regulating Oocyte Meiosis and Fertility via Spindle Assembly in Mice

YipingLei
Ningxia Medical University

Objective STAT3 is a key signal transducer whose Y705 phosphorylation drives nuclear translocation and transcriptional activity in hormone and cytokine responses. Although its roles in embryo genesis and immunity are established, its function in oocyte meiosis is unknown. This study explores how STAT3 regulates oocyte maturation and fertility in mice.

Methods An oocyte-specific Stat3 knockout model (Ddx4-Cre; Stat3^{fl/fl}) was established. Fertility (cumulative and average litter size) was assessed from 6 weeks to 8 months of age. Ovarian reserve and oocyte quality were evaluated by HE staining, follicle counting, and superovulation. GV-stage oocytes treated with Stattic (3 μ M) were analyzed for GVBD and PBE rates, spindle morphology, and chromosome alignment via α -tubulin/DAPI staining. Mature oocyte transcriptomes were examined using SMART-seq2.

Results (1) Stat3 knockout mice exhibited significantly reduced cumulative litter size ($P < 0.05$) and average litter size ($P < 0.05$), despite normal ovarian morphology and ovulation; (2) Stattic-mediated STAT3 inhibition decreased GVBD ($P < 0.01$) and PBE rates ($P < 0.01$), with increased spindle abnormalities (e.g., irregular/contorted structures) and chromosomal misalignment ($P < 0.05$); (3) Transcriptomics revealed dysregulated expression of APC/C complex subunits (Anapc1/4/7/11, Cdc26), cell cycle regulators (Ccnd3, Ccne1), and upregulated microtubule-associated genes (Tubb6, Tubb2b).

Conclusion STAT3 governs meiotic progression through phosphorylation-dependent regulation of spindle assembly and chromosomal segregation. Its deficiency disrupts APC/C complex activity and cell cycle coordination, ultimately impairing fertility. These findings provide novel insights into mechanisms underlying reproductive disorders.

Keyword: Fertility, Meiosis, Oocyte, Spindle assembly, STAT3

亚太 C2-129-0007

Study on the Functional and Molecular Mechanisms of Epigenetic Regulatory protein BRD4 in Spermatogenesis.

Xie Mingyang # (2531667106@qq.com), Lin Weican, Lin Zhenghan, Yu Jing, Zhang Lihong*.

#First Author

*Corresponding Author

Department of Human Anatomy, School of Basic Medical Sciences,
Fujian Medical University, Fuzhou 350122, China

Objectives Approximately 7–12% of men worldwide suffer from infertility, and impaired spermatogenesis is closely linked to genetic mutations. Investigating these mutations and elucidating their mechanisms are critical for advancing the diagnosis and treatment of male infertility. BRD4 is a well-known acetylated histone reader that binds to acetylated lysine residues on histones and regulates transcription, yet its detailed role in spermatogenesis remains unclear.

Methods Because whole-body Brd4 knockout mice exhibit embryonic lethality, we generated germ cell-specific Brd4 knockout mice (Brd4^{lox/-}; Vasa-Cre, Brd4^{vKO}) to investigate its function in spermatogenesis.



Results Adult Brd4 vKO male mice were infertile, with a reduced testis-to-body weight ratio, severe germ cell loss in the seminiferous tubules, and virtually no mature sperm in the epididymis. Moreover, Brd4 deficiency led to a marked depletion of undifferentiated spermatogonia, indicating that Brd4 is essential for the self-renewal of spermatogonial stem cells (SSCs) and the long-term maintenance of undifferentiated spermatogonia.

Conclusion Collectively, these findings demonstrate that Brd4 is indispensable for spermatogenesis, though the precise mechanisms warrant further study.

Keywords: BRD4; Male Infertility; Conditional Knockout mice

亚太 C2-129-0008

Asporin Mediates Muscle Inflammation and Myorepair via TGF- β Signaling Dependent-Myogenesis and M1 Polarization

Jingwen Huang, Qisen Wang, Xiaoting Jian, Yangyang Li, Ziwei Zhao, Jijie Hu, Hua Liao
1Guangdong Provincial Key Laboratory of Construction and Detection in Tissue Engineering; Department of Anatomy, School of Basic Medical Science, Southern Medical University, Guangzhou, 510515, China.
2Department of Orthopaedics and Traumatology, Department of Orthopaedics, Nanfang Hospital, Southern Medical University, Guangzhou, 510515 China.

Objective To investigate the role and mechanism of Asporin (ASPN) in modulating muscle inflammation and myorepair.

Methods CTX myoinjury was manipulated in tibialis anterior (TA) of B6 mice, followed by injecting of recombinant ASPN (rmASPN) or neutralizing antibodies (anti-ASPN) to control ASPN level in inflamed muscle. Differentiated C2C12 cells were co-cultured with macrophages or not, treating with rmASPN, TGF- β signal antagonist SRI, or MCP-1 antagonist Bindarit. Immunofluorescence, RT-qPCR, Western blotting were performed to assess the gene and protein levels of ASPN, myogenic transcription factors and muscle proteins, myokines, TGF- β /Smad signal molecules in inflamed muscle or myofibers, and inflammatory mediators in macrophages. ELISA was used to detect ASPN concentration in culture supernatant, and FACS to analyze macrophages phenotype and function.

Results Physiologically, ASPN was stably expressed in myofibers, but its level markedly elevated in inflamed muscle and in regenerating centronuclear myofibers at the early (inflammatory) stage post-myoinjury. As well, dramatic increase of ASPN gene and protein expression was monitored in C2C12 myotubes bearing pro-inflammatory stimuli. rmASPN exposure enhanced new myofiber numbers and size, and up-regulated expression of eMyHC, MyoD, Myogenin and Desmin, but down-regulated p-Smad2/3 level in new myofibers or C2C12 myotubes. The increased percent of M1, but not M2 macrophages, and the impaired uptake of macrophages to apoptotic cells were observed in inflamed muscle exposing to rmASPN. Further, rmASPN exposure elevated MCP-1 production in myofibers and the percent of F4/80+CCR2+ cells in inflamed muscle. When co-culturing with C2C12 myotubes under LPS/IFN- γ and rmASPN stimuli, macrophages tended to M1 phenotype and obviously upregulated p-P38 MAPK levels. However, additional adding of Bindarit corrected M1 polarization of macrophages induced by rmASPN and down-regulated p-P38.

Conclusions These findings suggest a role of extracellular ASPN on impacting myorepair through blocking the intrinsic TGF- β signaling in regenerating myofibers, and provide a mechanistic basis for ASPN directed macrophage M1 polarization in inflamed muscle via interfering with myofiber MCP-1 dependent CCR2-p38 MAPK pathway.

Keywords: Asporin; Myoinjury; Inflammation; Macrophage; TGF- β /Smad; MCP-1



亚太 C2-129-0011

PRAG1 Condensation Drives Cell Contraction Under Stress

Peiwu Ye¹, Peiran Jiang^{2,3}, Luyu Ye⁴, Min Liu⁴, Qiuyuan Fang⁴, Peilin Yu⁵, Jianhong Luo⁶,
Huanxing Su^{1,*}, Wei Yang^{2,4,7,*}

1 Institute of Chinese Medical Sciences, University of Macau, Macau 999078, China; yc07526@umac.mo

2 Department of Neurosurgery of the Fourth Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou 310058, China; 21718539@zju.edu.cn

3 Department of Neurobiology of the Second Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou 310058, China

4 Department of Biophysics, Institute of Neuroscience, NHC and CAMS Key Laboratory of Medical Neurobiology, Zhejiang University School of Medicine, Hangzhou 310058, China; yeluyu@zju.edu.cn (L.Y.); 12118070@zju.edu.cn (M.L.); 12018376@zju.edu.cn (Q.F.)

5 Department of Toxicology, School of Public Health, Zhejiang University School of Medicine, Hangzhou 310058, China; yupeilin@zju.edu.cn

6 School of Brain Science and Brain Medicine, Zhejiang University, Hangzhou 310058, China; luojianhong@zju.edu.cn

7 Guizhou University Medical College, Guiyang 550025, China

* Correspondence: huanxingsu@umac.mo (H.S.); yangwei@zju.edu.cn (W.Y.)

Objectives A proportion of biomacromolecules undergo liquid-liquid phase separation (LLPS) to form diverse, functionally specialized condensates. This phenomenon has attracted significant research interest because of its critical role in neurodegenerative disease. Nevertheless, the molecular diversity and pathological functions of the condensates in Parkinson's disease (PD) remain poorly understood.

Methods Since mitochondrial dysfunction plays a central role in dopaminergic (DA) neuronal death in PD, we used mitochondrial complex I inhibitors to establish cellular PD models. Following treatment, we purified condensate-enriched fractions for mass spectrometry (MS) analysis and screened for the differentially enriched proteins with phase-separation ability.

Results Among the proteins differentially enriched between treated and control groups, peak1-related, kinase-activating pseudokinase 1 (PRAG1)—a member of the PEAK pseudokinase family—stood out. We demonstrate that PRAG1 forms dynamic condensates in cells, driven by its α N and α J helices. Notably, these condensates mediate cell contraction, whereas condensation-defective PRAG1 mutants lose this function. Strikingly, spherical PRAG1 condensates were observed not only in multiple cellular stress models but also in DA neurons derived from PD patients, suggesting a broader pathological relevance.

Conclusion Our findings uncover a novel mechanism by which PRAG1 LLPS drives cell contraction and propose a potential connection between dysregulated PRAG1 phase separation and DA neuronal death in PD.

Keywords: PRAG1; phase separation; cell contraction; stress; Parkinson's disease



亚太 C2-129-0012

Mechanistic insights into the protective effects of icariin against testicular aging: an integrated study of network pharmacology and experimental validation

Jiandong Sun^{1,2}, Chengyu Lv¹, Zihang Lin¹, Shanshan Luo¹, Shumin Liao¹, Shie Wang^{1,2*}
1Key Laboratory of Stem Cell Engineering and Regenerative Medicine of Fujian Province University,
Fujian Medical University, Fuzhou, 350122, P. R. China.

2Department of Histology and Embryology, School of Basic Medical Sciences,
Fujian Medical University, Fuzhou, 350122, P. R. China.

*Corresponding authors: Dr. Shie Wang (e-mail: shiewang@fjmu.edu.cn).

Objectives As a bioactive monomer derived from traditional Chinese medicine, icariin (ICA) has exhibited protective effects against male infertility induced by environmental pollutants. However, the therapeutic potential of icariin in alleviating male reproductive senescence remains to be fully elucidated.

Methods In the present study, we examined icariin the protective effects of icariin in aged murine models through drug gavage method, while elucidating its molecular mechanisms via integrated network pharmacology, molecular docking and molecular dynamics simulation approaches.

Results Our Results revealed that 125 potential targets of icariin against testicular aging were identified. Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway analysis indicated that these targets were associated with reactive oxygen species (ROS) scavenging, lipid storage regulation, androgen metabolism, and ferroptosis as well as the cellular senescence and PI3K/AKT signaling pathway. In addition, the top five hub targets (ESR1, TP53, BCL2, HIF1A, and TNF) screened by CytoHubba demonstrated high binding potential with icariin. Molecular docking and molecular dynamics simulation further revealed the stable binding between icariin and the hub targets. Furthermore, In vivo experiments showed that icariin treatment significantly reduced ROS, malondialdehyde (MDA) and Fe²⁺ levels in aging testes. Furthermore, icariin activated the ESR1/AKT pathway, thereby restoring testosterone synthesis and mitigating cellular senescence in 12-month-old mice.

Conclusion These findings elucidate the critical role of icariin in ameliorating testicular aging and provide a novel foundation for future research into its molecular mechanisms.

Key words: Icariin, testicular aging, network pharmacology, molecular docking, molecular dynamics simulation

● 亚太 C2. Cell Biology ● Abstract

亚太 C2-129-0001

Neuroprotective effects of gastrodin mitigate neuronal ferroptosis in hypoxic-ischemic brain damage through Nrf2 pathway.

Guo Tao, Kuang Xianfeng, Zuo Hanjun, Shi Jisha, Wang Zhao, Xiao Rong, Li Juanjuan
(lijuanjuan@kmmu.edu.cn).

Department of Anatomy and Histology & Embryology, Kunming Medical University, Kunming 650500, China;
Department of Anatomy, Kunming University of Science and Technology.

Objectives Hypoxic-ischemic brain damage (HIBD) is a severe condition primarily affecting neonates, often resulting from perinatal asphyxia. Gastrodin (GAS), a bioactive compound derived from *Gastrodia elata*, is recognized for its anti-inflammatory and antioxidant properties. This study



aimed to investigate whether GAS can exert neuroprotective effects and attenuate neuronal ferroptosis through the Nrf2 signaling pathway in neonatal mice with HIBD.

Methods Employing behavioral, molecular, and pharmacological approaches, we utilized neonatal C57BL/6 mice with HIBD and HT22 neurons subjected to oxygen-glucose deprivation (OGD).

Results GAS treatment significantly improved neurological outcomes in HIBD mice by reducing infarct size, preserving Nissl bodies, and mitigating neuronal degeneration. Furthermore, it decreased levels of reactive oxygen species (ROS), malondialdehyde (MDA), excess iron accumulation, and ferroptosis-related proteins, including TfR1, COX2, SAT1, and ACSL4, while enhancing levels of glutathione (GSH), GPX4, SLC7A11, and Trf. Network pharmacology and CETSA assays suggest that Nrf2 activation is a critical mechanism underlying these effects. Both in vivo and in vitro studies corroborate that GAS upregulates Nrf2 and its downstream targets (HO-1, NQO1) in ischemic penumbra and OGD-exposed HT22 cells. Notably, GAS exhibits effects similar to the ferroptosis inhibitor ferrostatin-1, restoring mitochondrial membrane potential (JC-1) and GSH levels, while decreasing MDA, DCFH-DA, and iron accumulation (FerroOrange). The Nrf2 inhibitor ML385 effectively abolished GAS-mediated neuroprotection, thereby validating the dependency of this pathway.

Conclusion This study identifies a novel mechanism by which GAS mitigates neuronal ferroptosis through the Nrf2 pathway, highlighting its potential therapeutic role in HIBD.

Key Words: gastrodin, hypoxic-ischemic brain damage, ferroptosis, Neuron

亚太 C2-129-0002

Molecular mechanism of IRF8 regulating CTSS to promote macrophage M2 to M1 polarization leading to renal allograft loss

Yihan Chen, Jiazhou Xu, Junxi Wu, Xinxin Yuan, Zheng He
遵义医科大学

Chronic rejection of renal transplantation leads to allograft loss (AL), which is an important cause of increased mortality in kidney recipients. The current immunosuppressive regimen is not effective in blocking the progression of AL, which can be attributed to the unknown mechanism of AL. In this project, the transcriptome microarray data and single-cell sequencing data of renal transplant rejection were analyzed, and a high-risk state of transplant rejection, where significant lethality appeared, was captured. In this state, the number of M1 and M2 macrophages increased, accompanied by a significant upregulation of expression of IRF8 and its target gene CTSS, reflecting an M1 polarization trend, which was positively correlated with the increase in patient mortality. Based on the potential regulation of CTSS by IRF8, we hypothesized that IRF8, inducing polarization of anti-inflammatory M2 macrophages to pro-inflammatory M1 macrophages through regulating the expression of CTSS, is one of the main reasons that lead to AL. To this end, this study intends to construct a macrophage-specific IRF8 knockout mouse model, combined with flow cytometry, immunohistochemistry, and chromatin immunoprecipitation, to analyze the mechanism of the IRF8-CTSS axis in regulating the progression of AL. The Results may provide new strategies and theoretical basis for the potential target locations and the development of future treatments targeting macrophage polarization-induced AL.



亚太 C2-129-0006

Shenrong Guben Huanshao Pill regulates the LDHB-lactate-NDUFV2 axis to improve mitochondrial function and exert anti-senescence effects

Xiaohui Hu^{a#}, Yanan Guo^a, Yixiao Tian^a, Rong Shen^{a*}, Degui Wang^{a, b*}

^a School of basic medical sciences, Lanzhou University, Lanzhou, Gansu Province, 73000, China

^b NHC Key Laboratory of diagnosis and therapy of Gastrointestinal Tumor, Lanzhou, Gansu Province, 730000, China

Objectives Senescence is a complex biological process characterized by declining physiological functions and increased disease risk. With global Senescence accelerating, the search for safe and effective anti-senescence strategies has become crucial. Although rapamycin and metformin show anti-senescence potential, their long-term use is associated with side effects, making low-toxicity natural compounds an attractive alternative.

Methods This study focuses on Shenrong Guben Huanshao Pill (SRW), a traditional Chinese medicine composed of Ginseng, Deer Antler Velvet, and other herbal ingredients, known for its kidney-tonifying and vitality-boosting effects. With a clinical history spanning over 400 years, its anti-senescence mechanisms remain largely unexplored by modern science. To bridge this gap, we employed proteomics, metabolomics, network pharmacology, and ultra-performance liquid chromatography-mass spectrometry (UPLC-MS/MS) to systematically investigate the anti-senescence mechanisms and active components of SRW.

Results Our findings reveal that SRW exerts anti-senescence effects by improving mitochondrial function, reducing oxidative stress, and inhibiting apoptosis. Network pharmacology analysis indicates that SRW influences cell cycle regulation and inflammation-related pathways. In D-galactose (D-Gal) and X-ray-induced cellular and murine senescence models, SRW significantly decreased reactive oxygen species (ROS) levels, suppressed the p53 signaling pathway, and downregulated Cyclin-dependent kinase inhibitors p16 (CDKN2A) and p21 (CDKN1A), thereby promoting cell cycle progression. Additionally, SRW reduced Interleukin-1 beta (IL-1 β) levels, mitigating inflammation and delaying cellular senescence.

Conclusion Notably, this study provides the first evidence of a strong correlation between NADH dehydrogenase [ubiquinone] flavoprotein 2 (NDUFV2) and Lactate dehydrogenase B (LDHB) with senescence. More importantly, we identified NDUFV2 and LDHB as key players in anti-senescence, demonstrating that SRW enhances NDUFV2 expression to improve mitochondrial function while activating the LDHB-lactate-mitochondria axis, synergistically exerting anti-senescence effects. Furthermore, UPLC-MS/MS analysis identified myricetin, luteolin, and γ -mangostin as the primary active compounds in SRW. Molecular docking and experimental validation highlighted myricetin's promising therapeutic potential. This study innovatively uncovers the "multi-pathway, multi-target" anti-senescence mechanisms of SRW, providing novel therapeutic targets and strategies that lay a scientific foundation for future drug development.

Key Words: Mitochondrial function, Multi-pathway, multi-target, Shenrong Guben Huanshao Pill (SRW), Senescence.



● 亚太 C3. Oncology ● Podium

亚太 C3-129-0009

Metabolic Programming of Tumor-Associated Macrophages Promotes T Cell Exhaustion in Uveal Melanoma

Haiyang Yu ¹, Min Li ¹, Shuangyan He ¹, Aixiang Luo ², Ruping Zheng ², Jufang Huang ² *

¹ Aier Eye Inst, Changsha, Hunan, China

² Department of Anatomy and Neurobiology, School of Basic Medical Sciences, Central South University, Changsha, China

Objectives Uveal melanoma (UM) is the most common primary intraocular malignancy in adults and responds poorly to immune checkpoint inhibitors (ICIs), partly due to its highly immunosuppressive microenvironment. This study aims to dissect the heterogeneity of tumor-associated macrophages (TAMs) in UM and their role in driving T cell dysfunction.

Methods We analyzed single-cell RNA sequencing data and performed multiplex immunohistochemistry on UM samples to characterize immune cell composition and exhaustion profiles. In vitro, we modulated TAM glycolytic and lipid metabolic pathways to assess their effects on CD8⁺ T cell proliferation, cytokine production, and exhaustion marker expression. In vivo validation was conducted in a syngeneic mouse UM model treated with TAM-targeted metabolic intervention combined with anti-PD-1 therapy.

Results UM tumors harbored an immunosuppressive microenvironment enriched in CTLA-4⁺/LAG-3⁺ exhausted CD8⁺ T cells and regulatory T cells. Three TAM subsets were identified: complement-dominant, cytokine-active, and metabolically active macrophages. The metabolically active subtype, marked by enhanced glycolysis and fatty acid oxidation, was associated with poor prognosis. Targeting these pathways in TAMs restored CD8⁺ T cell function in vitro and reduced exhaustion marker expression. In vivo, metabolic reprogramming of TAMs synergized with anti-PD-1 therapy, enhancing CD8⁺ T cell infiltration and suppressing tumor growth.

Conclusion Metabolically reprogrammed TAMs contribute to T cell exhaustion and immune evasion in UM. Targeting TAM metabolism may offer a promising strategy to improve immunotherapy efficacy in this malignancy.

Keywords: Immunotherapy, Tumor-associated macrophages, T cell exhaustion, Metabolic reprogramming, Uveal melanoma.

● 亚太 C3. Oncology ● Poster

ID: 318103

FABP5 in tumor-associated macrophages drives tumor growth and angiogenesis in a colorectal cancer mouse model.

YANG DANDAN
Tohoku University

Objectives Tumor-associated macrophages (TAMs) play a crucial role in tumor progression, with a high density of TAMs in colorectal cancer (CRC) tissues linked to a favorable prognosis. Fatty acid-binding protein 5 (FABP5) is highly expressed in TAMs and regulates macrophage function by



modulating lipid transport and metabolism; however, its role in CRC remains unclear. This study investigates the effect of FABP5 expression in TAMs on CRC pathology.

Methods Wild-type and Fabp5 knockout (KO) C57BL6 mice were subcutaneously implanted with MC38 colon cancer cells to establish a tumor-bearing model. Bone marrow-derived macrophages (BMDMs) were co-cultured with MC38 cells in vitro. Tumor growth and angiogenesis were evaluated by immunohistochemistry. Prostaglandin E2 (PGE2) and vascular endothelial growth factor (VEGF) levels were measured by ELISA.

Results FABP5 was predominantly expressed in TAMs but not found in other cells within the tumor microenvironment. KO mice had significantly smaller tumors, lower Ki67 expression, and reduced angiogenesis compared to WT mice. Tumor levels of PGE2, which promotes tumor growth and angiogenesis, were lower in KO mice than in WT mice. Similarly, VEGF levels were also reduced in KO mice. In vitro, MC38 cell proliferation was enhanced by co-culture with WT BMDMs but not KO BMDMs. VEGF expression in MC38 cells was upregulated when co-culture with WT BMDMs compared to KO BMDMs.

Conclusions FABP5 in TAMs promotes tumor growth and angiogenesis in colorectal cancer, suggesting that it enhances the production of PGE2 and VEGF in the tumor microenvironment.

Keyword: Tumor associated macrophage, FABP5, colon cancer.

ID: 318576

PSA and p53 as Diagnostic Markers in Prostate Pre-malignancy: The Down-regulating Ability of Uvaria chamae Root Extract in Cadmium Chloride-Induced Pre-malignancy in Male Wistar Rats

Gabriel D. Edem¹ Christopher L. Sakpa² Vitalis C. Ezeuko²

1.Reproductive Anatomy/Cancer Biology Unit

2.Reproductive Anatomy Unit

Objectives This investigation was conducted to assess the potentials of ethanol root extract of Uvaria chamae in down-regulating and up-regulating PSA and p53 respectively as pre-malignant biomarkers in cadmium chloride-induced prostate pre-malignancy.

Methods Prostate pre-malignancy was induced using 3mg/kg of cadmium chloride (CdCl₂) intraperitoneally once weekly for twenty-eight (28) days. The animals were sacrificed by incision following anaesthesia with chloroform. The anti-cancer activity of Uvaria chamae root extract was evaluated after pre-treatment of the experimental animals with CdCl₂ using the serum level of PSA and tissue expression of p53 which are important pre-malignant and malignant biomarkers.

Results Results obtained from this investigation showed elevated serum level of PSA and high expression of p53 marker in CdCl₂-induced pre-malignant prostate tissue as well as increase number of positive cells after Image J analysis. Subsequently, post-treatment with ethanol root extract of U. chamae showed a significant and dose-dependent decrease in the serum level of PSA and poor expression of p53 marker especially in 2500mg/kg and 1500mg/kg of U. chamae administered groups, thus indicating the down-regulating ability of U. chamae root extract.

Conclusion These findings draw attention to the anti-cancer ability of U. chamae root on prostate pre-malignancy. Further studies should be employed to isolate the bio-active ingredients responsible for these great therapeutic effects.

Ethical Approval and Funding: Ethical approval was obtained by the Ethical Committee of School of Basic Medical Sciences, University of Benin, Benin City. Subsequently, approval number CMS/REC/2022/275 was assigned. Special thanks to Tertiary Education Trust Fund (TETFUND)



for supporting and sponsoring this research.

Keywords: PSA, p53, prostate, pre-malignancy, Uvaria chamae

Keyword:

亚太 C3-129-0003

Pan-Cancer Analysis of SLC4A4: Expression Heterogeneity, Prognostic Value, and Immunotherapeutic Potential

Cheng Yang¹, Xuanchi Wang¹, Yi Zhao¹, Yue Han¹, Xianfeng You¹, Haoyi Li¹, Changxian Chen², Na Liang^{1,2*}, Qiang Xu^{3*}

¹Department of Histology and Embryology, School of Basic Medicine, Zunyi Medical University, Zunyi, China, ²Department of Pathology, Affiliated Hospital of Zunyi Medical University, Zunyi, China, ³Department of Urology, the Second Affiliated Hospital of Zunyi Medical University, Zunyi, China

*Corresponding Author: Na Liang, Qiang Xu. E-mail: naliang@zmu.edu.cn

Objectives To characterize the pan-cancer expression patterns, molecular mechanisms, and clinical relevance of SLC4A4 and evaluate its potential as a diagnostic biomarker, prognostic predictor, and immunotherapeutic target.

Methods Multi-omics data (TCGA, GTEx, GEO, CCLE) were integrated to assess SLC4A4 mRNA/protein expression across 33 cancers. Differential expression, survival (Kaplan-Meier, Cox regression), and genomic alterations (SNVs/CNVs) were analyzed using R packages (ggplot2, survival, maftools). Methylation, copy number variations, and Protein-Protein Interaction networks were explored via cBioPortal, TIDE, and STRING. Functional pathways (GSEA/GO) and immune microenvironment associations (TIMER2.0, TISIDB, spatial transcriptomics) were systematically evaluated.

Results SLC4A4 exhibited significant downregulation in 25 cancers, including gastric cancer, COAD, and KIRC ($P < 0.05$). Low SLC4A4 expression correlated with poor overall survival (OS) and progression-free interval (PFI) in KIRC and MESO ($HR < 1$). High SLC4A4 mutation rates in SKCM/BLCA were linked to microsatellite instability (MSI) and tumor mutational burden (TMB). SLC4A4 methylation levels are associated with survival of multiple cancers, and its expression is correlated with DNMTs (positive in BLCA, negative in COAD). SLC4A4 associated with M1 macrophage infiltration (renal cancer: $R = 0.62$, $P < 0.001$). The drug prediction Results from the CMAP database suggest that drugs inhibiting the glycine metabolic pathway may target differentially expressed genes in the SLC4A4 high-expression subgroup of renal cancer and potentially exert therapeutic effects on the disease.

Conclusion SLC4A4 shows pan-cancer heterogeneity, prognostic value, and dual regulation of DNA repair, methylation, and immune remodeling, with immunotherapy/M1 polarization links supporting its dual role as biomarker and therapeutic target.

Key Words: Diagnostic biomarker, Immunotherapeutic target, Pan-cancer analysis, Prognostic predictor, SLC4A4.



亚太 C3-129-0004

Research on the Expression of SLC4A4 in the Development of Gastric Carcinoma and Impact on the Proliferation and Migration of Gastric Carcinoma Cells

Di Wu¹, Yi Zhao¹, Xiaofen Xie¹, Yingying Zou¹, Lin Lu¹, Changxian Chen², Qiang Xu^{3*}, Na Liang^{1,2*}
¹Department of Histology and Embryology, School of Basic Medicine, Zunyi Medical University, Zunyi, China, ²Department of Pathology, Affiliated Hospital of Zunyi Medical University, Zunyi, China, ³Department of Urology, the Second Affiliated Hospital of Zunyi Medical University, Zunyi, China
*Corresponding Author: Na Liang, Qiang Xu. E-mail: naliang@zmu.edu.cn

Objectives SLC4A4 acts as a tumor suppressor gene; this research is crucial for understanding its role and potential mechanisms in gastric carcinoma, especially regarding how its expression changes under related pathological conditions.

Methods The expression levels of SLC4A4 in gastric carcinoma patients were analyzed, and the effects of SLC4A4 on the malignant biological behaviors of gastric carcinoma cells, such as proliferation and migration were investigated by in vitro experiments.

Results Bioinformatics analysis indicated that SLC4A4 expression was significantly lower in gastric carcinoma tissues compared to normal gastric samples. SLC4A4 mRNA expression levels were lower in gastric carcinoma tissues than in adjacent tissues using qPCR. Furthermore, SLC4A4 mRNA and protein levels in the gastric carcinoma cell lines (SGC-7901, BGC-823) were lower than in the gastric epithelial cell line GES-1. Immunohistochemistry revealed that SLC4A4 was highly expressed in normal gastric mucosal epithelium as well as in intraepithelial neoplasia. The expression of SLC4A4 gradually decreased from intraepithelial neoplasia to advanced gastric carcinoma, including both moderately and poorly differentiated types. The lowest expression was found in poorly differentiated advanced gastric carcinoma. Overexpression of SLC4A4 appears to reduce the proliferation and migration of gastric carcinoma cells.

Conclusion The findings emphasize SLC4A4's role in signaling pathways associated with cell proliferation and migration, offering direction for future studies on its mechanistic functions.

Key Words: Acidic tumor microenvironment, Gastric carcinoma, Intraepithelial neoplasia, Metastasis, SLC4A4.

亚太 C3-129-0005

基于巨噬细胞膜仿生修饰的载药菌影系统靶向重编程肺癌相关巨噬细胞及抗肿瘤效应研究

林瑞婷, 吴晓丹, 叶森, 黎晖
广州中医药大学基础医学院

肿瘤相关巨噬细胞 (Tumor-associated macrophages, TAMs) 在免疫抑制微环境中扮演关键角色, 其 M2 型极化特性显著促进肿瘤进展。本研究针对传统纳米递药系统靶向性不足及 TAMs 调控效率低的问题, 创新性构建了一种多功能仿生载药体系 (mPAE@BG)。该体系以细菌菌影 (Bacterial ghost, BG) 为载体, 通过装载具有免疫调节作用的丹皮酚脂质体 (PAE-Lipo), 并进一步采用连接 M2 巨噬细胞靶向肽 (M2pep) 的巨噬细胞膜进行杂化膜包被, 形成兼具病原体相关分子模式激活特性与宿主细胞仿生功能的智能递药系统。

实验结果表明: 1) 体外细胞实验中, mPAE@BG 通过靶向肽介导的主动靶向作用显著巨噬细胞对载药体系的摄取效率, 诱导 TAMs 向促炎 M1 表型极化 (M1/M2 比值是 PBS 组的 3.75 倍), 同时促进巨噬细胞对肺癌细胞的吞噬能力 (吞噬率提升 36.4%); 2) 在肺癌皮下移植瘤小鼠模型中,



该体系通过 EPR 效应与主动靶向双重作用富集于肿瘤部位（肿瘤蓄积量是 BG 组增加 1.6 倍），显著抑制肿瘤生长，并重塑肿瘤免疫微环境，表现为 M1/M2 比值增加，CD8+T 细胞浸润增加。本研究首次将细菌仿生载体、中药免疫调节剂与细胞膜伪装技术相结合，为肺癌免疫治疗提供了新型靶向递药策略，其“载药-靶向-调控”三位一体的设计理念为实体瘤微环境重编程研究开辟了新方向。

亚太 C3-129-0006

FAP α -Responsive Dual-Targeting Nanoplatfrom Synergizes Chemotherapy-Antiangiogenic to Enhance Immunogenic Cell Death in Triple-Negative Breast Cancer

Weihong Nie, Chunying Shi

Department of School of Basic Medicine, Qingdao University, Qingdao, Shandong Province 266071, China. E-mail: whongnie@163.com

Objectives Triple-negative breast cancer (TNBC) lacks specific therapeutic targets, rendering conventional chemotherapy the predominant clinical approach. However, non-selective chemotherapy often induces systemic toxicities and drug resistance. This study developed a fibroblast activation protein α (FAP α)-responsive dual-targeting nanodelivery system that integrates chemotherapy with anti-angiogenic strategies to achieve precision therapy and induce tumor immunogenic cell death (ICD).

Methods Evaluated peptides tumor-homing (SML) via immunofluorescence/in vivo imaging; confirmed VEGFR targeting peptide (QKS) anti-angiogenic activity using human umbilical vein endothelial cells (HUVEC) tube formation assays. Nanoparticle properties (size distribution, zeta potential, chemical bonding, and spectroscopic features) were systematically characterized using TEM, DLS, FTIR, CD, and UV-Vis spectroscopy. Nanoparticle antitumor efficacy in vivo was systematically evaluated by monitoring tumor volume dynamics and distant metastasis formation. Elucidated molecular mechanisms using RNA-seq and Western blot data integration.

Results FAP α -responsive and SML-mediated nanoparticles significantly accumulated in TNBC cells/tumors, while QKS peptide effectively inhibited angiogenesis. The nanoparticles' physicochemical properties were systematically characterized, demonstrating excellent stability, and exhibiting FAP α enzyme-triggered controlled drug release. In vivo experiments demonstrated that the nanoparticles significantly inhibited tumor growth, effectively reduced distant metastasis, and prevented DOX-induced cardiotoxicity. Nanoparticles activated cGAS-STING pathway, inducing ICD and immune microenvironment remodeling. Histopathological examination of major organs confirmed the system's excellent long-term biocompatibility.

Conclusion This study developed a FAP α -responsive dual-nanodelivery system for spatiotemporal chemo/anti-angiogenic synergy, remodeling tumor microenvironment, enhancing ICD, and holds promise for advancing the clinical translation of intelligent.

KeyWords Anti-angiogenic, Chemotherapy, fibroblast activation protein α -responsive, Triple-Negative Breast Cancer, Targeted Therapy



● 亚太 C3. Oncology ● Abstract

亚太 C3-129-0001

The mechanism of IDO₁ regulation of TMEM100 through IL-6-STAT3 pathway to promote glioblastoma

Laibing Liu,^{1*} Xiangbin Yang,^{2*} Zijiang Yu,¹ Yang Shen,¹ Linlu Feng,¹ Run Zhou,¹ Tao Huang,¹

Shipeng Luo,¹ Jiale Zhang,¹ Dan Yang,¹ Mashaal Ahmad,¹ Yumei Li,^{1&}

1.Key Laboratory of Human Brain Bank for Functions and Diseases of Department of Education of Guizhou Province, Guizhou Medical University/Department of Neurosurgery, Affiliated Hospital of Guizhou Medical University, Guiyang, Guizhou, 561113, China.

2.Department of Neurosurgery, Guiyang Second People's Hospital, Guiyang, Guizhou, 550081, China.

& Corresponding author.

E-mail: Yumei Li: meimeibenben823@sina.com.

Address: Key Laboratory of Human Brain Bank for Functions and Diseases of Department of Education of Guizhou Province, Guiyang, Guizhou, 561113, China.

As the most common malignant brain tumor, the median survival expectation of glioblastoma multiforme (GBM) patients is only about 14 months, and the five-year mortality rate exceeds 95%(1-5). Therefore, exploring new strategies and improving patients' prognoses is an urgent problem in clinical treatment. In this study, we first confirmed TMEM100 (transmembrane protein, 100) was the most differentially related gene in Tryptophan (Trp) metabolism and IL-6-STAT3 (signal transducers and activators of transcription 3, STAT3) pathways, all three associated with developing GBM through bioinformatics analysis. We demonstrated that Trp metabolism-related products, proteins related to the IL-6-STAT3 pathway, and the expression of TMEM100 was positively correlated with the malignancy of the tumors in clinical samples, suggesting that the IL-6-STAT3 pathway may also be activated in the process of tumorigenesis. In the vitro experiments, we not only detected the same expression as the population data, but after knocking down the expression of IDO₁ in GBM cells, the growth of the cells was slowed down, and the expression of Trp metabolism, IL-6-STAT3 pathway-related proteins and genes, and TMEM100 were decreased. Then, the inhibitor stattic specifically blocked the activation of the IL-6-STAT3 pathway, the cell growth, Trp metabolism and TMEM100 expression were reduced in the cells.

Meanwhile, knocking down the expression of TMEM100 in GBM cells, the detection showed that the metabolism of Trp in cells was slowed down, and the activation of the IL-6-STAT3 pathway was reduced, which resulted in the slowing down of GBM cell growth. To demonstrate that high expression of TMEM100 may be responsible for drug resistance in GBM, we tested the efficacy of the chemotherapeutic drugs temozolomide and gefitinib in vitro experiments. We found that Temozolomide and gefitinib could not significantly inhibit the growth of tumor cells, but both drugs could significantly inhibit the growth of GBM after reducing the expression of TMEM100 in cells. Gefitinib and temozolomide could significantly promote the apoptosis of tumor cells and play a therapeutic role. Taken together, the Results confirmed highly expressed IDO₁ catalyzed Trp depletion and induced tumor immune tolerance, and secreted pro-inflammatory factors activated the IL6-STAT3 pathway, which may regulate the high expression of TMEM100, meanwhile the high expression of TMEM100 in GBM was the reason for its resistance to chemotherapy drugs, thereby diminishing the efficacy of chemotherapeutic agents and exacerbating tumor damage to the body.

Keywords: Glioblastoma multiforme, Tryptophan metabolism, Indoleamine2,3-dioxygenase₁, Transmembrane protein 100, Interleukin-6, Signal transducers and activators of transcription 3, Drug resistance.



亚太 C3-129-0007

Gliomas as allies: A novel cancer-for-neuroscience perspective on neural repair and regeneration in the CNS

Issam AbuQeis^{1,2}, Ying-Chun Ba², ZHU Youbao³, Abeer Teeti⁴, Ting-Hua Wang¹

1 Institute of Neuroscience, School of Basic Medicine, Kunming Medical University, Kunming 650500, China.

2 Department of Anatomy, School of Basic Medicine, Kunming Medical University, Kunming 650500, China.

3 International Education School, Kunming Medical University, Kunming 650500, China.

4 Department of Epidemiology, School of Public Health, Kunming Medical University, Kunming 650500, China.

Background Gliomas, traditionally viewed as malignant tumors of the central nervous system (CNS), exhibit molecular mechanisms that may paradoxically contribute to neural repair and regeneration. This study explores the hypothesis that glioma-associated genes, particularly Centromere Protein F and ATPase Family AAA Domain-Containing Protein 2, play a role in CNS recovery following injury.

Methods Through bioinformatics analysis of high- and low-grade glioma datasets, we identified hub genes significantly enriched in pathways related to cell proliferation and survival, and we performed RT-qPCR validation in glioma cell lines (C6, LN229, U251). Moreover, *In vitro* silencing these genes in C6 cells via siRNA, to investigate the role of key genes in cell viability and increased apoptosis, underscoring their functional importance.

Results from bioinformatics analysis, we found two key genes designated as CENPF and ATAD2, also RT-qPCR analysis of those genes in CNS injury models (cerebral ischemia, spinal cord injury, and traumatic brain injury) revealed dynamic expression patterns, with marked upregulation in acute phases, suggesting their involvement in early injury responses. The ischemia-reperfusion (IR) model showed the most robust gene expression, highlighting its utility for future therapeutic investigations.

Conclusion Our data showed CENPF and ATAD2 found in glioma are important in neurological diseases. Notably, this study challenges the conventional view of gliomas by proposing their potential role in neural repair. These findings open new avenues for leveraging glioma-associated mechanisms to develop innovative therapies for CNS injuries, bridging oncology and regenerative neuroscience.

Keywords: Cancer Neuroscience, Glioma, Gene Therapy, Neural Regeneration, CNS Repair, Key Genes, siRNA, Bioinformatics.

亚太 C3-129-0008

Prediction of anti-lung cancer mechanism of Notoginsenoside R1 based on network pharmacology

Jing-Juan Li¹, Ya-Qi Yang¹, Xiao-Xing Cai¹, Ting-Hua Wang^{*}

1. Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, 650500, China;

Email address: wangtinghua@vip.163.com

Objectives Lung cancer is the leading cause of cancer death worldwide, but the effective treatment are urgently needed and the molecular mechanism is waiting to be determined. Notoginsenoside R1 (NGR1) is the main active component isolated from Notoginseng. Here, we explored the mechanism of NGR1 in the treatment of lung cancer.

Methods By using PubMed Mesh to identify accurate keywords and collecting datas in GeneCards, TCMSP, HERB and ETCM databases and downloaded. The co-existing targets were selected by



Venn, the protein-protein interaction network was constructed by String, Cytoscape. Next, GO and KEGG pathway enrichment analysis were followed. All data were integrated to find a core network.

Results Thirty-six co-existing intersection hub genes of Lung, Lung cancer and Notoginsenoside R1 were obtained. PPI network was constructed, in which 33 intersection targets had interaction relationships, a total of 171 interaction relationships, and finally 10 hub genes were obtained, which include AKT1, IL6, CASP3, ESR1, TNF, IL1B, BCL2, NFKB1, MAPK1, NFKB2.

Conclusion The complex network relationship of multi-target and multi-pathway NGR1 in the treatment of lung cancer involved in AKT1, IL6, CASP3, ESR1, TNF etc., therefore, providing a new knowledge to understand the network mechanism of Notoginsenoside in anti-lung cancer.



● 亚太 C4. Histology ● Podium

ID: 318290

Hemp Seed Fiber Reduces Liver Fibrosis in Aging Mice via TGF- β 1/Smad Pathway

jinhanjie20241001008

右江民族医学院

Objective Hepatic aging is frequently associated with an elevated risk of fibrosis, which is closely linked to dysregulation of the TGF β 1/Smad signaling pathway. This study aimed to investigate whether hemp seed dietary fiber mitigates liver fibrosis in aged mice by modulating this pathway and to elucidate the underlying molecular mechanisms.

Methods Male aged mice were randomly assigned to control, low-, medium-, and high-dose HSDF groups for a 12-week intervention. Liver histology was evaluated using Masson staining, while TUNEL assays quantified apoptosis. qPCR and Western blot analyses were performed to assess the expression of fibrosis-related markers and apoptosis-regulating proteins. Mice received intraperitoneal pentobarbital sodium anesthesia before procedures. Euthanasia was performed by cervical dislocation under deep anesthesia to minimize distress.

Results Hepatic architecture was significantly improved in the low- and middle-dose groups, with reduced hepatocyte disorganization and extracellular matrix accumulation. Collagen deposition around the central vein was notably reduced by approximately 16–18% compared to the control group. Apoptotic cell levels decreased in a dose-dependent manner, with a 36% reduction in the mid-dose group. Molecular analysis revealed downregulation of TGF β 1, Smad mRNA and protein expression, suggesting attenuation of fibrosis-related signaling. Furthermore, the Bcl2/Bax ratio was increased, indicating enhanced cellular survival and reduced apoptosis.

Conclusion HSDF effectively mitigates liver fibrosis and apoptosis in aged mice, potentially through modulation of the TGF β 1/Smad pathway and apoptosis-related mechanisms. These findings suggest that HSDF may serve as a functional dietary intervention for maintaining liver health.

关键字: hemp seed dietary fiber, liver fibrosis, TGF β 1/Smad

ID: 318404

Multi-cellular Clusters of Uterine NK Cells and Infertility: from Histology, through Recurrent Pregnancy Loss to Clinical Perspectives

Ivan Varga Lenka Lapidés Kristina Visnyaiova Pavel Babal
Comenius University, Faculty of Medicine

Objective Uterine Natural Killer (uNK) cells belong to innate immunity. They are the most abundant cell type at the maternal–fetal interface during early pregnancy, and represent 70% of uterine leukocytes. The exact mechanisms of how uNK cells may contribute to implantation but also to recurrent miscarriages are still obscure.

Methods This study includes data from 387 women with recurrent pregnancy loss or implantation failure, with a focus on the formation of multi-cellular clusters of uNK cells. Endometrial biopsies were collected by Pipelle endometrial sampling. Primary anti-CD56 antibodies were applied to detect uNK cells.



Results We found significant correlations between uNK cells clusters and number of uNK cells. There was no correlation between clusters and pregnancy rate, no seasonal changes of the number of uNK cells, no correlation between low uNK cells and abortions, no correlations of medications of the patient and number of uNK cells, and no correlation of the positivity of food intolerance on the number of uNK cells.

Conclusion Our findings highlight the potential significance of uNK clustering as a biomarker for implantation success. By further investigating the regulatory mechanisms governing uNK cell cluster formation, we may pave the way for novel therapeutic strategies aimed at improving pregnancy outcomes. Acknowledgement. This research was funded by a grant from The Slovak Ministry of Education No. VEGA 1/0625/23. Ethical Approval. This study protocol was approved by the ISCARE Reproduction and Gynecology Clinic in Bratislava. Written informed consent was obtained from all participants involved in the study.

关键字: uterine NK cells, infertility, reproductive medicine, clinical embryology, immunohistochemistry

ID: 320040

A Zebrafish Model of Chronic Heart Failure Caused by the Protein Aggregation in Heart Valves

Yitong LI¹ Shingo Maegawa² Ryo Kimura^{1,3,4,5} Shiho R. Suzuki¹ Taiki Nishimura¹ Masatoshi Hagiwara¹

1.Department of Drug Discovery Medicine, Graduate School of Medicine, Kyoto University, Kyoto, Japan

2.Department of Intelligence Science and Technology, Graduate School of Informatics, Kyoto University, Kyoto, Japan

3.Department of Child Development, United Graduate School of Child Development, Osaka University

4.Department of Psychiatry, Osaka University Graduate School of Medicine

5.Bioinformatics Center, Research Institute for Microbial Diseases, Osaka University

Objective Chronic heart failure is one of the most serious health issues worldwide, with increasing numbers of people affected. We previously developed a unique zebrafish, tomato, expressing an artificial DsRed gene under the control of the *tph2* promoter. Unexpectedly, the tomato fish showed cardiac dilation and symptoms resembling those of chronic heart failure. This study investigates the pathogenesis of these cardiac abnormalities.

Methods Crossbreeding experiments examined the genetic link between DsRed gene and heart enlargement. Echocardiography assessed cardiac function, while histological analysis evaluated cardiac and atrioventricular valve (AV) structure. RNA sequencing and immunohistological imaging identified molecular pathways involved in valve remodeling. Cre-mRNA injection was used to remove the DsRed genes and determine the role in cardiac defects. Zebrafish were maintained under standard conditions, and anesthesia procedures were performed by 0.016% tricaine methanesulfonate.

Results Crossbreeding suggested a link between red fluorescent protein and heart enlargement. The tomato zebrafish showed blood regurgitation, atrial dilation and AV valve thickening. RNA sequencing and qPCR revealed that inflammation, cell proliferation, and epithelial-mesenchymal transition contributed to valve remodeling. Immunostaining and in situ hybridization elucidated RFP and *tph2* expression in the AV valve, and Cre-mRNA injection rescued these heart defects.

Conclusion This is the first study to establish a novel model of heart failure caused by protein aggregation in the cardiac valve. These findings advance our understanding of the effects of *tph2* on heart valves and highlight the potential of this transgenic zebrafish for investigating chronic heart failure and developing new therapies.

关键字: zebrafish, chronic heart failure, red fluorescent protein, cardiac valve



ID: 320639

Microscopics Appearance of Ovarian Follicles and the Estrous Cycle of Rat Models with Early- and Late-stage of Cisplatin-induced Premature Ovarian Insufficiency Treated with Platelet-rich Plasma

Roza Silvia¹ Ahmad Aulia Jusuf² Mila Maidarti^{2,3} Budi Wiweko^{2,3}

1. Faculty of Medicine, Universities Andalas, Padang, Indonesia

2. Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

3. Yasmin IVF Clinic, Dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia

Objectives This study aimed to compare the restoration effect of platelet-rich plasma (PRP) on the ovarian function of rat models with early- and late-stage of cisplatin-induced premature ovarian insufficiency (POI) on microscopics appearance of ovarian follicles and estrous cycle.

Methods Thirty young-adult female (10-12 weeks old) Sprague Dawley rats with normal estrous cycle were randomly classified into four treatment groups (two groups cisplatin+PRP and two groups cisplatin without PRP) and one control (without cisplatin). Serial injections of Cisplatin (3 mg/kg body weight, intraperitoneal, once a week) were performed either three- or five-times to induce early or late stage of POI rat models, while control group was injected with NaCl 0.9%. Intraovarian injection of PRP (processed from the donor rats' blood) was conducted a week after last cisplatin injection. Post-operative infection was controlled with antibiotics. Estrous cycle was evaluated through vaginal smears and stained with Methilen Blue staining every morning during the last week before termination (two weeks after PRP injection). Following necropsy, ovarian tissues were prepared for histologic evaluation with haematoxylin and eosin (H&E) staining solution.

Results After PRP treatment, only early POI rats recovered better, characterized by the normal development of follicles in the ovary and the returned-to normal of estrous cycle (4-5 days duration).

Conclusion This study indicates that PRP may not beneficial to restore ovarian folliculogenesis and estrous cycle in late POI.

关键字: estrous cycle, ovarian follicles, platelet-rich plasma, premature ovarian insufficiency

ID: 321172

Effects of Virgin Coconut Oil Compared to Amnion on Dermal Tissue Regeneration: An Anatomical and Immunohistochemical Approach

Tuti Lestari^{1,2} Sumaryati Syukur³ Gusti Revillab² Rauza Sukma Ritad⁴

1. Department of Biomedic, Faculty of Medicine, University of Andalas

2. Department of Anatomy, Faculty of Medicine, University of Andalas

3. Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Andalas

4. Department of Biochemistry, Faculty of Medicine, University of Andalas

Objective Burn injuries treatment has a long way in getting the maximum treatment results. Virgin Coconut Oil (VCO) has been proven to accelerate the wound healing, however the factors responsible for the speed up remain unknown. This study is to analyze the effect of topical VCO administration on type 1 collagen in *Rattus norvegicus* previously injured with superficial second degree burns compared to Amnion



Methods This study uses 27 male albino Wistar rats, aged more than 2 months, and weighed ranging from 180 g to 200 g, divided into three treatment groups: untreated wound rat group (K), amnion treated (A) and topical VCO treated (V). Burn injuries on the model animals are made by attaching an iron rod (d=2 cm) for 15 seconds under general anesthesia, it is placed earlier in a pot of 100 °C water. Biopsy of burn area, also in general anesthesia, held on day 14 is gauged by embedded it into paraffin blocks stained with hematoxylin eosin which follows by immuno-histochemical examination to assess the expression of type 1 collagen using the ImageJ program.

Results The research results obtained show that the highest collagen type 1 measurement is found in group (A) 48,786, group (V) 44,417 and lowest in group (K) 33,157. There is significant difference between groups (K) - (V) and groups (K) - (A) with $p = 0.0000$ but there is no significant difference between groups (V) - (A) $p = 0.184$.

Conclusion Both amnion and VCO treatments had a significant effect on the formation of type I collagen; however, there was no significant difference between the VCO and amnion groups, although the type I collagen level in the amnion group was higher compared to the group treated with topical VCO.

This research has passed the ethical approval (reg no. 177/KEP/FK/2019) and fully funded by Lembaga Pengelola Dana Pendidikan (LPDP).

关键字: Collagen type 1, VCO, Rattus norvegicus, Second degree burns

亚太 C4-129-0001

Autografted hair follicles with dermal papilla removed promote wound repair and regeneration in Bama mini-pigs

Wenzi Liang¹ (20wzliang1@stu.edu.cn), Changmin Lin¹

¹ Department of Histology and Embryology, Shantou University Medical College, Shantou, 515041, PR China.

Autologous free flap transplantation is the most economical and effective method for clinical treatment of large-area trauma, but the shortage of flap donors prevents widespread use of this method. Hair follicle stem cells have great potential to repair wounds, but wound repair by hair follicle stem cells has not yet met expectations. We used a wound model of Bama mini-pigs and treated the wound with autologous hair follicles or flaps. The wound healing was observed on days 7, 14, and 21 post-surgery and wound healing rates were analyzed. Histological staining was performed to evaluate re-epithelialization of the wound. Immunofluorescence staining was used to detect the expression of hair follicle stem cell markers (CK15, Sox9) and explore the mechanism of wound repair. This research found that autologous hair follicles can accelerate wound healing compared to flaps. The efficiency of hair follicles in wound repair is related to their structure. Dermal papilla act as a biological barrier to hair follicle stem cell migration, and removal of dermal papilla biological barrier can improve the migration of hair follicle stem cells and the efficiency of wound healing. Autologous hair follicles for wound repair has the advantages of minimal damage, simple fabrication, and abundant source, which may be able to replace the flap transplantation as a therapeutic strategy in the future. This study is helpful to elucidate the regulatory mechanism of hair follicle stem cells involved in wound repair, and has important academic and clinical value for solving the problem of shortage flap donor.

Key Words: Bama mini-pigs, dermal papilla, hair follicle stem cells, transplantation, wound repair.

Ethical Approval: The use of these Bama mini-pigs in this work was approved by the animal ethics committee of Shantou University Medicine College (SUMCXM2024-123)

Surgical and Anesthesia Protocol: Bama mini-pigs fasted for more than 12 hours before anesthesia and drank water freely. The whole surgical procedure was carried out in a sterile large animal operating room. Each pig had a total of 15 wounds, which were divided into five groups, with three wounds per group. The wounds were sampled on Days 7, 14, and 21, respectively. Fifteen 2×2 cm wounds were made on the dorsal skin of Bama mini-pigs after anesthesia with



Zoletil 50 (tiletamine-zolazepam, Virbac France), Lumianning (Jilin Huamu Animal Health Products Co., Ltd. China) and atropine sulfate injection (Shengda Animal Pharmaceutical Co., Ltd. China). Anesthesia was induced in Bama mini-pigs using the following protocol: (1) Pre-anesthesia: Atropine (0.05 mg/kg) was administered intramuscularly (IM) into the gluteal muscle to reduce salivary and bronchial secretions. (2) Induction: After 5-10 minutes, a mixture of Lumianing (2 mg/kg, IM) and Zoletil 50 (6.0 mg/kg, IM) was injected into the gluteal muscle. (3) Supplemental Dosing: If adequate anesthesia was not achieved within 10 minutes, a mixture of Lumianing (1 mg/kg, IM) and Zoletil 50 (3.0 mg/kg, IM) was administered as a supplement. (4) Intraoperative Maintenance: During surgery, if signs of pain or discomfort were observed, additional doses of Zoletil 50 (3.0 mg/kg, administered slowly via an intravenous catheter) and Lumianing (1 mg/kg, IM) were administered as needed to maintain anesthesia. After anesthesia, full-thickness skin was surgically removed from the marked area (2 × 2cm) with a scalpel.

Funding: This work was supported by the National Natural Science Foundations of China (Grant number 81972957 and 82472574).

亚太 C4-129-0002

Metformin ameliorates thymus degeneration of mice by regulating mitochondrial function

Wenlan Fang, Shuping Yang, Yun sun, Yurong Chai

Department of Histology and Embryology, School of Basic Medical Sciences, Zhengzhou University, Zhengzhou, Henan Province, 450001, PR China

Objectives As the main lymphoid organ, the thymus degenerates with age. The loss of thymic epithelial cells is mainly related to thymus degeneration and reduced T cells development. D-galactose can cause damage similar to that of accelerated aging in mice. As an insulin sensitizer, metformin is a first line drug for the treatment of diabetes and has been shown to prolong the lifespan of mice, but the mechanism is still unclear.

Methods We explored the therapeutic effect of metformin on thymus degeneration in the accelerated aging mice, which was established by intraperitoneal injection D-galactose (120 mg/kg/day) for eight weeks. Metformin was intragastrically given with 100 or 300 mg/kg body weight per day, respectively, for six weeks. The effects of metformin on thymic degeneration in D-galactose induced accelerated aging mice were examined by histological examination, immunohistochemistry study and flow cytometric analysis and its underlying mechanism was further explored.

Results Administration of metformin could alleviate thymus atrophy caused by D-galactose. Metformin therapy increased mitochondrial membrane potential, with a reduction in mitochondrial reactive oxygen species, malondialdehyde and superoxide dismutase levels, and restored mitochondrial balance through enhanced expression of dynamin-related protein 1. Furthermore, metformin altered T lymphocyte subsets and cellular senescent cells; the expression of FoxN1, Aire and Sox2 of thymic epithelial cells also increased.

Conclusion Metformin presented a positive effect on thymic degeneration through improving mitochondrial function, which provides help for the formulation of medical intervention strategies for immune aging-related health problems in today's aging world.

Key word: D-galactose; metformin; mitochondrial function; thymic epithelial cells; thymus degeneration



亚太 C4-129-0006

SIRT6 modulates lesion microenvironment in LPC induced demyelination by targeting astrocytic CHI3L1

Jingyi Du, Yue Yin, Dong Wu, Can Diao, Tiantian Zhao, Fan Peng, Naigang Li, Dongshuang Wang, Jiaming Shi, Liyan Wang, Liang Kong, Wenjuan Zhou, Aijun Hao.

Department of Human Anatomy and Histoembryology, School of Basic Medical Science, Shandong University;
Department of Clinical Laboratory, Affiliated Hospital of Shandong University of Traditional Chinese Medicine.
wenjuanzhou@sdu.edu.cn, aijunhao@sdu.edu.cn

Objectives Demyelination occurs widely in the neurodegenerative diseases, especially the multiple sclerosis (MS), which with a complex and inflammatory lesion microenvironment inhibiting remyelination. Sirtuin6 (SIRT6), a histone/protein deacetylase, is of interest for its promising effect in transcriptional regulation, cell cycling, inflammation, metabolism and longevity. In this study, we detected the role and mechanism of SIRT6 in LPC induced demyelination.

Methods Demyelination was induced by LPC injury. Pharmacological SIRT6 inhibitor or activator and Adeno-associated virus-overexpression of SIRT6 were used to regulate the expression of SIRT6. Techniques such as electron microscope, LFB staining, western blot, RNA-seq and ChIP-seq were utilized to investigate the roles and mechanisms of SIRT6 in LPC induced demyelination.

Results We found that SIRT6 modulated LPC-induced damage in motor or cognitive function. Inhibition of SIRT6 impaired myelin regeneration, exacerbated neurological deficits, and decreased oligodendrocyte precursor cells (OPCs) proliferation and differentiation, whereas activation of SIRT6 reversed behavioral performance in mice, demonstrating a beneficial effect of SIRT6. Importantly, RNA-seq further revealed that SIRT6 took charge in regulation of glial activation during remyelination, and significant alterations in CHI3L1 were obtained. Mechanistically, SIRT6 regulates the secretion of CHI3L1 from reactive astrocytes by H3K9ac. SIRT6 upregulation in astrocytes improved remyelination and functional recovery after LPC-induced demyelination, whereas together with AAV-CHI3L1-OE inhibits this therapeutic effect.

Conclusion Our data elucidate the role of SIRT6 in remyelination and further reveal astrocytic SIRT6/CHI3L1 as the key regulator for improving the remyelination environment, which may be a potential target for MS therapy.

Key Words: Remyelination, SIRT6, CHI3L1, Astrocyte, Multiple sclerosis.

亚太 C4-129-0007

The optimized design and application research of targeted delivery peptides for acute kidney injury

Kai yan Su (sky2262023@163.com) Chun ying Shi

Department of School of Basic Medicine, Qingdao University, Qingdao, Shandong Province 266071, China. E-mail: sky2262023@163.com

Objective Acute kidney injury (AKI) has high mortality and poor prognosis, necessitating targeted therapies. Growth factors show promise but suffer from poor delivery efficiency. This study developed AI-optimized peptides for targeted AKI treatment.

Methods After ischemic renal injury occurs, kidney injury molecule 1 (KIM-1) is significantly upregulated and continuously expressed in ischemic renal tissue. While phage display previously identified the KIT peptide for KIM-1 targeting, AI-based screening (Wemol database) optimized three peptides (WEV, PPW, MMG) via saturation mutation, cyclic peptide prediction, and structure-based design. WEV showed superior targeting in hypoxia/reoxygenation assays and in vivo imaging. WEV-bFGF, constructed via genetic engineering, retained bioactivity and enhanced ischemic kidney delivery in rat models. ELISA/Western blot confirmed improved targeting versus



KIT-bFGF, and renal function/pathology tests demonstrated therapeutic efficacy. AI-optimized WEV outperforms phage-derived peptides, offering a precise AKI treatment strategy.

Results Optimized peptide sequences were obtained through different peptide designs and verifications. In vitro cell experiments showed that the WEV peptide had the best enrichment effect on the surface of hypoxic HK-2 cells compared to the KIT peptide and other peptides; after intravenous administration, small animal live imaging showed that the WEV had the strongest fluorescence intensity in ischemic kidney tissue at 6h and 24h, suggesting its specific targeting to ischemic kidney tissue. After preparing recombinant WEV-bFGF, it was found to have biological activity similar to bFGF; Elisa and Western blot tests showed that WEV-bFGF had better ischemic kidney targeting ability compared to KIT-bFGF and bFGF; finally, WEV-bFGF could effectively protect kidney morphology and function one day after acute kidney ischemia.

Conclusion AI-optimized WEV enables precise bFGF delivery to ischemic kidneys, enhancing regeneration. This strategy holds significant potential for AKI therapy.

Keywords Acute renal ischemia, Artificial intelligence, targeted drug delivery, vascular endothelial growth factor.

Ethical approval and fund autonomy statement: Ethics approval All animal experiments were approved by the Ethics Committee of Qingdao University (Approval No. QDU-AEC-2023365) and were carried out in compliance with all relevant ethical regulations. This work was supported by the Natural Science Foundation of Shandong Province (ZR2023MC168), and the Key R&D Program of Shandong Province (2019GSF107037);

亚太 C4-129-0008

Quercetin Alleviates Endothelial Dysfunction in Preeclampsia by Inhibiting Ferroptosis and Inflammation through EGFR Binding

Meiting Shia,d#, Yao Shena,b, Ruiman Lid, Xuesong Yanga,b, Guang Wanga,b,c*

Objectives Preeclampsia (PE), a pregnancy-exclusive complication, currently lacks an effective treatment strategy. Considering the restricted use of medications during pregnancy, the exploration of natural, safe, and efficacious drugs for PE is of great significance. This study aimed to elucidate the associations among ferroptosis, inflammation, and PE, and to evaluate the protective effects of quercetin (QCT), a flavanol compound, against endothelial dysfunction in the context of PE.

Methods Samples from normal pregnant women and PE patients were gathered for analysis. Pregnant rat models, including ferroptosis-induced and selective reduced uteroplacental perfusion (sRUPP) models, were established. In vitro experiments were conducted on human umbilical vein endothelial cells (HUVECs). Computational methods like target prediction, molecular docking, and the cellular thermal shift assay (CETSA) were employed to identify QCT's target.

Results Ferroptosis, inflammatory imbalance, and endothelial dysfunction were detected in PE patients. Erastin injection in rats led to PE-like manifestations. In vitro, QCT counteracted ferroptosis, inflammation, and endothelial dysfunction by binding to the epidermal growth factor receptor (EGFR). In sRUPP rats, QCT alleviated PE symptoms, enhanced GSH-Px activity, and restored placental vascular density.

Conclusions QCT alleviates endothelial dysfunction in PE by inhibiting ferroptosis and inflammation via EGFR binding, suggesting its potential as a safe and effective preventive agent for PE. The potential applications of QCT are expanded. However, further research is required to fully understand its in vivo mechanisms and effects.

Keywords: Quercetin, Preeclampsia, Endothelial dysfunction, Ferroptosis, Inflammation



亚太 C4-129-0009

Study on the Improvement of Pericyte Damage in Diabetic Retinopathy by Berberine through Regulating Vof16

Jilin Chen¹, Ting-Hua Wang*

¹.Institute of Neuroscience, Kunming Medical University, Kunming, Yunnan, China;

*Corresponding author: Ting-Hua Wang, Kunming Medical University, Kunming, Yunnan, China; Email: wangtinghua@vip.163.com.

Objective: This study aims to explore the ameliorative effect of berberine on pericyte damage in diabetic retinopathy (DR) and its underlying mechanism.

Methods: A diabetic rat model and a pericyte damage model induced by high glucose were established. In vivo experiment, the morphological changes of the retinal tissues in diabetic rat and the expression of pericyte markers after berberine intervention were observed. In vitro experiment, the viability and apoptosis of pericytes in a high-glucose environment, as well as the expression changes of Vof16, were detected.

Results: Our results showed that berberine could significantly improve the loss of pericytes and the structural damage of the retina in diabetic rat, enhance the viability of pericytes in a high-glucose environment, and inhibit cell apoptosis. Mechanistic studies demonstrated that berberine could upregulate the expression of Vof16. Further experiments confirmed that interfering with the expression of Vof16 could partially reverse the protective effect of berberine on pericyte damage.

Conclusion: Berberine alleviates pericyte damage by regulating the expression of Vof16, thereby improving diabetic retinopathy, providing a new potential target and theoretical basis for the treatment of DR.

Keywords: Berberine; Cell Apoptosis; Diabetic Retinopathy (DR); Pericyte Damage; Vof16.

Ethical Approval: This study was carried out in strict accordance with the Guide for the Care and Use of Laboratory Animals of the National Institutes of Health (NIH) of the United States, and was approved by the Animal Care Committee of Kunming Medical University (Institutional Animal Care and Use Committee Protocol Number: Kmmu20242012).

Funding: None.

● 亚太 C4. Histology ● Poster

ID: 318402

Effectiveness Test of Black Cumin Seed Extract (*Nigella sativa*) on the Neutrophil-to-Lymphocyte Ratio and granuloma formatin in liver of Rats Model Infected with *Schistosoma japonicum*

Budi Dharmono Tulaka^{1,2} David Pakaya¹ Nilawati¹ Duta Agrianto Mendila¹ Made Sukma Indica Ayesha¹ Dzar Ghifari Muhammad Rizal¹
¹.Tadulako University
².Undata Hospital Palu

Objective *Schistosoma japonicum* infection can cause chronic inflammation that characterized in the neutrophil-to-lymphocyte ratio (NLR) changes and triggering granuloma formation in the liver. Black cumin seeds (*Nigella sativa*) are anti-inflammatory agents that potential to



reduce the inflammation. The aim of this study is to determine the effectiveness of black cumin seed extract on the NLR of rats infected with *S. japonicum*.

Methods This is an experimental study with posttest-only controlled group design. This study used 9 male Wistar rats, 12 weeks of age, and 200–250 grams of Body weight (BW). The rats were injected i.p. with *S. japonicum* cercariae and divided into three treatment groups: K1 (normal control), K2 (negative control: rat model), K3 (rat model + black cumin seed extract at 160 mg/kg BW). The NLR was measured through intracardiac blood samples analyzed using a hematology analyzer. The data was analyzed with GraphPad Prism 10.3.0 using non-parametric Kruskal-Wallis test. The rats were sacrificed with ketamine and xylazine anesthesia, liver histology was performed on paraffin embedded using hematoxylin-eosin (HE) staining and was evaluated qualitatively by assessing the granuloma formation.

Results The NLR of rats treated with black cumin seed extract was not statistically significant ($p = 0.16$) and found the granuloma formation in K2.

Conclusion Black cumin seed extract clinically reduced the NLR and granuloma formation.

关键字: immunopathology, natural products, schistosomiasis

亚太 C4-129-0004

IGF-1 regulates gap junction remodeling of gastric smooth muscle cells in diabetes gastroparesis rats through AMPK pathway

Su Jinyu, Zhang Gaoyuan, Zhang Mohan (mhzhang@ybu.edu.cn)

Department of Histology and Embryology, Medical College, Yanbian University; Yanji, China

Objective Diabetic Gastroparesis (DGP) is a complication of diabetes characterized by delayed gastric emptying and motility disorders. The pathogenesis is linked to impaired gastric smooth muscle cell function induced by hyperglycemia. Gap junctions (GJs) play a crucial role in intercellular electrical signal transmission, and their dysregulation is a key factor contributing to gastric hypomotility. Insulin-like growth factor-1 (IGF-1) is a polypeptide with structural similarities to insulin and shows therapeutic potential for metabolic disorders, including diabetes. AMP-activated protein kinase (AMPK) is ubiquitously expressed in various tissues and is a focal point in research on diabetes mellitus and related metabolic conditions. This study aimed to explore the impact of high glucose on GJ in gastric smooth muscle cells via the AMPK pathway and the mechanism of IGF-1 intervention.

Methods The study utilized diabetic rat models and primary gastric smooth muscle cells. Various experimental techniques including immunohistochemistry, fluorescence tracer, flow cytometry, Western Blot, protein phosphate antibody chip were employed to analyze the remodeling of gastric smooth muscle gap junctions, alterations in AMPK activity and pathway, and the impact of IGF-1 intervention in high glucose conditions.

Results Animal experiments demonstrated that in rats with diabetic gastroparesis (DGP), body weight decreased significantly, blood glucose levels rose, gastric emptying was delayed, gastrointestinal propulsion rate decreased, and gastric antrum smooth muscle contractile function weakened. The expression of Cx43 protein in gastric smooth muscle tissue increased, leading to elevated membrane-plasma ratio and Ser368 phosphorylation, resulting in reduced GJ channel opening rate. Treatment with IGF-1 not only ameliorated the overall condition of DGP rats but also decreased membrane-plasma ratio and Cx43 phosphorylation in gastric smooth muscle. These findings indicate GJ remodeling in the gastric smooth muscle of DGP rats under hyperglycemic conditions, with IGF-1 enhancing GJ function in gastric smooth muscle and restoring gastric motility. Compared to the Normal Glucose group, the High Glucose group exhibited a significant decrease in the proportion of cells with dual fluorescent markers in total gastric smooth muscle cells, reducing



intercellular dye transfer rate. Furthermore, PCR-array analysis revealed abnormal expression of 19 GJ-related genes in the gastric smooth muscle cells of rats under high glucose conditions, indicating impaired GJ function and suggesting remodeling phenomena. IGF-1 mitigates GJ remodeling by modulating key genes like *Gjc3* and *Gja1*. Both in vivo and in vitro experiments confirmed that under high glucose conditions, AMPK activity in rat gastric smooth muscle cells increased, concomitant with elevated AMP/ATP ratio, TAK1 protein activity, LKB1 protein activity, and CaMkk β expression. Treatment with the AMPK inhibitor Compound-C partially reversed the GJ dysfunction induced by high glucose in these cells. Following IGF-1 intervention, a significant reduction in AMP/ATP ratio, TAK1 and LKB1 protein activity, and CaMkk β expression in the upstream AMPK pathway was observed. Additionally, IGF-1 regulated Cx43 function through downstream AMPK molecules such as CaMKII, p53, and AKT1, thereby ameliorating GJ remodeling in rat gastric smooth muscle cells and tissues.

Conclusion (1) gap junction remodeling exists in gastric smooth muscle of diabetic gastroparesis rats. (2) AMPK is involved in gap junction remodeling. (3) IGF-1 can regulate gap junction remodeling through AMPK

Keywords: adenylate activated protein kinase; diabetic gastroparesis; gap junction; gastric smooth muscle; Insulin-like growth factor-1

亚太 C4-129-0005

Poria cocos polysaccharide ameliorates colitis and linked anxiety-like behavior through microbiota-gut-brain axis.

Chenyu Li, Jing Lan, Jiaqi Wang, Yunfei Ma (yunfeima@cau.edu.cn). State Key Laboratory of Veterinary Public Health and Safety, College of Veterinary Medicine, China Agricultural University, Beijing, China 100193.

Objectives Ulcerative colitis (UC) is a chronic inflammatory bowel disease associated with anxiety-like behavior that seriously affect quality of life. *Poria cocos* polysaccharide (PCP), a key bioactive component of *Poria cocos*, has been reported to exert anti-inflammatory effects. In this study, our aim is to explore the ameliorative effect and mechanism of PCP in colitis and anxiety-like behavior.

Methods We established a mouse model of dextran sodium sulfate (DSS)-induced colitis and used integrated approaches including molecular biology techniques, behavioral assessments (such as open field test), 16S rRNA sequencing, and metabolomic.

Results We found that oral administration of PCP (300 mg/kg/d) significantly alleviated weight loss and reduced the disease activity index (DAI) in UC mouse. In addition, PCP treatment alleviated colon epithelial shedding, reduced inflammatory cell infiltration, increased the number of goblet cells, and maintained the integrity of the intestinal barrier by upregulating tight junction proteins (occludin, ZO-1). Furthermore, PCP treatment significantly reduced proinflammatory cytokine levels (TNF- α , IL-1 β , and IL-6) in both colon and hippocampus while improving anxiety-like behavior. Mechanistically, our study suggested that PCP enhanced gut microbiota diversity and richness, and further elucidated its regulation of hippocampal neuroinflammation via key differential metabolites associated with neuroinflammatory pathways.

Conclusion In short, we revealed that PCP ameliorates intestinal inflammation and alleviates UC-associated anxiety-like behavior via the microbiota-gut-brain axis, providing new potential drugs and therapeutic strategies for the treatment of UC.

Key Words: *Poria cocos* polysaccharide; Ulcerative colitis; Microbial-brain-gut axis; Anxiety-like behavior



● 亚太 C5. Organoid & Tissue Engineering ● Podium

ID: 320105

Dynamic Hydrogel Induces Differentiation of Human Vascular Organoids into Arterioles and Promotes Neovascularization in Myocardial Infarction

Dayu Sun¹ Feiyang Zheng^{1,2} Guanyuan Yang^{1,3} Jianhua Xu¹ Chuhong Zhu¹

1. Department of Anatomy, Engineering Research Center of the Ministry of Education for Tissue and Organ Regeneration and Manufacturing, Engineering Research Center for Organ Intelligent Biological Manufacturing of Chongqing, Third Military Medical University, Chongqing 400038, P. R. China

2. Department of Gastroenterology, 920th Hospital of Joint Logistics Support Force of The People's Liberation Army

3. General Surgery Center, The General Hospital of Western Theater Command, Chengdu, China

Objectives Stem cell-derived human blood vessel organoids (hBVOs) are embedded in extracellular matrices to stimulate vessel sprouting. Although vascular organoids in 3D collagen I-Matrigel are currently available, they are primarily capillaries, which necessitate mature arteriole differentiation for neovascularization.

Methods The dynamic hydrogel (D-hydrogel) and non-dynamic hydrogel (ND-hydrogel) were synthesized. Human induced pluripotent stem cells were aggregated into embryonic bodies and induced into hBVOs. During sprouting stage, hBVOs were encapsulated in ND- or D-hydrogels to investigate the bioeffect of matrix viscoelasticity in regulating vascular development. The morphology, lumen diameters and angiogenesis levels of hBVOs were examined by immunofluorescence. The cellular composition, developmental trajectory and underlying mechanisms were investigated by single cell RNA sequencing. Furthermore, the differentiation of hBVOs was tested in vivo by co-injecting with ND- or D-hydrogel into myocardial infarction rat models.

Results The vascular organoids within the dynamic hydrogel demonstrated enhanced angiogenesis, larger lumen diameters and differentiation into arterioles containing smooth muscle cells. The dynamic hydrogel mechanical microenvironment promoted vascular patterning and arteriolar differentiation by elevating Notch receptor 3 signaling in mesenchymal stem cells and downregulating platelet-derived growth factor B expression in endothelial cells. Transplantation of vascular organoids along with the dynamic hydrogel led to the reassembly of arterioles and restoration of cardiac function in infarcted hearts.

Conclusion These findings indicate that the viscoelastic properties of the matrix play a crucial role in controlling vascular organization and differentiation processes, suggesting an exciting potential for its application in regenerative medicine.

关键字: vascular organoid, dynamic hydrogel, arteriole differentiation, myocardial infarction, neovascularization



ID: 320117

Cardiac Organoid Model Inspired Micro-Robot Smart Patch to Treat Myocardial Infarction

Fangfang Wang Zilu Xu Feiyang Zheng
Third Military Medical University

Objectives Post-myocardial infarction (MI), the rapid decrease in pH triggers myocardial cell acidosis, which compromises the therapeutic efficacy of exosomes in MI. The groundbreaking research in the human cardiac organoid MI model suggests that exosomes, when paired with pH adjustment, dramatically reduce cardiomyocyte mortality while maintaining their proliferative potential, underscoring the importance of pH regulation in myocardial preservation.

Methods Micro-robot mounted micro-needle (MN) patch is thus proposed, targeting MI-acidic microenvironment, to deliver exosomes into deep injured tissue.

Results Upon injection, the patch base releases VEGF-laden nanoparticles adhering to the infarcted myocardium. The smart patch is found not only 3D reconstructs the vascular network in MI regions but also effectively saves cardiomyocytes in rats. Furthermore, the minimally invasive delivery of MN patches are also verified to hearts of rabbits and pigs via thoracoscopic surgery underscores.

Conclusion These findings suggest that precise regulation of the microenvironment is a key to improving treatment outcomes.

关键字：Exosomes, Human cardiac organoid (HCO), Hypoxic-acidic microenvironment, Myocardial infarction (MI), Self-driven micro-robots

ID: 320666

miR-21 Promotes the Repair of Sciatic Nerve Injuries in Rats by Regulating the Differentiation of Bone Marrow Stromal Cells

魏财鸿
Ningxia Medical University

Objective The study aims to explore the repair mechanism of BMSCs transfected with miR-21 on rat sciatic nerve injuries.

Methods In vitro, rat BMSCs were transfected with miR-21 agonist or blocker and their respective empty vectors respectively, and the cells in each group were labeled with Hoechst33342 for postoperative implantation of the decellularized nerve injury area. At 8 w after operation, footprinting test, wet weight ratio of gastrocnemius muscle and electrophysiology were used to evaluate the recovery of nerve function. Immunofluorescence staining was conducted to detect the expressions of regenerated nerve fibers, myelin proteins, Schwann cells (SCs) marker proteins and neurotrophic factors (NTFs) in the regenerated nerves. The protein levels of ERK1/2 and Spry2 were assayed via Western blot.

Results Compared with the other groups, SFI, wet weight ratio of gastrocnemius muscle and nerve conduction velocity were significantly increased in agomir-21 group. The density of NF200 positive nerve fibers, the expression of MBP, the differentiation rate of BMSCs into SCs-like cells and the secretion of NTFs in the regenerated nerve were significantly increased. The protein expression of ERK1/2 was significantly increased, and the protein expression of Spry2 was significantly decreased ($P < 0.05$).



Conclusion miR-21 promotes the differentiation of BMSCs into SCS-like cells and the secretion of NTFs, which is conducive to peripheral nerve regeneration. The mechanism may be related to the negative regulation of Spry2 and activation of ERK1/2 pathway by miR-21.

关键字: miR-21; bone marrow stromal cells (BMSCs); peripheral nerve injury (PNI); Schwann cells (SCs); differentiation

亚太 C5-129-0001

Fabrication and Evaluation of 3D Printed PLGA/nHA/GO Scaffold for Bone Tissue Engineering

Xiaohe Li1 (798242742@qq.com), Ling Tong2, Guopeng Shi3, Haiyan Wang4
Department of Human Anatomy, School of Basic Medical Sciences, Inner Mongolia Medical University, Hohhot, 010010, China

Purpose The study aimed to fabricate and evaluate a bone tissue engineering scaffold made from a composite of polylactic-co-glycolic acid (PLGA), nano-hydroxyapatite (nHA), and graphene oxide (GO) using low-temperature 3D printing and freeze-drying techniques.

Methods The scaffolds were produced with varying compositions: PLGA alone and in combination with nHA and GO. The macro and microstructure, pore size, porosity, mechanical properties, and in vitro biocompatibility were assessed. Bone marrow mesenchymal stem cells (BMSCs) were co-cultured with the scaffolds to evaluate cell adhesion, proliferation, and cytotoxicity.

Results The PLGA/nHA/GO composite scaffolds exhibited optimal pore size and microtopography, enhanced mechanical properties, excellent water absorption, and appropriate degradability. The co-culture with BMSCs demonstrated improved cell adhesion and proliferation, indicating good biocompatibility.

Conclusion The PLGA/nHA/GO composite scaffolds show potential as a bone tissue engineering material due to their favorable properties and biocompatibility, suggesting their suitability for bone defect repair applications.

Keywords: 3D printing, scaffold, bone tissue engineering, polylactic-co-glycolic acid, nano-hydroxyapatite, graphene oxide

Ethics approval: The study protocol was approved (YKD2019GG115) by the Ethics Committee of Inner Mongolia Medical University. Written informed consent was not required because of the retrospective nature of the study.

Funding This research was funded by the Inner Mongolia Autonomous Region Health and Health Technology Project(202201188), Inner Mongolia Natural Science Foundation (2021MS08086), Inner Mongolia Medical University "Achievement Transformation" Project (YKD2020CGZH009), 2021 Inner Mongolia Medical University "Zhiyuan Talent" Project (ZY0120017), Inner Mongolia Department of Education Higher Education Innovation Team Development Plan (NMGIRT2227), Inner Mongolia Autonomous Region Key Research, Development, and Achievement Transformation Project (2023YFHH0003), Innovation Team Development Plan for Higher Education Institutions in Inner Mongolia Autonomous Region(NMGIRT2419), Joint project with Inner Mongolia Medical University (YKD2022LH039), Science and Technology Program of the Joint Fund of Scientific Research for the Public Hospitals of Inner Mongolia Academy of Medical Sciences (2023GLLH0225).



亚太 C5-129-0004

Esculin-porous starch hydrogel facilitates the regeneration of sciatic nerve injury in mice

Yang Yu^{1,2} Wo Yan¹

1 Department of Anatomy and Physiology, Shanghai Jiao Tong University School of Medicine

2 Department of Anesthesiology, Shanghai Second People's Hospital

Objectives The efficiency of Schwann cell clearance and its reparative effects make it a crucial participant in peripheral nerve regeneration (PNI). After nerve injury, macrophages regulate Schwann cell-mediated nerve regeneration. The dual anti-inflammatory and pro-inflammatory actions of macrophages are key factors in PNI repair. Esculin (AE) possesses neuroprotective properties, including antioxidant and anti-inflammatory effects. However, controlling the timing of its anti-inflammatory action remains a challenge in nerve repair. Our goal was to develop a water-based gel loaded with slow-release esculin to regulate macrophage polarization and enhance Schwann cell proliferation, ultimately promoting sciatic nerve injury repair.

Methods The physical properties of the porous starch AE-Gel (PSAE-Gel) were characterized using a zeta sizer for particle size and zeta potential analysis, scanning electron microscopy (SEM), and transmission electron microscopy (TEM). The optimized nanoparticles were studied for drug release kinetics in vitro, and their biological utilization was assessed. Additionally, a mouse sciatic nerve crush injury model was used to evaluate peripheral nerve repair.

Results 1. Hydrogel-loaded sustained-release AE has good biocompatibility and tissue compatibility; PSAE can change the polarization of macrophage BV2, and after the use of PSAE, it can reduce the ROS production of Schwann cell MSC, increase mitochondrial membrane potential and inhibit apoptosis, providing a protective effect. (Figure 1) 2. Photocrosslinked hydrogel-loaded sustained-release PSAE alleviates denervated muscle atrophy in mice, promotes growth and repair after nerve injury in mice, and improves sensory and motor functions after nerve injury in mice. (Figure 2) 3. Transcriptional sequencing of in vitro cell models combined with literature analysis revealed that AE may improve LPS-induced M1 polarization of BV2 cells by inhibiting the EGFR/PI3K/AKT pathway. (Figure 3)

Conclusion PSAE-Gel exhibits potent anti-inflammatory activity and sustained release properties, effectively improving sensory and motor function recovery in target organs after peripheral nerve injury.



● 亚太 C5. Organoid & Tissue Engineering ● Poster

ID: 320486

Impact of In Ovo and Ex Ovo Incubation Conditions on the Morphology of the Chicken Chorioallantoic Membrane

Zuzana Demcisakova¹ Lenka Luptakova¹ Liesbeth Couck² Ward De Spiegelaere² Eva Petrovova¹
1.University of Veterinary Medicine and Pharmacy in Košice
2.Ghent University

Objectives The chicken chorioallantoic membrane (CAM) is a valuable model for studying angiogenesis and its inhibition in response to tissues, cells, or soluble factors. It has become widely used in tissue engineering as an essential tool for materials testing in regenerative medicine applications. This study evaluates the morphological and ultrastructural changes in the CAM during chicken embryo development under in ovo and ex ovo incubation conditions, which may influence the outcomes of angiogenic studies.

Methods Morphometric analysis of in ovo/ex ovo-cultivated CAM was performed on hematoxylin-eosin sections, evaluating vessel number, diameter, and CAM layer thickness. Ultrastructural changes were examined using transmission electron microscopy. Vessel formation was assessed through immunohistochemical staining with markers for embryonic endothelium (WGA), endothelial cells (VE-Cadherin), and macrophages (KUL-01). Proliferative activity was evaluated using PhosphohistoneH3. Gene expression of angiogenesis-related factors was analysed using the RT2ProfilerPCRArray.

Results The CAM exhibits significant morphological differences depending on the incubation conditions, with the most notable changes observed in mesenchyme thickness. Ultrastructural differences were observed in the distribution and arrangement of blood vessels in the chorion of the CAM under ex ovo conditions. Furthermore, a continuous layer of cells was detected on the surface of the chorion epithelium. In ex ovo culture, chorionic cells, such as the villous cavity cells and basal cells, were absent.

Conclusion Different incubation conditions can induce structural changes of CAM, which may affect research outcomes when the chicken CAM is used as an assay, either in ovo or ex ovo, for the same purposes.

关键字：Allantois epithelium. Angiogenesis. Chorioallantoic membrane. Chorion epithelium. Tissue engineering.



亚太 C5-129-0003

MAIS: an in-vitro sandbox enables adaptive neuromodulation via scalable neural interfaces

Haoman Chen^{1,2,3#}; Fanxuan Chen^{1,4,#}; Xinyu Chen^{5,#}; Yang Liu^{5,6#}; Junpeng Xu^{1,3,7#}; Jiajun Li^{8#}; Xueying Bao⁹; Yuzhe Chen¹; Haojun Sun¹; Jiaju Jiang¹; Fangzhou Ye^{5,10}; Jianzhong Su¹; Gen Yang^{1,11}; Fangfu Ye¹; Zhouguang Wang^{1,3,7*}; Liyu Liu^{1,12,*}; Hexige Saiyin^{5,13*}; Xiaokun Li^{1,2,3,7*}; Lixiang Ma^{5,*}; Jianwei Shuai^{1,*}
1Oujiang Laboratory (Zhejiang Lab for Regenerative Medicine, Vision, and Brain Health), Wenzhou Institute, University of Chinese Academy of Sciences, Wenzhou, 325000, China

2The First School of Medicine, School of Information and Engineering, Wenzhou Medical University, Wenzhou, 325000, China

3State Key Laboratory for Macromolecule Drugs and Large-scale Preparation, Wenzhou Medical University, Wenzhou, 325000, China

4School of Biomedical Engineering, School of Ophthalmology and Optometry, Eye Hospital, Wenzhou Medical University, Wenzhou, 325000, China

5Department of Anatomy and Histology & Embryology, School of Basic Medical Sciences, Fudan University, Shanghai, 200032, China

6State Key Laboratory of Medical Neurobiology and MOE Frontiers Center for Brain Science, Institutes of Brain Science, Fudan University, Shanghai, 200032, China

7School of Pharmaceutical Science, Wenzhou Medical University, Wenzhou, 325000, China

8Intelligent Imaging Innovations, Denver, 80216, USA

9National Institute for Data Science in Health and Medicine, Xiamen University, Xiamen, 361102, China

10ENT Institute and Department of Otorhinolaryngology, Eye & ENT Hospital, Fudan University, Shanghai, 200031, China

11State Key Laboratory of Nuclear Physics and Technology, School of Physics, Peking University, Beijing, 100871, China

12College of Physics, Chongqing University, Chongqing, 401331, China

13State Key Laboratory of Genetic Engineering, School of Life Sciences, Fudan University, Shanghai, 200433, China

#These authors contributed equally to the paper as first authors.

*Corresponding Author

First authors: Haoman Chen, hmchen@zeroacademy.net; Fanxuan Chen, fxchen@zeroacademy.net; Xinyu Chen, 19211010039@fudan.edu.cn; Yang Liu, 20211010031@fudan.edu.cn; Junpeng Xu, hpxujunpeng@gmail.com; Jiajun Li, li.jiajun@intelligent-imaging.cn.

Corresponding Author: Jianwei Shuai, shuaijw@wucas.ac.cn; Lixiang Ma, lxma@fudan.edu.cn; Xiaokun Li, lixk1964@163.com; Hexige Saiyin, saiyin@fudan.edu.cn; Liyu Liu, liu@iphy.ac.cn; Zhouguang Wang:

wangzhouguang@wmu.edu.cn.

Objectives Brain-computer interfaces (BCIs) predominantly rely on artificial decoder to track neural representations. However, fixed paradigm is incompatible with drift representations in human brain. Resolving the representational “drift” is a critical barrier to permit long-term complex neuromodulation in BCIs. Here, we present the Multi-Agent Interactive System (MAIS)—a in-vitro platform testing variety neural interface decoders.

Methods By integrating human cortical organoids with reprogrammable microelectrode array chips. MAIS establishes dynamic closed-loop perturbation system capable of both spatial programming control and multi-organoid emergent behavior simulation. Within this architecture, each consisting of hCOs functionally fused with MEA substrates, engage in role-specific perturbative interactions, indicating the potential organoid communication in specific in vitro scenarios.

Results This study resolves the biological-electronic encoding incompatibility of brain organoid-MEA Integration through three progressive breakthroughs. Firstly, a hybrid agent is developed as a bioengineered platform that enables closed-loop perturbation of biological neuronal networks via exogenous signals. Secondly, the real-time tracking of neuronal activity enables the establishment of dynamically reconfigurable stimulation nodes that self-align with the electrophysiological states of the organoids. MAIS implements plasticity-driven adaptation principles, ensuring biological compatibility through spatially adaptive coordination. Finally, the MAIS system is constructed using shared plasticity rules rather than centralized control, achieving “plug and play” (PnP) interactions between multiple hCO agents via a biological neural network decoder.



Conclusion MAIS embodies a self-evolving neural coding sandbox in which plasticity-driven dynamic decoding bridges the compatibility gaps between biological and digital systems, providing a scalable and foundational infrastructure for human-centered neural interfaces.

Key Words: Brain organoids; closed-loop perturbation; electrophysiology; microphysiological systems; synthetic biological intelligence.

Ethics: The ethics were approved by the Ethics Committee of the School of Basic Medical Sciences at Fudan University.

Funding: This study is supported by the National Natural Science Foundation of China (grant no. U24A2014, 32370852, 12090052), the Ministry of Science and Technology of the People's Republic of China (grant no. 2021ZD0201900, 2021YFA1101302).

亚太 C5-129-0005

A Study on the Promotion of Rat Pressure Injury Healing by Luteolin/Polyvinyl Alcohol/Sodium Alginate Hydrogel

Wenyi Huang^{1,2}, Yu Yan², Hui Li^{1*}, Chun Li^{2*}

1. School of Basic Medical Sciences, Guangzhou University of Chinese Medicine, Guangzhou 510006, China

2. School of Nursing, Guangzhou University of Chinese Medicine, Guangzhou 510006, China

*Corresponding authors:

Hui Li (Email: lihui@gzucm.edu.cn)

Chun Li (Email: hllc@gzucm.edu.cn)

Objective This study investigates the mechanism of luteolin/polyvinyl alcohol/sodium alginate (Lut/PVA/SA) hydrogels in repairing pressure injuries (PI) to provide optimized strategies for clinical PI treatment.

Methods Four groups of PVA/SA hydrogels were prepared using chemical cross-linking and freeze-thaw cycles, with the optimal formulation screened based on physicochemical properties. A Lut/PVA/SA drug-loading system was constructed, and drug encapsulation efficiency and release kinetics were validated via CCK-8, PI/Calcein-AM double staining, and Fourier transform infrared spectroscopy. A stage II PI model in SD rats was established to evaluate therapeutic efficacy and histological changes. Network pharmacology identified Lut targets, while KEGG enrichment analysis and systematic literature review predicted potential mechanisms. RT-qPCR, Western blot and immunofluorescence (IF) were used to assess anti-inflammatory, antioxidant, and anti-apoptotic effects.

Results The 5P2S hydrogel was selected as the drug carrier due to superior physicochemical properties ($P < 0.05$). Lut ($\leq 500 \mu\text{M}$) showed no cytotoxicity and achieved sustained release equilibrium within 48 hours within a three-dimensional porous scaffold. The Lut/PVA/SA group significantly accelerated wound healing, enhanced collagen deposition ($P < 0.05$), and upregulated $\alpha\text{-SMA/Collagen I}$ expression ($P < 0.05$). Lut/PVA/SA activated the NRF2/HO-1 pathway, elevating SOD and CAT levels while reducing MDA ($P < 0.05$). It also downregulated BAX/Caspase 3, upregulated BCL2, and restored the BAX/BCL2 balance ($P < 0.05$). Protein expression of pro-inflammatory factors (TNF- α , IL-6, IL-1 β) was suppressed ($P < 0.05$).

Conclusion Lut/PVA/SA hydrogel exhibits favorable physicochemical properties and promotes stage II PI healing in SD rats. Its therapeutic effects may involve enhancing antioxidant capacity via the NRF2/HO-1 pathway, inhibiting fibroblast apoptosis by modulating the BAX/BCL2 balance, alleviating inflammatory microenvironments, and accelerating collagen synthesis to facilitate wound repair.

Keywords: Luteolin; Polyvinyl alcohol; Sodium alginate; Pressure injury; Therapeutic efficacy

Ethical approval This study received ethical approval from the Animal Experiment Center of Guangzhou University of Traditional Chinese Medicine, Laboratory Animal Ethical Review No. 20240229009.



Funding This work was supported by the Science and Technology Program of Guangzhou (202201011394), Guangdong Scientific Research Platform and Projects for the Higher-educational Institution (2022KTSCX025), National Natural Science Foundation of China (82274256).

In vivo experimental procedures 48 SD rats were adapted for a week in a 21-22°C SPF environment with a 12h light/dark cycle and free access to food and water. Using a random number table, they were divided into 8 groups (6 rats per group). The blank control group was untreated. The other seven groups were anesthetized with isoflurane, had their back hair removed, and their back skin was compressed with a magnet for 10h, then relaxed for 2h, repeated once, to create stage II pressure induced injury models. After treatment, wound healing was observed daily, and images were taken on days 0, 7, 14, and 21. Finally, the rats were euthanized by cervical dislocation under anesthesia, and tissues were collected for further experiments.

● 亚太 D. Anatomical Education ● Podium

ID: 318391

Expectations of First Year Undergraduate Medical Students towards Human Cadaveric Dissection: Reflective Writing as an Effective Tool

Sandip Shah Sarun Koirala Vijay Khanal Gita Yadav Laxman Khanal
B.P. Koirala Institute of Health Sciences, Nepal

Objective Cadaveric dissection promotes psychosocial development and emotional socialization. The objective of this study was to assess the expectations of first year undergraduate medical students of BPKIHS towards human cadaveric dissection using a reflective writing exercise.

Methods Non-Interventional qualitative cross-sectional study was conducted before dissection Lab Exercise in Unit 0. Students were divided in twenty groups. Each group consist of 5 students and group leaders were also nominated for timely submission of questionnaire. Each group was instructed to meet their teams in person to discuss their questions before first dissection in department and write their responses to the reflective questions together in 200 words. After data collection, all the data were managed by research team. Qualitative analysis of reflective writing was done by grounded theory data analysis procedure. Afterwards, we framed levels of coding more specifically open, axial and selective coding.

Results The Mean age of participants is 19.63 years ; 74.5 % were of Indo-Nepalese ethnic groups; 70.4% were Male and 72.4% had seen dead body before admission to BPKIHS. Total 147 unique open codes were identified. These open codes were sorted into 8 axial codes such as gratitude/respect, story of patient, anatomy learning, humanity, career building, lifestyle/ interpersonal modification, empathy and courage.

Conclusion Thus, the gravity of dissection experience is further heightened by knowing the story of patients and their courage for building their career in medicine as reported by students in their reflective response.

关键字: Cadaveric dissection, anatomy, reflective writing, empathy



ID: 318440

Artificial Intelligence-generated Chest X-rays as an Educational Tool for Medical Students: an Efficacy Evaluation

Yigeng Li¹ Ritvik Sivananda³ Saad Ashraf² Sijing Feng⁴

1.Bendigo Health

2.Monash Health

3.Monash University

4.Everlight Radiology

Objectives Radiological anatomy is a crucial component of medical education and clinical practice. However, barriers such as limited access to online resources and patient privacy concerns restrict medical students' exposure to real-life radiological imaging. This project aims to use artificial intelligence (AI) to synthetically generate chest x-rays (CXR), with the goal of improving medical students' experience in learning radiological anatomy.

Methods A customised, pre-trained AI model, was prompted to generate CXRs. 12 highest-quality CXRs were selected, and each was labelled with 5 anatomical structures in a quiz format, with answers key appended. The accuracy of anatomical labels was validated by a board-certified radiologist. Medical students were invited to review the images, attempted the questions, then completed an online survey. The survey incorporated structured rating scales to quantitatively assess image and question quality as well as open-ended response fields to collect qualitative feedback about the educational utility of the AI-generated CXRs.

Results The respondent cohort (N=11) comprised of medical students in their preclinical year (9.1%), clinical year (90.9%). Evaluation scores demonstrated strong acceptance of the AI-generated CXR, with 90.9% of respondents rating anatomical accuracy $\geq 7/10$ (where 10=extremely satisfied). Similarly, 90.9% rated the CXR quality $\geq 7/10$ when compared to real patient CXRs, and 81.8% rated $\geq 7/10$ for their usefulness in learning radiological anatomy.

Conclusion This study demonstrates that AI-generated CXRs can be an effective tool for teaching radiological anatomy to medical students.

关键字: Artificial intelligence, Chest x-ray, education

ID: 320092

Design and Development of a Virtual Reality for Spatial Learning of Pelvis and Perineum

Dr. Arthur Lau Chin Haeng¹ Prof Rajendran Kanagasuntheram¹ Dr Krishnan Jayabharathi¹ Dr Muthukrishnan Chandrika¹ A/ Prof George Wai Cheong Yip¹ Mr John Yap²

1.Yong Loo Lin School of Medicine, National University of Singapore

2.Information Technology, National University of Singapore

Objectives A challenge of learning anatomy is the spatial understanding. The Department of Anatomy, Yong Loo Lin School of Medicine, National University of Singapore utilises a blended teaching approaches but the challenges remains. A possible solution is using virtual reality (VR). The aim of this study is design and develop a VR to assist the learning of the spatial arrangement of the pelvis and perineum anatomy.

Methods Design and development of the VR tool involved anatomy educators and developers, led by the MoSCoW prioritisation method. The VR contains two modes which is learning by deconstructing and assessment by reconstructing the anatomy. The tool is developed for Meta



Quest 3 headset. To evaluate the learning experience, the station-based anatomy practical is simulated with one student wearing the headset and the others observing through a screencast. Collaboration is required between the VR user and observers to assemble the anatomy in the shortest duration. Focus group discussion is conducted and qualitative data analysed through thematic analysis.

Results Four second-year medical students were recruited and tasked to complete the assembly of the anatomy. The duration of assembly took approximately 16 minutes. Preliminary themes generated from the analysis are as follow: (1) Assembly helped spatial understanding, (2) Enhancing conventional teaching with VR, (3) Differing learning experience between VR user and observers, (4) Motion sickness with VR.

Conclusion Although the VR shows promising findings in supporting spatial learning and fostering active collaboration, challenges remain in terms of feasibility of deployment, motion sickness and differing learning experience.

关键字: Anatomy education, Virtual Reality, Spatial Anatomy

ID: 320618

The Effectiveness of the Integrated OBE and STAD Teaching Approaches in the Oral Anatomy and Physiology Course

Shuang Xia Tingting Chen Xuechao Jing Sha Xie Zhangding Liao Guohe Tan Li Wei
Guangxi Medical University

Objective Traditional lecture-based learning (LBL) model with respect to problem-solving, collaborative learning, and lifelong learning strategies, the Outcome-Based Education (OBE) concept is integrated with the novel Student Teams Achievement Divisions (STAD) teaching reform model to carry out the curriculum reform of Oral Anatomy and Physiology. It transforms the traditional teaching method mainly focusing on instruction into a model centered on students and based on teams. By leveraging the online and offline extended teaching classrooms, dynamic formative assessment, and teaching reflection, the teaching effectiveness is enhanced. It promotes educational and teaching innovation and improves the competitiveness of core talents in the field of medical science.

Methods A parallel - group controlled experiment involved 150 Chinese oral medicine students (69 males, 81 females; 21-23 years old). Using previous satisfaction data (experimental group 93.5%, control group 79%), with $\alpha = 0.05$, power=80%, and a 1:1 sampling ratio, the students were randomly assigned to an OBE+STAD experimental group or an LBL control group. After 18 weeks, outcomes were evaluated via final exams, self-assessment questionnaires, and satisfaction surveys.

Results The experimental group generally performed better than the control group on the final examination ($P<0.05$), student self-assessment ($P<0.05$) and satisfaction survey ($P<0.05$).

Conclusions Compared with LBL, the OBE + STAD model was an innovative teaching method that promoted more comprehensive quality development. It represents an alternative model for optimizing the capacity of future oral doctors.

关键字: OBE Concept; Anatomical curriculum reform; STAD teaching model



ID: 320700

Gi Tract Clay: Anatomical Carving as Alternative Modality in Human Anatomy Teaching

Oski Illiandri
Universitas Lambung Mangkurat Banjarmasin

Objectives Effective anatomy education is critical for medical and allied health students. Traditional methods like cadaveric dissection and 2D diagrams have limitations in accessibility, engagement, and spatial understanding. Human anatomy carving, a hands-on modality, offers an alternative approach to enhance learning through tactile and visual experiences.

Methods This study evaluated the efficacy of human anatomy carving in anatomy teaching among undergraduate medical students. Participants were divided into two groups: one engaged in carving gastro intestinal tract (GIT) anatomical structures using clay, while the control group utilized conventional methods. Pre- and post-assessments measured spatial understanding, retention, and engagement. Surveys gauged students' perceptions of the learning experience.

Results The carving group demonstrated a 15% greater improvement in spatial understanding compared to the control group ($p < 0.05$). Retention rates after two weeks were significantly higher in the carving group (mean score: 70%) versus the control group (mean score: 57%). Qualitative feedback revealed that 70% of carving participants found the activity engaging and effective for understanding complex anatomical relationships. Challenges included initial material handling and time constraints.

Conclusion Human GIT anatomy carving is a viable alternative or supplementary modality in anatomy education, promoting enhanced spatial comprehension, retention, and student engagement. This method bridges the gap between theoretical knowledge and practical understanding, particularly in contexts where cadaveric resources are limited. Future studies should explore its integration with digital tools and evaluate long-term learning outcomes.

关键字: anatomy; clay; gi tract; teaching

ID: 328763

Mapping Core Anatomy Competencies for Clinical Skill Development in Undergraduate Dental Education: A Scoping Review in Progress

Evelyn Jerusha Edward^{1,2*} Khan NLA³ Zul Izhar Mohd Ismail¹ Siti Nurma Hanim Hadie¹

1. Department of Anatomy, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Kota Bharu, Kelantan, MALAYSIA

2. Unit of Basic Medical Sciences (Anatomy), Faculty of Dentistry, AIMST University, Bedong, Kedah, MALAYSIA

3. Centre of Preclinical Science Studies, Faculty of Dentistry, Sungai Buloh Campus, Universiti Teknologi MARA Sungai Buloh, Selangor, MALAYSIA

Objectives Anatomy education forms the foundation of dental training, underpinning essential clinical skills such as diagnosis, treatment planning, and procedural proficiency. However, the specific anatomy competencies emphasized within undergraduate dental curricula and their relevance to clinical readiness vary across institutions. Understanding these core competencies and pedagogical approaches is essential to enhance curriculum design. This review is guided by the primary research question: Which anatomy competencies are essential for supporting clinical readiness in dental education? It aims to explore the anatomy competencies currently integrated



into undergraduate dental curricula and evaluate relevance in fostering the development of clinical skills.

Methods The review follows the Joanna Briggs Institute (JBI) framework and is reported according to PRISMA-ScR guidelines. A three-phase search is conducted across Scopus, PubMed, and Wiley Online Library, complemented by grey literature and reference list screening. Included studies focus on undergraduate dental students and anatomy education linked to clinical practice. Data extraction uses a standardized form, with findings synthesized through tables and narrative summaries.

Results Key anatomy competencies such as head and neck anatomy, tooth morphology, and anatomical variation emerge as critical to clinical skill development. Pedagogical innovations including flipped classrooms, interactive simulations, and virtual reality are examined for their role in enhancing knowledge retention and application. Early analysis identifies gaps in curricula and variability in competency emphasis across institutions.

Conclusion This review offers evidence-based insights to guide educators and curriculum developers in strengthening anatomy instruction, supporting competency-based learning that better prepares dental students for clinical practice.

关键字: Anatomy education, Clinical competency, Dental curriculum, Pedagogy, Undergraduate dentistry

亚太 D-129-0003

Exploration and Practice of a Triadic Teacher-Student-Machine Pedagogical Model in Anatomy Education Integrating AI Teaching Assistants and Knowledge Graphs

Zhong-xin Guo, Xue-chao Jing, Shuang Xia, Ting-ting Chen, Lin Xu, Qiong-ying Deng, Guo-he Tan
(tanguohe@gxmu.edu.cn)

Department of Human Anatomy, School of Basic Medical Sciences, Guangxi Medical University, Nanning, Guangxi, China.

Objectives Anatomy, a foundational core course in medical education, serves as the introductory discipline for medical students. Traditional anatomy instruction primarily adopts a teacher-centered lecturing approach with passive student learning, resulting in limited teacher-student interaction and insufficient cultivation of students' autonomous learning and exploratory abilities. With the rapid advancement of technology, artificial intelligence (AI) has been widely integrated into medical education in China. Our anatomy department has explored and implemented an intelligent teaching model integrating AI teaching assistants and knowledge graphs, achieving significant educational outcomes.

Methods The teaching team developed a knowledge graph for anatomy curriculum design using the Chaoxing Fanya online platform. By integrating the DeepSeek large language model, an AI teaching assistant was implemented to establish a natural language-based "teacher-student-machine" interactive framework.

Results Knowledge Graph Construction: A visual representation of anatomical knowledge logic and conceptual relationships was created, integrating interdisciplinary resources from basic and clinical sciences to form a comprehensive knowledge network. AI Teaching Assistant Application: A dedicated AI agent for anatomy courses was developed, enhancing teaching efficiency, reducing faculty workload, and providing personalized learning recommendations based on individual student needs. Teaching Model Innovation: A "teacher-student-machine" collaborative teaching paradigm was established, demonstrating improvements in educational quality.

Conclusion The integration of AI teaching assistants and knowledge graphs effectively supports the development of an intelligent anatomy education model. This tripartite interaction framework



promotes active learning engagement and optimizes teaching outcomes, offering practical insights for medical education reform.

Key Words: Anatomy Education, AI Teaching Assistant, Knowledge Graph, "Teacher-Student-Machine" Teaching Model

● 亚太 D. Anatomical Education ● Poster

ID: 320649

Development of three-dimensional anatomy education contents: using extended reality, automatic organ segmentation and metaverse platform

Seung-Ho Han^{1,2} Deog-Im Kim² Sang Su Park² Kun Hwang^{2,3}
1.Department of Anatomy, College of Medicine, Ewha Womans University
2.Ewha Medical Academy, Ewha Womans University Seoul Hospital
3.Department of Plastic Surgery, Armed Forces Capital Hospital

Traditional anatomy methods have been supplanted by using digital models during a couple of years ago. This study aims to develop comprehensive 3D anatomy education contents using XR, deep learning, and metaverse platform. This approach is poised to position itself as a high-fidelity educational method in the future. A 3D scanning process reconstructed individual human bones from a cadaver into 3D images. Sixty PET/CT images from Ewha Womans University Hospital were used for human organ segmentation. Forty image sets were employed to train an AI model for automatic segmentation through deep learning, while the remaining 20 were utilized for validation and independent testing. The metaverse platform incorporated the reconstructed 3D images. The automatic segmentation model achieved an accuracy of 0.9311 for all target organs on a 10 PET/CT dataset. Maximum standardized uptake values averaged 0.23, while SUVmean differences were 0.138 for single volume of interest and 0.27 for organ contours. Individual human bones were uploaded to the metaverse platform, facilitating real-time collaboration with inter-user data synchronization through bone manipulation, color differentiation, and surface output. This XR offers a comprehensive 3D view of human anatomy, enabling users to interact with the view model from various angles. This provides users with a deeper understanding of anatomical relationships. It segmented more accurately for 4 human organs in nuclear medical imaging using deep learning than previous methods. These techniques can overcome the limitations of existing anatomy education and drive innovation in future anatomy education.

关键字: anatomy education, extended reality, metaverse, automatic segmentation, deep learning



亚太 D-129-0002

Application of a virtual simulation dissection platform in assisting dissection courses on the deep region of the lateral face

Liang Jie^{1,2}, Xu Xiangliang^{1,2}, Wang Diancan^{1,2}, Li Wei^{1,2}, Liu Xiaojing^{1,2}

1. Department of Oral and Maxillofacial Surgery, Peking University, School and Hospital of Stomatology, Beijing, 100081, CHINA
2. Oral and Maxillofacial Anatomy Laboratory, Peking University School and Hospital of Stomatology, Beijing 100081, CHINA

Corresponding author: Xu Xiangliang, kqxxl@126.com

Objective Deep region of the lateral face including complex regions such as pterygopalatine fossa and infratemporal fossa, remains as a challenge for students during the dissection course in head and neck anatomy. Due to the limited space and complex structure, students have difficulties in understanding the spatial relationship of the structures and may destroy the structure to be observed unintentionally. This study aims to develop a virtual simulation platform to assist the dissection course in the deep part of the face, and to verify the effect of applying this platform on improving the students' performance.

Methods The study was divided into two parts. First, to build a virtual dissection platform, which includes a refined three-dimensional model of the deep region of the face based on imaging data and gross specimens, and interactive virtual dissection modules of each dissection steps were designed, supplemented by standardized operation videos. Secondly, the 2020-2022 undergraduate students majoring in Stomatology were included as participants. Class of 2020 was set as the control group with traditional teaching process, while the 2021 and 2022 class were set as the experimental group, who use the virtual dissection platform before class. The effect of the platform was evaluated through baseline knowledge quiz, teachers' operation scores (degree of exposure, completion, and structure preservation), post-class quiz and questionnaires.

Results After the platform was launched, a total of 169 students and 447 operations were recorded, with an average usage time of 7.98 minutes per person. The accuracy of the pre-class test (significant difference, $*p < 0.05$), the independence of operation and the efficiency of experiment completion were significantly better than those in the control group. According to the questionnaire survey, 89.1% of the students felt that the platform helped to clarify the experimental procedures, 86.8% of the students improved their understanding of anatomical structures, and 81.9% of the students did not feel that the application of virtual platform increases their burden. However, some students reported that the platform took a long time to load and needed further optimization.

Conclusion The virtual simulation effectively significantly improves the students' cognition and performance during dissection class on deep region of the lateral face, and provides an innovative solution for the blended teaching mode for future dissection and anatomy courses.



● 亚太 D. Anatomical Education ● Abstract

亚太 D-129-0001

Exploration and practice of systematic anatomy teaching empowered by DeepSeek+AI

Zhang Xun, Zhan Suyang, Liu Man, Li Feifei, Sun Chongchong, Guo Fangzhen
Department of Morphology, Qingdao Huanghai University, Qingdao, China. zhangx03@qdhhc.edu.cn

Objectives The advancement of digital intelligence technology has brought transformation and challenges to education. This study aimed to explore innovative teaching models for systematic anatomy based on digital intelligence. By applying DeepSeek+AI-enabled teaching, we conducted a practical exploration in systematic anatomy teaching.

Methods A total of 243 nursing students from Qingdao Huanghai University were divided into the control group (n=121) and the experimental group (n=122) based on their class. With the informed consent of the students, the control group utilized an online learning platform for supplementary teaching, while the experimental group adopted the DeepSeek+AI-enabled teaching approach. A questionnaire survey was conducted to assess students' self-evaluated knowledge mastery, learning initiative, and satisfaction with the teaching model. Additionally, a one-way ANOVA was performed to analyze the students' comprehensive course scores.

Results The questionnaire results revealed that the experimental group scored significantly higher than the control group in both self-evaluated knowledge mastery and learning initiative ($P<0.05$). Furthermore, the experimental group's satisfaction score with the teaching model was 4.83, significantly higher than the control group's score of 4.57 ($P<0.05$). Comparative analysis of academic performance showed that the experimental group achieved a higher comprehensive score of 88.42 compared to the control group's 79.32 ($P<0.05$).

Conclusion DeepSeek+AI-enabled teaching effectively enhances students' learning initiative, broadens their knowledge base, and cultivates their capacity for lifelong learning. This approach is well-suited to adapt to the continuous innovations and evolving medical technologies in the future.

Key Words: Systematic Anatomy teaching; DeepSeek+AI; Digital Intelligence

Supported by Undergraduate Teaching Reform Research Project of Shandong (M2023167); 2024 Research Project of the Chinese Society of Educational Development Strategy Project (YB202430).



● 亚太 E. Bioanthropology ● Podium

ID: 318173

Macroscopic Study of the Facial Suture Closure – A Total Sum Score for Age Estimation in a Thai Population

Siriwat Thunyacharoen Pasuk Mahakkanukrauh
Anatomy Department, Faculty of Medicine, Chiang Mai University.

Objective Age estimation through skeletal analysis, particularly focusing on facial sutures, has been studied within a Thai population. Further exploration of this method could deepen our comprehension of skull structure and development, and offer clearer insights into the complex dynamics between suture closure and age.

Methods From 296 cadaver skull samples, 159 males and 137 females were evaluated for the degree of closure. The structure of facial sutures, especially ectocranial sutures must be observed clearly. Acsádi and Nemeskéri Scoring System and Frédéric Rating Scale have been applied to discriminate the age-at-death of the bilateral side of sphenoparietal, intermaxillary, internasal, frontonasal, sphenozygomatic, frontoethmoidal, sphenotemporal, frontomaxillary, zygomaticomaxillary, zygomaticotemporal and frontozygomatic suture.

Results A positive correlation occurred in males between total sum score and age in both classifications. However, Acsádi and Nemeskéri Scoring System is better than Frédéric Rating Scale classification.

Conclusion The findings of this study indicate that the closure of facial sutures serves as a dependable indicator of age. This research suggests that total score summation of sutural closing with the Acsádi and Nemeskéri Scoring System and Frédéric Rating Scale should be employed alongside other approaches. Additionally, further studies aimed at developing tailored methods for the Thai demographic may yield improved outcomes for age estimation.

关键字: Keywords: Age estimation, Facial suture Acsádi and Nemeskéri Scoring System, Frédéric Rating Scale, Thai population, Total sum score

ID: 320702

Risk Factors of Intracranial Aneurysm Recurrence after Endovascular Embolization Treatment

Lei Zhao¹ Si-xian Lin¹ Wen-wu Yang¹ Zhengyu Wang¹ Xiao-li Min¹ Rui Liao²
1.The Second Affiliated Hospital of Kunming Medical University
2.University Library, Kunming Medical University

Background IA is a common neurosurgical disease. Endovascular embolization treatment(EVT)is often used in clinic, but the recurrence rate is still high. We performed this meta-analysis to identify various potential risk factors for the recurrence of IA.

Methods We searched PubMed, Embase and the Cochrane Library with appropriate keywords to assess the risk factors for recurrence after endovascular embolization treatment of intracranial aneurysms. The quality of the included literature was assessed using the Newcastle-Ottawa Scale, and Stata17.0 was used to analyze the data.

Results A total of 10 literatures met the inclusion criteria after screening, all of which were retrospective case-control studies. In addition, The Newcastle-Ottawa Scale(NOS) scores of all 10



literatures were ≥ 6 . The results of meta-analysis showed that gender, age ≥ 65 years old, history of hypertension, history of diabetes, smoking history, aneurysms occurred in anterior or posterior circulation, relationship with parent artery, neck of aneurysm had no significant influence on the postoperative recurrence of intracranial aneurysm. Meanwhile, preoperative ruptured aneurysms, large aneurysms, aneurysms with coil embolization alone, and incomplete degree of embolization, as well as Hunt-Hess high grade showed statistically difference in postoperative recurrence events.

Conclusion 5 risk factors related to the recurrence of IA have been identified, which will help clinicians assess the likelihood of recurrent IA in patients and propose appropriate treatment options.

关键字：Intracranial Aneurysm, Meta-analysis, Recurrence, Risk Factor, Endovascular Embolization Treatment

亚太 E-129-0001

Study of Fingerprint phenotype and genotype in Han adults

Xilu Hu, Xiaotong Yu, Xiu Zhang, Fei Guo, Lei Yu Xu, Xinye Shen, Fu Ren
Shenyang Medical College
huxilu@symc.edu.cn

Objective Fingerprints are formed during the 13th to 18th weeks of the gestational cycle and will remain unchanged throughout life if there is no trauma. Numerous studies have substantiated that fingerprints are unique to each individual. No identical fingerprints can be found, but little is known about the mechanism behind the variation. Therefore, this study investigated fingerprint phenotypes and genotypes to explore the differences between populations and sexes and to reveal the mechanism that affects the occurrence of fingerprints.

Methods Fingerprints of 300 subjects were collected after their informed consent, and the level 1 and 2 features of fingerprints were obtained. DNA was extracted from peripheral venous blood for whole genome sequencing to conduct the genome-wide association study.

Results In the level 1 features, significant sex differences were observed across various patterns ($P < 0.05$), with the exception of arches. Furthermore, a statistically significant positive correlation ($P < 0.01$, $r > 0$) was identified in the distribution of loops and whorls among the fingers, especially between adjacent fingers. In the analysis of the distribution differences between genders in the level 2 features of fingerprints, the peripheral area of male fingerprints has the strongest correlation with the Hook. In contrast, female fingerprints have the strongest correlation with the Fragment. Through whole exome sequencing, four genes (ATP13A2, ABCA12, SYNE1, and POR) and nine SNP loci mutations were screened out, which were significantly associated with fingerprint patterns.

Conclusion The influence of fingerprint patterns still exists in the Han Chinese in Liaoning Province. There were significant gender differences in the distribution of detailed features. Four genes affecting human fingerprint phenotype were finally screened by whole exome sequencing: ATP13A2, ABCA12, SYNE1, and POR.

Keywords Association Study, Fingerprint, The level 2 features, Whole-exome sequencing



亚太 E-129-0003

EDMA-based studies of craniofacial phenotypes in *Igsf3* and *Usp40* double knockout mice

JieLi, Fu Ren
Shenyang Medical College
1463326384@qq.com

Objective Specific single nucleotide polymorphisms (SNPs) in the genes of *Igsf3* or *Usp40* and variations were associated with facial features, which were confirmed with single knockout mice of *Igsf3* or *Usp40* before. In this study, we constructed a double knockout mouse model of *Igsf3*^{-/-} and *Usp40*^{-/-}, measured and analyzed the cranial regions of the double knockout mice by Euclidean distance matrix analysis (EDMA) to

investigate the effects of *Igsf3* and *Usp40* on the craniofacial morphology of the mice.

Methods Male mice from five genotypic groups, including wild-type and various combinations of single and double knockouts, were analyzed at 8 weeks of age. Post-euthanasia, skulls were scanned using Micro-CT, and three-dimensional reconstructions were obtained. EDMA was employed to assess craniofacial differences across groups.

Results Significant morphological differences were observed in the nasal bone, cranial vault, zygomatic arches, and mandibles of double knockout mice compared to controls. Notably, the pyriform aperture exhibited reduced height and width, the parietal bones showed increased width and left-side lengthening, and the zygomatic arches were shortened with concavity on the left side. Mandibular analysis revealed a general reduction in size, with over 92% of linear measurements indicating shrinkage. Additionally, increased asymmetry was detected between the left and right zygomatic bones and mandibles in double knockout mice.

Conclusion These findings suggest that *Igsf3* and *Usp40* genes play critical roles in craniofacial development, influencing both size and symmetry of facial structures. The double knockout mouse model provides a valuable framework for further elucidating the genetic mechanisms underlying craniofacial morphogenesis.

Keywords: EDMA; double knockout; *Igsf3*; *Usp40*; craniofacial morphology

• 亚太 E. Bioanthropology • Poster

ID: 318182

Comparative study on the distribution of Pacinian corpuscles in the pancreas

Ke Ren Xiangquan Chen
Qu Jing Normal University

Objectives Pacinian corpuscles (PCs) are pressure- and vibration-sensitive mechanoreceptors found in hairless skin, external genitalia, joints, ligaments, lymph nodes, prostate, bladder, etc. The actual presence of PCs in the normal pancreas remains speculative.

Methods The present study therefore investigated the distribution of PCs in the normal human pancreas and compared the findings with those in several other animal species.

Results PCs were found in the pancreas of five human cadavers (n=74), one *Cynictis penicillata* (n=3), one *Saguinus mystax* (n=2) and one *Felis domesticus* (n=1) but not in *Suncus murinus*. The PCs varied in size, ranging from 0.2 to 0.7 mm. PCs in the pancreata of *C. penicillata*, *S. mystax*, and *F. domesticus* were more numerous and denser than those in the human pancreas, and they were mainly typical oval shapes, whereas PCs in the human pancreas were mostly irregular in shape. In addition, we found that PCs in animals and human pancreata had similar structures, with



consistent expression of protein gene product 9.5, in axonic profiles, and diffuse vimentin immunoreactivity in the inner core, outer core, and capsule.

Conclusion This study confirmed the existence of PCs in the pancreas of healthy humans and some animals. The number, distribution characteristics, and morphology of PCs in the pancreata of animals and humans are quite different; however, their structures and immunohistochemical profiles are similar.

关 键 字 : Pancreas, Pacinian corpuscles, vibration-sensitive mechanoreceptor, pressure mechanoreceptor, Cynictis penicillata, Saguinus mystaxs

亚太 E-129-0002

Association of SHBG Gene Polymorphism with Body Compositions in a Northern Population of China

Xiuhui Ma, Hua Ma, Mengyi Yang, Jing Zhang, Xi Wu, Zhenghao Huo, Zhanbing Ma, Jie Dang
School of Basic Medicine, Ningxia Medical University, Yinchuan, Ningxia, China djjune1978@126.com

Objectives Sex hormones critically regulate body composition. This study examines associations between SHBG gene polymorphisms (rs727428, rs3760213, rs6259) and 17 body composition parameters in Northern Chinese populations.

Methods Body composition metrics (BMI, LBM, FBM, BMR, etc.) were assessed via bioelectrical impedance analysis (BIA) in 828 college students (407 males, 421 females). Genotyping of SNPs from PBMC-derived DNA was performed using multiplex PCR. Associations were analyzed via one-way ANOVA (eta squared), with functional SNP predictions using FuncPred and SpliceAI-visual tools.

Results Males exhibited higher LBM, BMI, BMR, and bone mass ($P < 0.001$), while females had elevated FBM ($P < 0.001$). The AA genotype and allele A frequencies of rs3760213 and rs6259 were reduced in females ($P < 0.05$), with the T-A-A haplotype less prevalent in females ($P < 0.05$). rs3760213 and rs6259 AA genotypes correlated with increased FFMI, ECW, ICW, TBW, protein, SMM, SLM, and BMR versus AG/GG genotypes ($P < 0.01$). rs727428 showed marginal association with male BFM and VFA ($P < 0.05$). FuncPred linked rs3760213 to transcriptional regulation, while rs6259, though classified as benign, disrupted splicing elements (risk score: 54%).

Conclusion SHBG polymorphisms rs3760213 and rs6259 significantly influence LBM metrics. The AA genotype may optimize body composition by enhancing SHBG-mediated hormonal activity.

Key words: Body composition, Lean body mass, Fat mass, Sex hormone-binding globulin, Single nucleotide polymorphism

Ethics approval and consent to participate: All procedures performed in studies involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study is approved by the Ethics Committee of Ningxia Medical University (2022-G185), all participants provided written informed consent.

Funding: This work was supported by grants from the National Natural Science Foundation of China (32260218).



● 亚太 E. Bioanthropology ● Abstract

亚太 E-129-0004

The relationship between fat distribution and osteoporosis, sarcopenia, and osteosarcopenia in adults in Xinjiang, China.

Namuna Rousitmu, Youfeng Wen(wenyf@jzmu.edu.cn).
Institute of Biological Anthropology, Jinzhou Medical University, Jinzhou 121000, China;

Objective This study aimed to explore the relationship between osteoporosis (OP), sarcopenia (SP), osteosarcopenia (OS), and fat distribution—including trunk fat percentage (TFP), arm fat percentage (AFP), leg fat percentage (LFP), visceral fat mass (VAT), and lean body mass index (LMI) in adults from Xinjiang.

Methods In this cross-sectional study, adults over 18 years were categorized into four groups: normal, OP alone, SP alone, and OS. Body composition was assessed using bioelectrical impedance analysis (BIA). Associations between fat distribution indicators and OP, SP, and OS were examined using multiple logistic regression, with sex-specific analyses.

Results A total of 867 women and 355 men were included. Higher LMI was linked to lower odds of OP, SP, and OS. In men, higher TFP increased the risk of SP (OR=2.701) and OS (OR=2.558), while higher AFP was associated with reduced risks of SP (OR=0.315) and OS (OR = 0.445). In women, higher TFP was linked to increased odds of OP (OR= 0.734), and higher AFP was associated with a higher risk of OP (OR= 1.169). TFP, LFP, and VAT were positively associated with OS, while AFP was negatively associated with OS risk (OR= 0.706).

Conclusions In Xinjiang adults, higher LMI is protective against OP, SP, and OS. Fat distribution shows complex associations with these conditions, providing insights into the interplay between bone, fat, and muscle health.

Keywords: osteoporosis; sarcopenia; osteosarcopenia;

Ethics statement: Studies involving human subjects were reviewed and approved by the Ethics Committee of Jinzhou Medical University. Participants provided written informed consent to participate in the study.

Funding statement: This study was funded by the National Natural Science Foundation of China (NO.32171151).

亚太 E-129-0005

Body composition phenotypes and bone mineral density in plateau populations: A cluster analysis.

Wen(wenyf@jzmu.edu.cn.), Xin Li, Ting Huang, Shiping Ma, Jian Ma, Jin Huang, Liping Ye, Chunshan Li, Hailong Zhang, Qiuxi Zhang, Namuna Rousitemu. Institute of Biological Anthropology, Jinzhou Medical University, Jinzhou 121000, China; The First Affiliated Hospital of Jinzhou Medical University; Nagqu District People's Hospital.

The aim of this study was to use cluster analysis to examine phenotype categories of body composition assessed by lean mass and fat mass in plateau populations and to assess how these body composition categories are associated with bone mineral density (BMD). Methods: A total of 1356 participants from Lhasa, including 552 men and 804 women aged 18 years and above, were recruited. Measurements included height, grip strength, body composition (using bioelectrical impedance analysis), and BMD of the left calcaneus (using ultrasound densitometry). Results: A cluster analysis of the z scores for lean mass index and fat mass index identified five clusters for



women and four clusters for men. ANCOVA analysis revealed that, after controlling for age, clusters with a low lean mass index had significantly lower BMD levels compared to other clusters. Additionally, among women, those with a low lean mass index but an average or high fat mass index exhibited better BMD levels than those with a low fat mass index ($p < 0.05$). Also, we found that the phenotype of High lean mass - high adiposity had the lowest relative risk of osteopenia. Conclusion: This study emphasizes the positive role of adipose tissue in bone health among plateau populations. In females with low lean mass, high levels of fat seem to offset the negative impacts of low lean mass, thereby protecting bone health. Therefore, maintaining lean mass and fat reserves is crucial for the bone health of plateau populations.

Key Words: Body Composition Phenotypes, Bone Mineral Density, Fat Mass, Lean Mass.

The study protocol was approved by The Ethics Committee of Jinzhou Medical University and complied with the principles of the Declaration of Helsinki. All participants read and signed the informed consent form as a condition to participate in the study.

This study was funded by the National Natural Science Foundation of China (NO.31571233)

● 亚太 F1. Applied Anatomy: Innovation and Convergence ● Podium

ID: 311550

Schematics and Comics in a Regional Anatomy Book

Min Suk Chung
Ajou University School of Medicine

The author has done board lecture rather than slide lecture; no artistic talent results in schematics, which makes it easy to explain human body. The schematics motivated the author to draw comics containing mnemonics and humors of anatomy. The author has elaborated a regional anatomy book, full of schematics and comics to make regional anatomy easy and comfortable. Such application of schematics and comics is disclosed to suggest other anatomists to create their own schematics and comics.

The regional anatomy book contained 374 schematics and 242 comics. As the schematics, the muscles are drawn as arrows; the cavernous sinus and tympanic cavity are drawn as opened boxes; the pericardium, pleura, peritoneum are drawn as simple balloons. The comics deal with mnemonics of anatomy, surface anatomy, meanings of anatomical structures, and humors of anatomy. To assess the book's learning effects, students in medical schools in Korea were invited to volunteer after explanation.

Students who read the regional anatomy book remarked on the strong and weak points of schematics. A strong point is that students can redraw the schematics to enhance memorization. Students also remarked on the strong and weak points of comics. A strong point is that intermittent humors relieve the boredom. The regional anatomy book (PDF file) is obtainable (anatomy.co.kr) without payment or registration.

Every anatomist can draw one's own schematics and comics to create extraordinary learning materials, which will contribute to anatomy education.

关键字: Artistic anatomy, Cartoons, Humor, Medical education, Questionnaires



ID: 317890

Research Trends and Key Areas in Virus and Gastrointestinal Mucosal Immunity: A Bibliometric Study Spanning Four Decades

YU CAI¹ Jingqi Liu²

1. School of Basic Medical Sciences, Shenzhen University Medical School
2. School of Dentistry, Shenzhen University Medical School, Shenzhen 518055, China.

Objective The interplay between viruses and gastrointestinal (GI) mucosal immunity has garnered growing interest over the past 40 years, driven by recurring viral outbreaks. This study employs bibliometric analysis to evaluate the current state, major trends, and future prospects of research in this domain.

Methods Data were collected from the Web of Science Core Collection (WoSCC) on January 6, 2025. Tools such as VOSviewer, Citespace, and the Bibliometrix R package were used to analyze publication trends, countries, institutions, authors, journals, keywords, and citation patterns. Results: The analysis included 4,842 articles published between January 1, 1985, and December 31, 2024, with an annual growth rate of 8.65%. The United States led globally, accounting for 38.54% of publications, with the University of California as the top institution (32.42% of U.S. output). Dandekar S emerged as the most productive author. Analyses of co-citation clusters, keyword groupings, and citation bursts underscored foundational HIV research, alongside growing interest in human papillomavirus (HPV), influenza, gut microbiota, and inflammatory bowel disease (IBD). Recent hotspots focused on SARS-CoV-2 and the gut microbiome. Key areas of ongoing interest included HIV pathogenesis and antiretroviral therapy (ART), HPV-related disease prevention and detection, and the gut microbiome's role in antiviral immunity, IBD development, and prognosis.

Conclusion This bibliometric analysis illuminates insights into research trends and emerging hotspots in the field of viruses and GI mucosal immunity, offering valuable guidance for future research priorities.

关键字: Gastrointestinal tract; Mucosal immunity; Virus; HIV; Trends.

ID: 318169

Image Analysis Approach for Sex Determination Using Lumbar Vertebrae in a Thai Population: A Pilot Study

Nur Mujaddidah Mochtar^{1,2} Patison Palee² Phruksachat Singsuwan² Apichat Sinthubua² Tawachai Monum²
Pasuk Mahakkanukrauh²

1. Muhammadiyah Surabaya University
2. Chiang Mai University

Objective Estimating sex is essential to develop methods that provide the highest allocation accuracy. Image analysis offers a rapid approach for estimating sex. This study aims to estimate sex using lumbar vertebrae with image analysis.

Methods Dry bone samples consisting of normal and complete lumbar vertebrae were obtained from the Osteology Research and Training Center, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand. We randomly selected samples from 50 Thai individuals. The vertebrae were placed on a bone-standing support device and positioned for photography from six views: left lateral, posterior, right lateral, anterior, superior, and inferior. For image analysis and deep learning, the vertebral body of the superior view of the lumbar vertebrae that had the largest area was cropped



using Photoshop and processed into HSV images to analyze porosity. We then used the processed images to train a deep learning model.

Results The results showed an accuracy of 60.0% for sex determination with image analysis.

Conclusion Image analysis demonstrated accuracy in determining sex, reducing subjectivity and errors in measurement. This study presented an alternative approach to determining sex using lumbar vertebrae, particularly when skeletal elements are incomplete or absent.

The Committee on Research Ethics at Chiang Mai University's Faculty of Medicine authorized this study (Research ID: ANA-2567-0517). Supported by the Faculty of Medicine Graduate Student Scholarship, Chiang Mai University.

关键字: sex determination, lumbar vertebrae, image analysis

● 亚太 F1. Applied Anatomy: Innovation and Convergence ● Poster

ID: 317994

Sex determination of medial clavicle using histomorphology with Artificial Intelligence in a Thai population

Kewalee Pichetpan

Department of Anatomy, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

Objective This study aims to investigate histomorphology techniques for identifying sex-related differences using histological images.

Methods This study utilized medial clavicle samples with known sex, age, and cause of death from 46 Thai cadavers (30 male, 16 female). The ages of the individuals ranged from 20 to 92 years. Cortical bone sections were decalcified using nitric acid solutions for 7-10 days, followed by histological processing and staining with hematoxylin and eosin (H&E). Digitized images were acquired using an Olympus AX70 digital camera equipped with DP controller software. Damaged tissues were excluded from the analysis, and all images were stored as digital TIFF files. All histology images were used to train models for identifying sex-related differences in MATLAB software. The training dataset consisted of 480 standardized images. The model's performance was evaluated based on accuracy, with transfer learning yielding the best results.

Results This study employed transfer learning in smart computing to identify sex-related differences using medial clavicle images. The top-performing training model was subsequently utilized to evaluate a validation dataset, yielding the following accuracy results: Model 1: 79.17%; Model 2: 76.39%; Model 3: 72.22%.

Conclusion Histological images highlight the forensic potential of smart computing for identifying sex-related differences. This research provides a framework for future advancements in sex determination related to the medial clavicle using microscopic imaging techniques.

关键字: histomorphology, medial clavicle, sex, transfer learning



● 亚太 F1. Applied Anatomy: Innovation and Convergence ● Abstract

亚太 F1-129-0001

Research Trends and Key Areas in Virus and Gastrointestinal Mucosal Immunity: A Bibliometric Study Spanning Four Decades

Yu Cai1#, Jingqi Liu2#, Ou Sha1*

1 School of Basic Medical Sciences, Shenzhen University Medical School, Shenzhen 518055, China.

2 School of Dentistry, Shenzhen University Medical School, Shenzhen 518055, China.

* Correspondence: Ou Sha, email: shaou@szu.edu.cn

Objective The interplay between viruses and gastrointestinal (GI) mucosal immunity has garnered growing interest over the past 40 years, driven by recurring viral outbreaks. This study employs bibliometric analysis to evaluate the current state, major trends, and future prospects of research in this domain.

Methods Data were collected from the Web of Science Core Collection (WoSCC) on January 6, 2025. Tools such as VOSviewer, Citespace, and the Bibliometrix R package were used to analyze publication trends, countries, institutions, authors, journals, keywords, and citation patterns.

Results The analysis included 4,842 articles published between January 1, 1985, and December 31, 2024, with an annual growth rate of 8.65%. The United States led globally, accounting for 38.54% of publications, with the University of California as the top institution (32.42% of U.S. output). Dandekar S emerged as the most productive author. Analyses of co-citation clusters, keyword groupings, and citation bursts underscored foundational HIV research, alongside growing interest in human papillomavirus (HPV), influenza, gut microbiota, and inflammatory bowel disease (IBD). Recent hotspots focused on SARS-CoV-2 and the gut microbiome. Key areas of ongoing interest included HIV pathogenesis and antiretroviral therapy (ART), HPV-related disease prevention and detection, and the gut microbiome's role in antiviral immunity, IBD development, and prognosis.

Conclusion This bibliometric analysis illuminates insights into research trends and emerging hotspots in the field of viruses and GI mucosal immunity, offering valuable guidance for future research priorities.

Keywords: Gastrointestinal tract; Mucosal immunity; Virus; HIV; Trends.

Financial support and sponsorship: This study was financially supported by the Fundamental Research Fund of Science and Technology Foundation of Shenzhen City (Key program JCYJ20220818095811026).

Ethics statement: Ethics approval was not required for this article.



亚太 F1-129-0002

Comparative Analysis of Acupoint Locations Between Humans and Rats: Bridging Traditional Chinese Medicine with Modern Experimental Research Abstract

马爱荣
上海交通大学医学院

This study systematically compares the anatomical locations of 10 traditional acupoints between humans and rats to bridge the gap between Traditional Chinese Medicine (TCM) and modern experimental research. Using a combination of traditional research and dissection techniques, we examined the anatomical positions of Zhongwan (CV12), Tianshu (ST25), Zusanli (ST36), Sanyinjiao (SP6), Shaohai (HT3), Shenmen (HT7), Huantiao (GB30), Quchi (LI11), Zhaohai (KI6), and Tianshu (L&R) (ST25) across human cadavers and rat models. Our findings confirmed that certain acupoints, such as Zusanli (ST36) and Sanyinjiao (SP6), exhibit remarkable anatomical consistency across species, suggesting their reliability as targets for cross-species acupuncture research. However, significant anatomical differences were observed at other acupoints, such as Zhongwan (CV12) and Tianshu (ST25), particularly in their underlying neural and vascular structures, which may influence acupuncture's physiological effects and therapeutic efficacy. Additionally, we found that the physiological response to acupoint stimulation varied between species, with notable differences in gastrointestinal motility and neural activation. The operational challenges associated with stimulating acupoints in rat models, due to their smaller size and different anatomical proportions, were addressed using specialized tools and techniques. This research led to the development of a comprehensive inter-species acupoint map, providing a valuable resource for both researchers and practitioners. These findings underscore the need for a more nuanced approach in cross-species acupuncture studies and highlight the importance of refining research methodologies to account for anatomical and physiological differences between species. This work lays the groundwork for future studies aimed at better understanding the mechanisms and therapeutic potentials of acupuncture, with implications for both experimental and clinical practices.

● 亚太 F2. Innovative Techniques for Anatomical Science ● Podium

ID: 318307

Creation and Usage of Innovative Methodologies to Create 3D Models for Anatomy Teaching and Learning

Suresh Selvaraj Tarek Abdelkader
Singapore Institute of Technology, Singapore

Objectives New technologies that encourage active learning are increasingly used to supplement teaching. Creating 3D anatomical models actively engaging students in self-learning. This study aims to evaluate the effectiveness of these 3D models in enhancing the anatomy learning experience for allied healthcare students.

Methods To construct the 3D models, we used the Polycam app to capture overlapping images, which were then processed through algorithms to create accurate digital 3D models. These models were refined in Blender, labeled in Sketchfab, and linked with QR codes. The codes and links were distributed to the students.



We recruited 200 Allied Health Sciences students. A pre-exposure questionnaire was administered before they accessed the 3D models, followed by a post-exposure questionnaire and a qualitative feedback form. Both pre and post exposure questionnaires asked from same region with same level of depth. The QR codes enabled tracking of Webapp usage and focus areas on gross anatomy.

Results Pre-exposure questionnaire results showed an average score of 56%, which improved to 74% after using the 3D models, indicating significant learning enhancement. QR-coded 3D images positively impacted students' understanding in Human Gross Anatomy modules.

Qualitative feedback revealed that participants found the webapp helpful for better anatomy comprehension and grade improvement, with 58% rating the user experience between 7-10, 35% between 4-6, and 7% between 1-3.

Conclusion 3D images of platinated specimens created with mobile phone application enhanced the anatomy learning experience among the allied health science students.

关键字：3D anatomical models, Anatomy learning, mobile application, platinated specimen

ID: 320470

Integrating 3D Printing and Multimodal AI in Anatomical Education: A Paradigm Shift through Intelligent System Development

Xiaotong Li Airon Ma Yan Wo
Shanghai Jiaotong University School of Medicine

Objectives Anatomical education faces persistent challenges with traditional methods. This study aimed to evaluate the impact of integrating 3D printing into osteology teaching and develop AI-enhanced educational tools to advance pedagogical innovation.

Methods A randomized trial included 60 undergraduates from Shanghai Jiao Tong University. The experimental group (n=55) engaged in 3D model creation via scanning, digital refinement, and printing, while the control group (n=55) received 2D atlas-based lectures. Concurrently, a proprietary "Naked-eye 3D Layered Teaching System" and a "Multimodal AI Tutor" platform were developed.

Results The 3D group outperformed the control group in written tests (69.60 ± 6.64 vs. 65.16 ± 8.77), specimen identification (16.73 ± 2.23 vs. 15.67 ± 2.30), and total scores (86.18 ± 8.13 vs. 80.80 ± 10.44) ($P < 0.05$). Over 90% of students reported enhanced spatial cognition and interdisciplinary skills. The AI-integrated systems demonstrated scalable potential for immersive learning.

Conclusion 3D printing combined with multimodal AI tools significantly enhances anatomical education outcomes. Establishing national standards for AI-assisted teaching is critical to standardize innovation and propel anatomy into an AI-driven future.

关键字：hands-on 3D printing, osteology teaching, Naked-eye 3D Layered Teaching System, Multimodal AI Tutor



亚太 F2-129-0001

Visualizing spatiotemporal pattern of vascularization by SWIR fluorescence imaging of perforator flap transplantation

冯思嘉
复旦大学附属华山医院

Vascularization as a spatiotemporally interlaced process involving angiogenesis and vascular remodeling, has seldom been investigated comprehensively regarding the interrelationship of the two intertwining but sequential processes. Here, a shortwave infrared (SWIR) fluorescence imaging strategy based on quantum dots (QDs) was designed to dynamically visualize vascularization in vivo and in situ in a perforator transplantation mouse model. The vascularization process could be directly perceived from the established flap model with an optimal observation window at 10 min post-injection. Anchored in SWIR technology and image processing, it was revealed that temporally, angiogenesis lasted throughout 21 days after surgery while vascular remodeling took a dominant role after 14 days both in vivo and in situ. Moreover, four perforasomes of the flap in situ displayed spatially that Zone IV shortened the vascularization process with sufficient blood supply from the LDCIA, while Zone II recovered slowly from ischemia with a lack of blood supply. This study serves as a pioneer in adding novel cognition to spatiotemporal pattern of vascularization through visualizing angiogenesis and vascular remodeling simultaneously and dynamically, thus facilitating further investigation into the mechanisms behind.

亚太 F2-129-0002

Application of augmented reality technology in skull base and cerebrovascular surgery

GUO Yi-ding, ZHANG Pei-hai, YANG Xue-jun, GUO Yi
Department of Radiology, Beijing Tsinghua Changgung Hospital, Medical Center of Tsinghua University, Beijing, 102218, China
Corresponding author: GUO Yi (Email: gua01246@btch.edu.cn)

Objectives Neurosurgery developed rapidly with technology advancing. The concept of intelligent/digital neurosurgery becomes mature and Augmented Reality (AR) technology shows great potential in future neurosurgical operations. The feasibility and applicability of AR technology is currently the most important topic in clinical research.

Methods Four patients engaged from Jan. to Dec. 2024 in Neurosurgical Department of Beijing Tsinghua Changgung Hospital with vestibular schwannoma ($n = 1$), intracranial aneurysm ($n = 2$) and subclavian artery occlusion ($n = 1$) have been conducted tumor resection, aneurysm clipping and Common Carotid Artery (CCA) - Subclavian (SA) bypass, respectively. Using presurgical imaging data-based AR reconstruction on the HoloLens 2 platform, presurgical planning, surgical simulation, and intraoperative display were conducted. These were then compared with surgical practices and postoperative imaging data to qualitatively evaluate their effectiveness in assisting neurosurgery. Informed consent was obtained from all subjects involved in the study.

Results All cases were accepted surgery successfully, with presurgical AR-assisted surgical plan and simulation and intraoperative image projection on the surface of patient, fully replicated the key surgical steps, and modified the surgical approach.

Conclusion The application of AR technology in neurosurgical procedures allows for preoperative surgical planning, simulation, and intraoperative guidance. It aids young surgeons in quickly



understanding complex anatomical structures and shortens the learning curve, holding significant clinical value and promising application prospects.

Key words: Augmented reality; Skull base neoplasms; Intracranial aneurysm; Neurosurgical procedures

Ethics statement: The studies involving humans were approved by Beijing Tsinghua Changgung Hospital Institutional Review Board (24209-4-02)

This study was supported by the National Natural Science Foundation of China (No. U20A20389), Institute for Intelligent Healthcare, Tsinghua University (No.2022ZLB007) and Beijing Tsinghua Changgung Hospital (IIT program, No. 12024Z01017).

亚太 F2-129-0003

The mechanism of mitochondrial transfer in immune B cells to regulate Alzheimer's disease.

Ting-Hua Wang¹, Ning Bi¹, Lu-Lu Xue², Ya-Qi Yang³, Liu-Lin Xiong⁴

¹Institute of Neuroscience, Kunming Medical University, 1168 West Chunrong Road, Kunming 650500, Yunnan, China, wangtinghua@vip.163.com;

²State Key Laboratory of Biotherapy, Sichuan University, 17 Section 3 South Renmin Road, Chengdu 610041, Sichuan, China;

³Institute of Neuroscience, Kunming Medical University, 1168 West Chunrong Road, Kunming 650500, Yunnan, China;

⁴State Key Laboratory of Biotherapy, Sichuan University, 17 Section 3 South Renmin Road, Chengdu 610041, Sichuan, China.

Objectives This study explored whether B cells from young mice mitigate Alzheimer's disease (AD) pathology by transferring functional mitochondria and regulating neuronal cell cycles, offering insights into immune-metabolic therapies for AD.

Methods B cells were isolated from young (2-month-old), old (12-month-old), and APP/PS1 transgenic mice via magnetic bead sorting. Secreted protein profiles were analyzed using 4D-DIA proteomics. Aβ-damaged HT22 cells and primary hippocampal neurons were co-cultured with B cells. Neuronal recovery was assessed via immunofluorescence, RT-qPCR, JC-1 mitochondrial membrane potential assays, and reactive oxygen species (ROS) detection. APP/PS1 mice received tail vein B cell transplants (1×10^6 cells/mouse), with cognitive outcomes evaluated through Morris water maze, Y maze, and open field tests.

Results (1) Young B cells secreted structurally intact, metabolically active mitochondria (confirmed via electron microscopy and ATP assays). (2) Co-culture with Aβ-damaged neurons demonstrated mitochondrial engulfment, restoring membrane potential and reducing ROS. (3) Young B cells downregulated p21, p53, and p16, suppressing abnormal neuronal cell cycle activation. (4) Transplanted young B cells improved spatial memory and novel-arm exploration in APP/PS1 mice (Y maze) but did not affect spontaneous activity.

Conclusion Young B cells releasing mitochondria alleviate AD pathology by transferring mitochondria to restore neuronal energy metabolism and modulating cell cycle protein expression. This dual mechanism highlights B cell-based immunoregulation as a novel therapeutic strategy for AD.

Key words: Alzheimer's disease; B cells; cell cycle regulation; mitochondrial transfer; oxidative stress.

Ethical Approval: The animal study protocol was legally approved by the Animal Care & Welfare committee of Kunming Medical University with the approval number: kmmu20231650 (mouse). Our study examined male and female animals, and similar findings are reported for both sexes.

Funding information

This study was supported by the Wang Wenyuan Expert Workstation Project of Yunnan Provincial Science and Technology Talent and Platform Program (202205AF150013).



● 亚太 F3. Promise and Challenges of Future Anatomical Science ● Podium

亚太 F3-129-0001

Effect of Glasgow Coma Scale Score in Patients with Acute Respiratory Distress Syndrome

Qimei Wei^{1,2}, Guanghui Xiu^{1,2*}

¹Department of Intensive Care Unit, the Affiliated Hospital of Yunnan University (the Second People's Hospital of Yunnan Province), Yunnan University, Kunming, Yunnan Province, China

²School of Clinical Medicine, Dali University, Dali, Yunnan Province, China

Correspondence to Guanghui Xiu, No. 176 Qingnian Road, Wuhua District, Kunming City 650021, Yunnan Province, China, Email: ray-xiu @163.com.

Objectives To determine the effect of the Glasgow Coma Scale (GCS) score on 28-day mortality in patients with acute respiratory distress syndrome (ARDS).

Methods ARDS patients were enrolled from the eICU-CRD and stratified into survival and death groups based on 28-day survival. The primary predictor was the GCS score, which incorporates component scores for eyes, verbal, and motor responses, and a severity score (mild: 13-15, moderate: 9-12, severe: 3-8). A binary logistic regression model was developed using a random allocation of 2/3 patients as the modelling group and the remaining 1/3 as the internal validation group, and our model was externally validated using data from the Affiliated Hospital of Yunnan University.

Results A total of 10,371 patients met the eligibility criteria, with a 28-day mortality rate of 27.4%. Our risk prediction model incorporated 12 variables, and the AUC for discrimination in the modeling, internal validation and external validation groups was 0.81 (95% CI, 0.79-0.82), 0.80 (95% CI, 0.78-0.81) and 0.80 (95% CI, 0.71-0.88), respectively, indicating favorable discrimination and calibration (Hosmer-Lemeshow $P=0.466$).

Conclusions Our study revealed that the individual components of the GCS (verbal, eyes, motor) and the severity score (mild, moderate, severe) demonstrated comparable predictive effects to the total GCS score.

Key words: Glasgow Coma Scale Score; Encephalopathy; Acute Respiratory Distress Syndrome; Artificial Intelligence.

Funding

This study was endowed by Young and Middle-aged Academic and Technical Talents of Yunnan Province (202405AC350044), Yunnan Health Training Project of High Level Talents (D-2024003), Yunnan University Donglu Talent Young Scholar.

Ethics approval

The study received ethical approval from the Institutional Review Board of the Affiliated Hospital of Yunnan University, and a waiver of informed consent was included in the approval as unused identified health information.



● 中 A -人类学 ● Podium

中 A-129-0007

汉族人脸三维数字化测量及表型特征研究

乔辉 谭婧泽 (jztan@fudan.edu.cn) 复旦大学现代人类学教育部重点实验室 复旦大学生命科学学院人类遗传学与人类学系 上海 200438

本研究采用 GFM FaceScan 三维成像系统，对河南郑州、江苏泰州和广西南宁三个地区的汉族人群开展三维人脸图像扫描，共获取完整的三维人脸图像 2,379 例，基于人脸三维模型特点手动标定了 26 个标志点，并基于这 26 个标志点提取获得表型优先类表型（包括标志点空间位置、标志点曲率、欧式距离、测地线距离、曼哈顿距离、指数、角度、三角形面积、多边形体积、多边形表面积等）和数据驱动类表型（包括区块主成分、区块表面积、区块高斯曲率莫兰指数、区块均值曲率莫兰指数、区块 Z 坐标莫兰指数等）共 15 大类，共计提取到 14,838 个三维人脸表型数据。通过多元统计分析，发现 15 大表型之间都存在广泛的相关性，在性别、年龄、地区、身高、体重和 BMI 等基础信息上都存在显著差异，而且表型优先表型比数据驱动表型解释了更多的面部变异。分析还发现汉族人群可区分为北部（郑州）、中部（泰州）和南部（南宁）三个聚类，中部地区汉族的面部形态特征介于北部和南部之间，而这一聚类模式与基于遗传数据的分析结果具有很强的一致性，从三维人脸表型上进一步证实汉族群体确实存在北部、中部和南部的地区差异。

中 A-129-0009

中国健康人群和阿尔兹海默病患者头面部表型差异下潜在的遗传变异

卢政达 张兴华 张玉岭 程智 (chengzhi@tjnu.edu.cn) 天津师范大学生命科学学院
天津市动物多样性保护与利用重点实验室 天津 300387 天津市北辰中医医院

面部形态作为人类外貌的显著特征，与神经系统疾病高度关联。本研究旨在探究面部形态和阿尔兹海默病（AD）之间的联系，从而为疾病的早期诊断和治疗提供新的思路。我们使用直脚规和弯脚规分别测量了 35 例 AD 患者和 35 位健康人的头面部数据。通过测量，我们获得了 17 个位于头面部的直接参数和 1 个间接参数。为了进一步调查头面部形态变化后的分子机制，我们对 4 月龄 5xFAD 小鼠进行了面部组织的 mRNA 测序。形态学分析证实了在年龄相匹配的阿尔兹海默病患者与健康人间，阿尔兹海默病患者的唇高下降，鼻宽升高 ($p < 0.05$)，且在 5xFAD 小鼠上也出现了这种变化。切片结果显示 5xFAD 小鼠的表皮组织细胞存在明显的损伤。转录组数据证实，AD 模型小鼠的表皮功能相关基因存在差异性表达。综上所述我们发现，头面部形态的变化，特别是唇高和鼻宽，与 AD 的发病密切相关，这为阿尔兹海默病的风险预测和治疗提供了更多可能。



中 A-129-0013

中国西北地区 12 个族群 Heath-Carter 法体型特征

李兆航 1, 韩瑗 1, 希露格 1, 白昀 1, 李咏兰 1,2

(1. 内蒙古师范大学 生命科学与技术学院, 呼和浩特 010022; 2. 内蒙古自治区高等学校生物多样性保护与可持续利用重点实验室, 呼和浩特 010022)

采用 Heath-Carter 法研究中国西北民族的体型特征, 对西北地区 12 个族群共 6455 例(男性 2895 例, 女性 3560 例)成人的体质量、身高等 10 项指标值进行了测量, 计算内因子、中因子和外因子值, 并与国内 9 个族群进行比较。结果表明: ①西北地区 12 个族群中男性有超过一般的为偏内胚层的中胚层体型, 女性有超过三分之一的为偏中胚层的内胚层体型。②12 个族群中, 河南县蒙古族肌肉和骨骼最发达, 哈萨克族、裕固族脂肪丰富、肌肉和骨骼欠发达, 保安族体脂率最低、身材苗条, 回族与汉族体型最接近。③从合计体型看, 西北民族男性属于偏内胚层的中胚层体型, 女性属于偏中胚层的内胚层体型。男、女性身高、外因子与年龄呈负相关, 中因子与年龄呈正相关。男、女性各项体型指标值年龄组间差异均具有统计学意义。④在 11 个族群中, 西北民族的体脂率高, 肌肉和骨骼发达, 身体线性程度小, 其体型与蒙古族和羌族更接近。

中 A-129-0019

藏汉青少年人群血压与肠道菌群及代谢组相关分析

靳子冲, 毛亚琪, 胡烨, 司梦涵, 王士伟, 贺鹏文, 康龙丽*

(西藏民族大学医学院; 西藏民族大学高原相关疾病分子遗传机制与干预研究省级重点实验室; 环境与疾病相关基因研究高校重点实验室, 咸阳 712082)

目的: 探讨藏族与汉族青少年人群之间血压差异, 结合宏基因组学和代谢组学分析, 探索其潜在机制。方法: 本研究纳入藏汉青少年受试者, 对受试者进行血压检查, 采集粪便样本进行肠道宏基因组测序及其代谢物检测。受试者根据血压水平分为正常血压组 (C, Control) 和高血压前期组 (pHTN, Prehypertension)。结果: 1. 藏族与汉族青少年 pHTN 组的收缩压 (SBP) 和舒张压 (DBP) 均显著高于 C 组 ($P < 0.001$), 并且藏族青少年总体血压水平低于汉族相应群体 ($P < 0.001$)。2. 藏族人群的 α 多样性高于汉族人群 ($P < 0.05$), β 多样性显示两民族的肠道菌群结构存在显著分层。藏族青少年中主要富集厚壁菌门 (Firmicutes)、放线菌门 (Actinobacteria)、拟杆菌门 (Bacteroidetes)、变形菌门 (Proteobacteria)、疣微菌门 (Verrucomicrobia), 汉族青少年中变形菌门富集程度更高, 且汉族 pHTN 组中大肠杆菌属 (Escherichia) 丰度增加, 双歧杆菌属 (Bifidobacterium) 显著减少。此外, 藏族青少年的厚壁菌门/拟杆菌门比值 (F/B 比值) 较高于汉族。3. 定量代谢组分析表明, 短链脂肪酸 (SCFAs) 如异丁酸 ($P < 0.01$)、甲基丁酸 ($P < 0.01$) 和戊酸 ($P < 0.01$) 等在藏族青少年中水平高于汉族青少年。结论: 藏汉两民族青少年人群在菌群组成、代谢功能上存在显著差异, 肠道菌群及其代谢产物在血压调控中可能发挥重要作用。

【关键词】 血压; 肠道微生物; 短链脂肪酸



中 C-129-0004

高原藏族全基因组线粒体分析：进一步探索母系遗传结构

李欣 (lixinjzmu@163.com) 温有锋 锦州医科大学生物人类研究所 锦州 121000

青藏高原作为地球上最后被现代人类征服的极端陆地环境之一，其原住民藏族为解析高原适应性演化提供了关键研究对象。本研究基于 145 名无亲缘关系的拉萨藏族人群的线粒体全基因组数据，首次系统构建了藏族母系遗传精细谱系，并联合 107 个东亚对照群体开展多维度遗传结构解析。研究通过分子多样性指数 (haplotype diversity)、中性检验统计量 (Tajima's D, Fu's Fs) 及贝叶斯天际线分析 (Bayesian Skyline Plot)，揭示了藏族母系遗传动态；进一步整合主成分分析 (PCA)、多维尺度法 (MDS)、群体分化指数 (Fst) 与最大似然系统发育树，阐明了藏族在东亚族群中的遗传定位。藏族人群的母系遗传图谱显示出明显的东亚特征，其中 M9a (28.28%)、R (11.03%)、F1 (12.41%)、D4 (9.66%)、N (6.21%) 和 M62 (4.14%) 为主要单倍群。PCA、MDS、Fst 和系统发育树的结果一致表明：拉萨藏族人与其他高原藏缅语族人群聚为一类，西藏藏族人群存在明显的遗传同质性，同时发现藏族人与北方汉族人和地理相邻种群之间存在遗传相似性。本研究进一步揭示了青藏高原母系遗传的长期连续性，以及藏族与黄河流域粟作人群之间的遗传关系，为理解西藏藏族的母系遗传特征及其历史演化提供了重要参考。

中 C-129-0005

甘肃藏族成人的超重与肥胖

白静雅(461623796@qq.com) 海向军 马斌 欧阳思维 西北民族大学医学部人体解剖学教研室 兰州 730030

探讨甘肃藏族成人超重与肥胖现状。方法 采用随机整群法，抽取 20-80 岁甘肃藏族成人 754 例(男 350 例，女 404 例)为研究对象。使用人体测高仪和生物电阻抗分析仪，获得身体质量指数 (Body mass index, BMI)和体脂肪率数据，分析甘肃藏族成人超重与肥胖现状。依据中国肥胖问题工作组标准判定超重与肥胖 (超重: $24.0 \leq \text{BMI} < 28.0 \text{ kg/m}^2$; 肥胖: $\text{BMI} \geq 28 \text{ kg/m}^2$)，并根据体脂率标准 (男性 $> 25\%$ ，女性 $> 35\%$) 判断肥胖。甘肃藏族男性 BMI 均值为 23.35，女性为 22.89，均属正常范围。超重肥胖率在不同年龄段的分布特点为：20-29 岁 (男 21.57%，女 7.55%)，30-39 岁 (男 49.25%，女 26.76%)，40-49 岁 (男 62.16%，女 34.95%)，50-59 岁 (男 45.31%，女 39.80%)，60-69 岁 (男 39.34%，女 41.67%)，70-80 岁 (男 31.25%，女 54.84%)。甘肃藏族男性体脂率均值为 19.97%，女性为 31.05%，均属正常范围。体脂率在不同年龄段的分布特点为：20-29 岁 (男 15.69%，女 3.77%)，30-39 岁 (男 41.79%，女 19.72%)，40-49 岁 (男 47.30%，女 26.21%)；50-59 岁 (男 29.69%，女 37.76%)，60-69 岁 (男 39.34%，女 37.50%)，70-80 岁 (男 34.38%，女 58.06%)。甘肃藏族成人 BMI 和体脂率均值在正常范围内。超重肥胖率和体脂肪率均呈现男性在 40-49 岁，女性在 70-80 岁最高。



中 A-129-0011

利手在中国北方人群中的分布特征及其 Meta 分析

马秀慧 马华 杨梦怡 党洁 (djune1978@126.com) 宁夏医科大学基础医学院 宁夏 750000

利手作为人类典型不对称行为特征，与大脑偏侧化发育密切相关。既往研究多基于欧洲人群数据，且其遗传机制长期存在争议（单基因假说 vs 多基因模型）。为验证理论在东亚人群的适用性，本研究以中国北方健康群体为基线，联合精神分裂症患者（偏侧化异常群体）开展对比研究。通过 Meta 分析（纳入 69 项研究）与横断面调查（健康人群 3,716 例，患者 250 例），系统解析利手分布特征及影响因素。系统检索中英文数据库，采用 STATA14.0 进行 Meta 分析（异质性检验后选用随机/固定效应模型），以效应值（ES）及 95%CI 量化利手比率；采集宁夏、甘肃等北方地区数据，应用爱丁堡利手量表（EHI）测评，通过 χ^2 检验与多因素 logistic 回归分析影响因素。Meta 分析显示不同利手问卷类型对非右利手比率无显著影响（ $P>0.05$ ）；亚洲非右利手比率（8.4%）显著低于欧洲（15.3%）和北美（15.6%， $P<0.05$ ）。多因素回归证实年龄 ≥ 30 岁、男性、春夏季出生及中等学历为左利手独立风险因素（ $P<0.05$ ）；中国人群非右利手比率（8.8%）高于日本（7.4%）、瑞典（5.5%），低于法国（27.1%）、英国（19.5%）等 11 国（ $P<0.05$ ）；精神分裂症患者左利手比例较健康组高，女性患者风险尤为显著（ $P<0.05$ ）。利手分布呈现显著地域与性别二态性，其形成受年龄、出生季节及教育水平等多因素调控；精神分裂症患者较健康对照组相比利手显著左移；不同利手调查问卷调查结果对利手的判别彼此无异质性。

● 中 A - 人类学 ● Abstract

中 A-129-0002

黄衣佉族的身体组成成分

吕婧祎 肖瑶 宇克莉 程智 聂浩波 高新颖 姚玥彤 包金萍 郑连斌 张兴华(zxhwf1981@126.com) 天津师范大学生命科学学院 天津 300387 天津师范大学体育科学学院

为了解中国黄衣佉族的身体组成成分，测量了 321 例（男 126 例，女 195 例）成人的 19 项指标，包括体脂率、总肌肉量等。对这 19 项指标分别进行数据分析并与其他族群进行比较。结果表明：黄衣佉族男性的水分率、内脏脂肪等级与年龄呈显著正相关，总肌肉量、推定骨量、BMI 等共 14 项指标与年龄呈显著负相关。黄衣佉族女性的水分率、内脏脂肪等级与年龄呈显著正相关，除右下肢肌肉量、左下肢肌肉量和躯干脂肪率外，其余 14 项指标与年龄呈负相关。性别间 u 检验结果表明，黄衣佉族男女 19 项指标均值的性别间检验差异全部具有统计学意义（ $P<0.05$ 或 $P<0.01$ ）。方差分析结果表明，黄衣佉族男性体质量、身高、总肌肉量等共 11 项指标年龄组间比较均具有统计学意义（ $P<0.05$ 或 $P<0.01$ ）。由多重比较结果可知，差异均出现在 18-44 岁组和 60 岁及以上组间。其中总肌肉量、总能量代谢、躯干肌肉量在三组间均具有显著差异。黄衣佉族女性体质量、身高、体脂率等共 15 项指标年龄组间比较均具有统计学意义（ $P<0.05$ 或 $P<0.01$ ）。其中差异多出现在 18-44 岁组和 60 岁及以上组、45-59 岁组和 60 岁及以上组之间；水分率仅在 18-44 岁组和 60 岁及以上组间存在显著差异；身高和躯干肌肉量在三组间均存在显著差异。聚类分析结果说明黄衣佉族的身体组成成分特征与佉族、京族较为接近。



中 A-129-0003

中国海洋民族—京族的体质特征及 16 年来的变化

张兴华(zxhwf1981@126.com) 卢政达 于淼 王嘉欣 宇克莉 程智 包金萍 郑连斌 天津师范大学生命科学学院 天津 300387 天津师范大学体育科学学院

2020 年团队在广西东兴市测量了 320 例（男性 140 例，女性 180 例）京族成人的体质指标，并与 2004 年的体质数据进行了对比分析。研究结果如下：在有统计学意义的 57 项指标中，除大腿围外，其余 56 项指标男性均大于女性。根据指数均值，京族男女均为高头型、中头型、中面型、中鼻型、中躯干型、宽肩型、宽骨盆型与中腿型。与 2004 年数据相比，京族男女的身高、躯干前高、前臂围、容貌面高、头水平围变化不大。京族男女的体重、肩宽、骨盆宽、平静胸围、大腿围、小腿围、头长、头宽、额最小宽、面宽、下颌角间宽、容貌耳长、容貌耳宽变大，口裂宽、形态面高、鼻高、唇高变小。遗传因素是京族身高变化不大的主要因素；社会经济因素是京族体重、身体宽度与围度变大的主因；遗传与环境是影响京族头面部特征的主要因素。京族的体质特征符合中国人的共性特征，从体质人类学角度证实京族是中华民族的一员，为铸牢中华民族共同体意识提供了数据支撑。

中 A-129-0004

中国克木人的体质特征及 17 年来的变化

肖瑶 岩坎翁 宇克莉 高新颖 姚玥彤程智 高雯芳 刘鑫 包金萍 张兴华(zxhwf1981@126.com) 天津师范大学生命科学学院 天津 300387 西双版纳傣族自治州民族博物馆 天津师范大学体育科学学院

为了探究克木人的体质特征，研究团队于 2022 年 8 月在云南省西双版纳傣族自治州勐腊县测量了 178 例（男性 67 例，女性 111 例）成人的头面部与体部指标，并计算了体质指数与分型，运用 Excel 和 SPSS 对各项指标进行分析。结果表明：男女上眼睑褶皱率较高，蒙古褶率较低，眼裂高度以中等型为主，眼裂倾斜度大多为外角高，鼻根高度以中等型为主，鼻背侧面观以直型为主，耳垂类型大多为圆形，上唇皮肤部高度以中等型为主。男性鼻翼宽以宽型为主，女性鼻翼宽大多为中等型和宽型，红唇厚度男性以厚唇型和中唇型为主，女性以中唇型为主。克木人头长等 52 项指标的性别间差异均具有统计学意义，其中除骨盆宽、臀围、大腿围外，其余 49 项指标男性均大于女性。男性身高均以矮型为主，女性身高以矮型和亚中等型为主。克木人圆头型、高头型、中头型、超阔面型、中鼻型、宽胸型、宽肩型、宽骨盆型的出现率最高。聚类分析显示克木人与佤族、傣族比较接近，这与遗传因素、生活环境、饮食习惯等息息相关。2022 年与 2005 年相比，克木人男女的体重、胸围、臀围、大腿围、肩宽、骨盆宽等 13 项指标与指数变大，正是国家与政府的持续支持，17 年来克木人的体重、身体宽度与围度增大，肩部和盆腔发育水平增高，身体素质明显改善。



中 A-129-0005

北京地区现代人群第一跖骨性别和侧别差异研究

杜抱朴 (dubaopu1989@163.com) 刘丽 景朋 张梦楠 霍秀丽 陆涛 高艳 首都医科大学人体解剖学教研室 北京 100069

第一跖骨作为前足部的关键骨骼，在法医人类学的性别鉴定与生物轮廓重建中具有重要价值。当前，国内尚缺乏现代人群第一跖骨尺寸性别和侧别差异的系统性研究。本研究选取 304 例北京现代人（男性 158 例，女性 146 例）的 375 例第一跖骨标本，通过三维模型重建技术，测量 11 项形态学指标（含 7 项线性指标、跖骨头关节面表面积、跖骨底关节面表面积、总表面积和体积），进而解析这些指标的性别差异指数、偏侧不对称指数和波动不对称指数的分布情况。结果显示所有指标均存在显著性别差异，即男性指标大于女性。11 项测量指标的性别判别指数呈现分层状况：线性指标（7.65%~16.67%）< 表面积指标（23.90%~27.86%）< 体积指标（37.74%）。在线性指标中，跖骨长的性别差异程度要明显低于其它指标。除跖骨底背腹径呈现左偏优势外，其余指标均不存在侧别差异；跖骨各项参数均存在显著波动性不对称特征。跖骨长的性别差异和波动不对称性最低，可能与其主要受遗传因素和激素调控存在关联，同时提示其对抗环境压力因素的抵抗能力相对较强。第一跖骨整体缺乏侧别差异，可能与足部在行走过程和姿势行为中对称性使用或是利足行为所产生的载荷并不足以重塑第一跖骨尺寸存在某些关联。本研究揭示了北京现代人群第一跖骨的性别差异和侧别差异分布情况，提示第一跖骨可为性别鉴定与体格重建提供可靠依据。

中 A-129-0006

藏族肺活量与肌肉质量和力量的相关性研究

何佳欣 温有锋 (swyf@163.com) 锦州医科大学生物人类学研究所 锦州 121000

本研究旨在深入研究藏族人群肺活量与肌肉质量与力量之间的内在联系，精准量化在藏族群体中的相关程度。本课题组采取整群抽样方法随机抽取西藏拉萨市 20-79 岁藏族 564 名成年人作为研究对象，应用肺活量计采集肺活量；生物电阻抗法检测躯干肌肉量、左上肢肌肉量等肌肉质量指标；肌肉力量使用握力计进行握力数据采集。使用 IBM SPSS27 软件中的独立样本 t 检验进行各项指标的组间比较，采用 Pearson 相关分析确定肺活量与握力和四肢骨骼肌质量、躯干肌肉质量的相关程度，采用多元线性回归分析确定肺活量的预测模型。肺活量与握力、四肢骨骼肌质量和躯干肌肉质量存在显著差异（P 值均<0.001）。Pearson 相关系数均显示四肢骨骼肌质量、躯干肌肉质量、握力与肺活量显著正相关($r_1=0.641, r_2=0.586, r_3=0.674$, P 值均<0.001)，随着肺活量的增加，四肢骨骼肌质量、躯干肌肉质量和握力也随之增高。将年龄、性别、握力、四肢骨骼肌质量和躯干肌肉质量作为预测因子纳入回归模型时，其中握力、四肢骨骼肌质量和躯干肌肉质量对肺活量有较好的预测作用 ($R^2=0.501, F=187.565, P<0.001$)。因此，肌肉质量与力量可以考虑作为肺活量的重要检测指标。通过研究肺活量与肌肉之间的关系，可以为藏族精准预测肺活量提供参考依据，为进一步揭示藏族人群在高原环境下肌肉功能与呼吸功能的协同适应机制提供启示，为理解人类对极端环境的生理适应提供重要依据。



中 A-129-0008

新疆乌孜别克族行为习惯特征的分析

刘梦菡 (2816734702@qq.com) 温有锋 锦州医科大学生物人类研究所 锦州 121000

对新疆乌孜别克族行为习惯特征进行研究,探讨新疆乌孜别克族的行为习惯特征,为新疆乌孜别克族群体遗传学积累资料。采用整群随机抽样的方法抽取新疆木垒县、塔里木大学、伊犁州共 211 例 (男 144 例,女 67 例) 乌孜别克族成人为研究对象,按《人体测量方法》对 7 项行为习惯特征 (尖舌、卷舌、翻舌、叠舌、利手、扣手、交叉臂) 进行观察。所得数据采用 SPSS27.0 软件进行频数分布、聚类分析、卡方检验等统计学分析。结果显示:乌孜别克族卷舌、叠舌、翻舌、尖舌的出现率分别为 54.5%, 7.6%, 34.1%, 85.8%, 与我国其他族群相比,叠舌、翻舌、尖舌的出现率较高,卷舌的出现率较低。扣手右型、利手右型、交叉臂右型的出现率分别为 55.5%, 93.4%, 54.0%, 与我国其他族群相比,利手右型、交叉臂右型出现率较高,扣手右型出现率较低。聚类分析结果显示,新疆乌孜别克族的舌运动类型与同为阿尔泰语系的蒙古族、锡伯族 (新疆)、鄂温克族、鄂伦春族最为接近;利手、扣手、交叉臂的行为习惯特征与汉族最为接近。卡方检验分析结果显示,7 项行为习惯特征性别间出现率无差异 ($P>0.05$);卷舌与尖舌、翻舌与尖舌、叠舌与尖舌、卷舌与翻舌、卷舌与叠舌均不存在相关性,叠舌与翻舌存在相关性。扣手、利手、交叉臂以右型为主。

中 A-129-0010

中国人群的身体形态指数、身体圆度指数及其地区分布特征

李咏兰 1,2,韩媛 1,张兴华 2,宇克莉 3,郑连斌 3

1. 内蒙古师范大学生命科学与技术学院,呼和浩特 010022; 2. 内蒙古自治区高等学校生物多样性保护与可持续利用重点实验室,呼和浩特 010022; 3. 天津师范大学生命科学学院,天津市动物多样性保护与利用重点实验室,天津 300387

测量了 70127 例 (男为 32269 例,女为 37858 例) 中国人体重、身高、腰围,计算了身体形态指数 (A Body Shape Index, Is)、身体圆度指数 (Body Roundness Index, Ir) 值。男性 Is 值为 0.802 ± 0.058 , 女性为 0.802 ± 0.110 。男性 Ir 值为 3.664 ± 1.329 , 女性为 4.194 ± 1.529 。随年龄增长,中国人 Is 、 Ir 值增大。随人均可支配收入的增加, Is 值增大,但 Ir 值却没有明显受到经济发展的影响。 Ir 和 Is 之间呈显著正相关。 Is 、 Ir 的增加都会使血压升高、心率加快。收缩压型高血压人群的 Is 、 Ir 值显著高于非高血压人群。总体上中国 Is 、 Ir 存在地区的差异。经度、纬度会影响到中国人 Is 、 Ir 的值。随纬度增加,男性 Is 值增加,女性 Is 值会下降,男性、女性的 Ir 值均增加。随经度增加,男性、女性 Is 值增加,男性 Ir 值略下降,女性 Ir 值增加。分别对 26 个省份 Ir 值进行了统计,并绘制了 Ir 均数与纬度的散点图,显示北方省份人群 Ir 值明显高于南方省份。中国绝大多数省份 90% 以上的人 Ir 值在 1.00-6.89 之间。 Ir 与纬度的回归方程: 男性 $Ir=2.573+0.03\times La(^{\circ})$, 女性 $Ir=3.152+0.036\times La(^{\circ})$ 。



中 A-129-0012

西北民族走廊 10 个民族成人的体部特征

李兆航 1, 韩瑗 1, 希露格 1, 白昀 1, 李咏兰 1,2

1. 内蒙古师范大学 生命科学与技术学院, 呼和浩特 010022; 2. 内蒙古自治区高等学校生物多样性保护与可持续利用重点实验室, 呼和浩特 010022

研究西北民族走廊 10 个民族的体部特征。采用人体测量法对西北民族走廊族 10 个民族共 6455 例 (男性 2895 例, 女性 3560 例) 成人的身高、坐高等 8 项体部指标进行测量, 分析 10 个民族的体部特征, 进行了主成分分析与聚类分析, 并与中国南、北方汉族及其他少数民族的体部数据进行了聚类分析。西北民族走廊 10 个民族中哈萨克族身材最高、躯干最长、四肢较长且较宽、肩最宽; 德令哈蒙古族肩和骨盆最窄, 裕固族骨盆最宽; 回族身材最矮、四肢的宽度最窄, 土族四肢最短。西北民族走廊族群多数表现为中腿型、宽肩型、宽骨盆型, 体部特征总体上与中国北方民族更为接近。

中 A-129-0014

西北地区 15 个族群的身体围度特征

王晶晶, 韩瑗 1, 希露格 1, 白昀 1, 李咏兰*1,2

1. 内蒙古师范大学生命科学与技术学院, 呼和浩特 010022; 2. 内蒙古自治区高等学校生物多样性保护与可持续利用重点实验室, 呼和浩特 010022

测量了 6688 例 (男性 2984 例, 女性 3704 例) 西北地区 15 个族群的 9 项围度指标。15 个族群间围度值差异具有统计学意义 (均 $P < 0.01$)。男性族群中, 甘肃哈萨克族头水平围最大, 甘肃回族最小; 河南县蒙古族的平静胸围和上臂最大围均居首位, 甘肃保安族的胸围和大腿围最小。女性族群中, 青海撒拉族的头围和上臂最大围最大, 青海汉族头围最小, 甘肃汉族腰围最小。主成分分析结果显示, 青海撒拉族和西北地区蒙古族的身体围度特征相似, 男性、女性的上下肢和躯干围度均大于其余族群, 甘肃回族、东乡族和甘肃保安族的身体围度相近, 男性、女性的上下肢和躯干围度均小于其余族群, 其余 7 个族群的上下肢和躯干围度均处于中等水平。聚类分析结果显示, 西北地区 15 个族群 (如肃北蒙古族、甘肃哈萨克族、甘肃裕固族等) 在身体围度特征上与北方族群 (如巴尔虎蒙古族、鄂尔多斯蒙古族) 呈现趋同性。

中 A-129-0015

广西在校女大学生体成分与握力的相关性研究

罗睿 蓝婕 梁秋燕 李伟敏 邓琼英 玉洪荣(gxmu_yhr@qq.com) 广西医科大学基础医学院 南宁 530021 广西高校人体发育与疾病研究重点实验室 (广西医科大学)

为探讨在校女大学生的体成分与握力的相关关系, 揭示影响在校女大学生体质健康状况的基本因素, 在知情同意下, 随机选取广西医科大学 18~22 岁在校女大学生 100 名作为研究对象, 采用生物电阻抗法检测其体成分指标, 采用上海三公电子握力计 (型号: WCS-100) 测定其右手最大握力值。通过中位数法将样本分为高/低握力组。结果: (1) 独立样本 t 检验显示, 高握力组在水分、蛋白质、脂肪量、BMI 和肌肉量等指标上均显著高于低握力组 ($P < 0.05$), 高握力组的左上肢、右上肢、左下肢、右下肢和躯干的肌肉量亦均显著高于低握力组 ($P < 0.05$)。高握力组在左上肢、右上肢、左下肢、右下肢和躯干的脂肪量均高于低握力组, 但差异不显著 ($P > 0.05$)。 (2) Pearson 相关分析显示, 握力与水分 ($r = 0.376$)、蛋白质 ($r = 0.356$) 和肌肉量 ($r = 0.357$) 呈显著正相关 ($P < 0.01$)。其中, 握力与左上肢肌肉量 ($r = 0.307$)、右上肢肌肉量 ($r = 0.326$)、左下肢肌肉量



($r=0.291$)、右下肢肌肉量($r=0.275$)和躯干肌肉量($r=0.374$)亦呈显著正相关($P<0.01$)。值得注意的是,握力与 BMI($r=0.251$, $P=0.012$)和四肢骨骼肌指数($r=0.204$, $P=0.042$)呈显著正相关,但相关性相对较弱。这表明广西在校女大学生握力水平与全身蛋白质储备及骨骼肌发育程度存在强关联,躯干骨骼肌对握力的贡献度尤为突出。

中 A-129-0017

广西南部平话汉族中老年女性体成分与骨密度的相关性研究

玉洪荣(gxmu_yhr@qq.com), 黄丽仟, 韦灿燊, 林圣钧, 陈兴才, 邓琼英 广西医科大学人体解剖学教研室
南宁 530021 广西高校人体发育与疾病研究重点实验室(广西医科大学)

为探讨广西南部平话汉族中老年女性骨密度与体成分的相关关系,在知情同意情况下,随机选取广西南部平话汉族 45~74 岁中老年女性 161 人,采用生物电阻抗法检测其体成分指标,GE Achilles 超声骨密度测试仪测定其右侧跟骨的骨密度。结果:(1)单因素方差分析和线性回归分析显示,骨密度 T 值随年龄增长呈下降趋势($F=45.2$, $P<0.001$),其中以 55~64 岁年龄段的骨密度年均下降幅度最大($\beta=-0.15/\text{年}$)。这表明骨密度随年龄增长逐渐下降,55~64 岁是其骨密度下降的“关键窗口期”。(2)Pearson 相关分析显示,年龄与骨密度 T 值呈显著负相关($r=-0.562$, $P<0.001$),去脂体重、肌肉量、推定骨量、身体水分、体重与骨密度 T 值呈显著的正相关($P<0.01$),BMI、脂肪量与骨密度 T 值亦呈显著正相关,但相关性相对较弱($P<0.05$)。这表明去脂体重、肌肉量和推定骨量等反映肌肉骨骼系统的指标是影响骨密度的关键因素。(3)岭回归模型分析显示,年龄是影响骨密度的核心风险因素($\beta=-0.438$, $P<0.001$),肌肉量($\beta=0.153$, $P=0.023$)和去脂体重($\beta=0.215$, $P=0.008$)对骨密度有显著正向影响。这表明衰老是广西南部平话汉族中老年女性骨密度下降的主要驱动因素,而肌肉质量和瘦体重是其骨骼健康的重要保护因素。

中 A-129-0018

临夏地区成年人群骨密度异常分布特征及影响因素分析

马斌(yxmb@xbmu.edu.cn) 欧阳思维 白静雅 魏栋 郭丽 陈海林 海向军 西北民族大学西北民族地区环境生态与人群健康国家民委实验室 兰州 730030

探讨临夏地区成年人骨密度分布的性别与年龄差异,为制定区域性骨骼健康干预策略提供依据。采用超声骨密度仪对 2,411 名成年人(男性 859 例,女性 1,552 例)右脚跟骨进行检测,标准分为骨质正常、骨质少孔及骨质疏松三组,通过 SPSS25 软件进行 χ^2 检验分析。1.性别差异:女性骨质疏松占比显著高于男性($P<0.001$),且在 50-59 岁年龄段差异达峰值(女性 58.8%,男性 30.4%)。男性骨质正常占比整体高于女性(69.2%, 80.0%, $P<0.001$)。2.年龄相关性:两性骨密度均随年龄增长显著下降(均 $P<0.001$),但女性骨质恶化更为急剧。男性 40-49 岁后骨质疏松比例升至 15.8%,较 20-29 岁增长 14.5 倍,女性同期增长 24.5 倍(达 34.4%)。50-59 岁女性骨质正常比例仅为 11.8%。3.分层卡方检验显示各年龄段性别间骨质分布差异显著(男性 $P<0.001$;女性 $P<0.001$)。临夏地区成人骨密度异常呈现“女性高发、高龄速衰”特征,50 岁以上女性骨质疏松风险尤为突出。



中 A-129-0020

基于 EDMA 的 Lrp3 基因敲除小鼠颅骨表型研究

李泽东 (1178395373@qq.com) 于晓童 沈阳医学院基础医学院 沈阳 110034

颅面特征的差异是人类显著的表型之一，由于小鼠和人类的颅面骨骼发育过程相似，小鼠模型作为研究颅面生长发育过程的重要工具，在揭示颅面发育和骨骼形态学的机制中起着关键作用。Lrp3 是低密度脂蛋白受体家族成员，参与细胞信号转导和吞噬作用，但其在骨骼发育中的功能尚不明确。本研究旨在利用基于 EDMA 构建的 Lrp3 基因敲除小鼠模型，探究 Lrp3 缺失对小鼠颅骨发育的影响，以揭示其在骨骼生物学中的潜在作用。通过 CRISPR-Cas9 技术构建全身性 Lrp3 敲除小鼠 (Lrp3^{-/-})，以野生型 (WT) 小鼠为对照。使用微型计算机断层扫描 (Micro-CT) 分析颅骨的三维形态和骨密度，然后用 VG Studio MAX 3.2 软件求取颅骨特征点三维坐标，再利用 EDMA 获取颅骨特征点间的欧氏距离，对颅骨任意特征点之间的欧氏距离进行预测。Micro-CT 显示，Lrp3^{-/-} 小鼠颅顶骨厚度显著减少 ($p < 0.01$)，颅缝闭合延迟，且骨小梁密度降低。组织学分析表明，敲除小鼠颅骨软骨内成骨区域缩小，前囟门闭合延迟。Lrp3 影响颅骨发育和骨化过程，其缺失导致颅骨形态异常和骨密度降低。本研究首次阐明 Lrp3 在颅骨发育中的关键作用，为相关骨骼疾病的机制研究提供了新方向。未来可进一步探索 Lrp3 在骨质疏松或颅缝早闭等病理过程中的潜在应用价值。

中 A-129-0021

新疆塔城地区汉族人群骨量减少影响因素的研究

钟华 (zh13940150128@163.com) 温有锋 锦州医科大学生物人类学研究所 锦州 121001

为测量新疆塔城地区汉族人群的骨密度并结合问卷分析人群骨量减少相关影响因素，在知情同意的情况下，本研究随机选取新疆塔城地区 20 岁以上汉族人群 436 名为研究对象。按照《人体测量方法》测量身高、体重及骨密度值，依据《原发性骨质疏松症基层诊疗指南(2022)》诊断骨量减少，健康对照组 170 例，骨量减少组 266 例，并对受试者进行问卷调查，采集个人情况、生活方式等相关因素。使用 SPSS 26.0 统计软件进行相关分析、卡方检验等统计学分析，应用主成分分析法进行膳食模式分析。分析结果显示：两组间性别差异无统计学意义。在塔城汉族人群中，骨量减少与年龄呈正相关，与身高和体重呈负相关，年龄是骨量减少的危险因素，体重是骨量减少的保护因素。受教育程度、婚姻状况和职业类型等人口学特征及糖尿病史、高血压史和心血管疾病史等健康相关因素在两组间差异有统计学意义。塔城汉族人群摄入牛羊肉等蛋白质和水产品类、坚果等其他类、酒等饮品类食物的频率与骨密度 T 值呈显著正相关。运用主成分分析，塔城汉族人群的饮食习惯可提取为四种膳食模式：平衡膳食模式、地中海膳食模式、中国北方膳食模式、东欧地区膳食模式，其中中国北方膳食模式与骨量减少呈负相关。综上所述，新疆塔城地区汉族人群骨量减少的发生率为 61%，影响因素为人口统计学特征、疾病史和饮食摄入情况。



中 C-129-0002

新疆地区哈萨克族及汉族成年男性吸烟与体成分的相关性研究

张斐然(1624682246@qq.com) 温有锋 锦州医科大学生物人类学研究所 锦州 121000

本研究旨在探讨新疆塔城地区哈萨克族和汉族成年男性吸烟习惯及其对体成分的影响，为制定新疆成人健康干预策略提供数据支持。采用整群随机抽样方法选取塔城地区 446 例成年男性（哈萨克族 296 例、汉族 150 例）作为研究对象，运用标准化问卷收集吸烟等相关信息，使用生物电阻抗分析仪测量体成分，所获数据录入 SPSS 26.0 软件并进行描述性统计、卡方检验和 Wilcoxon 检验等统计学分析，结果显示：哈萨克族男性吸烟率为 49.7%，高于汉族男性吸烟率的 42.7%，两民族间差异无统计学意义($P>0.05$)。哈萨克族老年组男性体重、身体质量指数、体脂率、躯干脂肪量、四肢脂肪量、内脏脂肪含量和皮下脂肪含量等 19 个体成分指标，均表现为吸烟组显著低于非吸烟组($P<0.05$)，提示哈萨克族老年男性吸烟与体成分存在关联性。汉族男性各年龄组体成分指标在吸烟组与非吸烟组间均无显著性差异($P>0.05$)。本研究结果提示，吸烟对体成分的影响存在民族差异，其中哈萨克族男性吸烟对体成分的影响存在年龄差异。

中 C-129-0006

甘肃三特有少数民族成人围度与体成分关系研究

欧阳思维(ouyangsiwei@xbmu.edu.cn) 海向军 马斌 白静雅 西北民族大学医学部人体解剖学教研室 兰州 730030

本研究采用生物电阻抗技术，对甘肃省裕固族（男性 195 例，女性 193 例）、保安族（男性 177 例，女性 179 例）及东乡族（男性 198 例，女性 199 例）20-65 岁健康成人的体成分进行了测定，并收集了六项围度指标。结果显示，各民族的体成分特征存在显著差异。裕固族男性的腰围与内脏脂肪量呈强正相关($\beta=0.49$ kg/cm, 95%CI:0.40-0.57)，其腰臀比(0.92 ± 0.06)及内脏脂肪指数(12.3 ± 2.8)显著高于保安族和东乡族($P<0.01$)，提示高原游牧人群具有典型的腹型肥胖表型。保安族女性大腿围与下肢骨骼肌质量的相关性最高($r=0.81$, $\beta=0.72$ kg/cm)，其相对肌肉量百分比(29.3 ± 4.1)%优于其他族群。颈围的 AUC-ROC 存在族群间差异（裕固族 0.79、保安族 0.71、东乡族 0.74, $P=0.032$)。多水平回归模型显示，族群因素解释体成分变异的 19%-23%（校正 $R^2=0.61-0.74$ ），且性别与年龄的交互效应显著($P=0.003$)。裕固族腰围的变异系数(11.6%)及保安族大腿围的标准差(3.8 cm)均具有族群特异性。研究结果揭示了西北民族体成分差异具有显著的遗传环境交互作用特征，强调了建立分族群人体测量学常模的必要性，推荐颈围-胸围联合检测作为代谢风险评估的简易指标，为区域性精准健康管理提供了基于解剖形态学与人类适应机制的科学依据。



● 中 B- 人体解剖学与数字解剖学 ● Podium

中 B-129-0001

不同站姿与坐姿腰椎间盘负荷的有限元分析

牛升波 (niushengbo@163.com) 高捷 杜习起 苏威 张珂 侯锦程 张旭辉 陆军第八十三集团军医院骨科 新乡 453000 杨恒 杨长伟 海军军医大学第一附属医院骨科 上海 200433 宋琳 聊城市传染病医院骨科 聊城 252000

有限元法分析不同站姿与坐姿腰椎间盘负荷大小与分布，为非特异性慢性腰痛（NSCLBP）患者的治疗、无症状人群日常生活健康姿势提供参考。建立站立前倾、站立中立、站立后倾、放松坐姿前倾、挺直坐姿中立、放松坐姿后倾、放松坐姿中立、放松坐姿中立加腰部支撑 8 种腰椎有限元模型。对不同材料属性赋值后选取站立中立位模型进行验证。加载 400N 生理负荷后分析不同姿势的腰椎间盘 Mises 应力大小与椎间盘内压（IDP）大小。验证结果表明模型可以用于生物力学测试，3 种站姿中 L3-4、L4-5、L5-S1 椎间盘 Mises 应力峰值均高于 L1-2、L2-3 椎间盘，其中中立位 L3-4、L4-5、L5-S1 椎间盘 Mises 应力峰值最小。L3-4、L4-5 IDP 在后倾位最大，L5-S1 IDP 在前倾位最大。挺直坐姿中立位与使用腰部支撑的放松坐姿中立位腰椎间盘的 Mises 应力峰值、IDP 较小。腰椎曲度影响腰椎间盘负荷的分布与大小，中立位站姿、挺直坐姿中立位与使用腰部支撑的放松坐姿中立位腰椎间盘的负荷较低，对 NSCLBP 患者的治疗与无症状人群日常生活采取健康姿势有参考价值。

中 B-129-0004

膝关节精细模型构建及常见关节镜手术入路解剖结构的三维展示

胡玉(1759904271@qq.com) 闫帅 巩洁 赵振美 山东数字人科技股份有限公司研发中心 济南 250000

构建膝关节的精细三维模型，对常见的膝关节镜手术入路解剖结构的场景进行搭建，为膝关节的解剖教学及其关节镜手术提供精准的解剖学资料。选取山东数字人科技股份有限公司铣切的膝部高清断层图像序列（4950*5320 像素，层厚 0.1mm），进行图像配准，使用 Amira 软件进行分割，使用本公司自研三维建模工具生成模型，并获取真实纹理贴图，创建膝部场景，模拟观察关节镜手术入路。本项目分割重建膝部皮肤、筋膜、脉管神经、骨、关节、肌等结构，发现由于股四头肌角（Q 角）的存在髌腱具有一定的外翻角度。前外侧入路能清晰观察到髌上囊、髌股沟、股骨内侧髁、髌骨关节面，膝关节囊、股骨外侧髁、外侧半月板，前交叉韧带，该入路适用于外侧半月板和前交叉韧带病变的诊断和治疗；前内侧入路常作为手术的探查入路，能清晰观察到股骨内侧髁、内侧半月板前角，通过前交叉韧带、股骨内侧髁及胫骨上关节面围成的间隙可观察到内侧半月板后角，该入路适用于内侧半月板尤其后角病变的诊断和治疗。数字解剖技术依据冰冻铣切获取的真实连续高清断层图像，精细分割并重建出外形逼真，器官结构毗邻关系准确，纹理贴图真实的三维模型，将有助于膝关节的临床解剖学教学，为膝关节有限元分析及关节镜手术入路设计奠定解剖学基础。



中 B-129-0005

数字人四链融合协同推进智慧化虚拟解剖教学范式创建

刘文荟（573268735@qq.com） 丁大伟 李辰 孟祥萍 山东数字人科技股份有限公司 济南 250100

当前医学教育面临尸体标本短缺、传统解剖教学可视化不足等现实困境，虚拟解剖技术通过高精度三维建模虽已实现基础性突破，但在数据丰富性、技术协同性、产品适配度及服务闭环构建等方面仍存在系统性障碍。本研究提出以数据链、技术链、产品链、服务链的数字人四链融合体系，协同推进智慧化虚拟解剖教学的范式创新。数字人四链融合核心内容包含，数据链筑基：整合多模态数字人体数据资源，构建虚拟解剖数据库；技术链驱动：通过自主研发 Tai 引擎技术，基于真实连续断层的人体结构三维重建技术，AIGC 医教垂直大模型构建等实现技术驱动解剖教学创新发展；产品链赋能：通过多类型数字解剖系统，并结合 PC 端、MR 头显、移动终端的多平台适配，实现云端资源同步与多用户协同操作；服务链闭环：设计 IFTU 全程服务支持系统。实现贴身设计、融合共建、全程服务、免费升级等全流程服务支持体系。本研究基于四链融合的解决方案，旨在优化虚拟解剖教学资源配置，提升解剖学教学环境，提高学生的学习兴趣和学习效率，为医学教育的高质量发展贡献力量。

中 B-129-0006

转录组测序揭示枕下肌应对损伤的解剖生理学机制

张璐 马威（mawei_dlmedu@163.com） 隋鸿锦 大连医科大学解剖学教研室 大连 116044

枕下肌在维持姿势和头部运动中起关键作用，其中头后大、小直肌参与构成肌硬膜桥复合体，为脑脊液提供动力。头后大、小直肌损伤修复过程受到多种因素调控，其修复效果直接影响着肌硬膜桥复合体的功能。本研究通过小鼠甘油损伤模型，组织学染色，结合转录组测序，揭示了枕下肌独特的损伤修复机制。甘油损伤后，枕下肌呈现完全的肌再生，无明显的脂肪浸润和纤维化形成，而在胫骨前肌中则出现大量脂肪浸润。与胫骨前肌相比，枕下肌较早形成大量新生肌纤维和新生血管，表明其修复更早、更高效。对甘油损伤后枕下肌和胫骨前肌的转录组测序分析发现，PPAR 信号通路在甘油损伤的枕下肌中被抑制，可能是枕下肌不成脂的关键因素。qRT-PCR 验证了枕下肌中脂肪相关基因（PParg, Plin1）的低表达。成纤维脂肪前体细胞是肌肉内脂肪细胞的主要来源，在甘油损伤后 3d~5d 时，与胫骨前肌相比，枕下肌中增殖的 FAPs 明显减少，而凋亡明显增多。同时，免疫浸润分析表明，损伤后头后大、小直肌中大量 M1 型巨噬细胞浸润，提示巨噬细胞可能参与 FAPs 的行为学调控，影响枕下肌中脂肪形成。本研究发现了枕下肌高效的损伤修复能力，其可能与 PPAR 通路和巨噬细胞对 FAPs 的生物学行为调控密切相关。这些发现为深入探究枕下肌的损伤应对机制提供了重要线索。



中 B-129-0008

基于有限元分析方法对儿童颈椎神经弓中心软骨联合及椎体的比较研究

申晓科 张少杰 (24395982@qq.com) 尹兆正 伊钰营 李磊 段博 内蒙古医科大学基础医学院 呼和浩特市 010000

通过构建 6 岁儿童颈椎神经弓中心软骨联合 (NCS) 及其相关结构的三维模型, 采用有限元方法探究其在生理活动中的力学响应并分析其生物力学特性。选择颈椎骨结构正常的 6 岁儿童颈椎影像资料, 将原始数据导入到 Mimics 软件中重建包括 NCS、颈椎骨性结构的三维模型, 之后使用 Geomagic Studio、Pro/Engineer、Hyper Mesh、Abaqus 等软件模拟构建含 NCS、椎骨、椎间盘、韧带等结构的儿童颈椎有限元模型, 运用有限元力学分析方法对儿童颈椎模型活动度及颈椎 NCS 相关结构应力特点进行对比分析。6 岁儿童颈椎模型中, NCS 在前屈、左侧屈及旋转工况下应力值随椎序递增而减小, C2 处最大 (0.64 ± 0.22 MPa), 与其作为头颈活动核心枢纽及未闭合软骨结构相关; 椎体在侧屈及旋转时应力呈“先减后增”趋势, C4 处最小 (0.10 ± 0.07 MPa), 后缘应力显著高于前缘; 关节突关节应力在前屈/后伸/侧屈中亦呈先减后增, C4/5 处最小。NCS、椎体、关节突关节及椎间盘位移值均随椎序递增而减小, C2/3 处最大。本研究验证了基于 CT 值赋值的有限元模型在解析儿童颈椎力学特征中的可靠性, 上颈椎 NCS 动态适应性高, 儿童尤其需关注 C2NCS 区域的损伤风险。

中 B-129-0009

1~12 岁儿童骶椎神经弓中心软骨联合形态发育解剖学研究

李磊 任小燕 张少杰 (24395982@qq.com) 内蒙古医科大学基础医学院人体解剖学教研室 呼和浩特 010000

在 1~12 岁儿童盆部 CT 影像资料上测量骶椎神经弓中心软骨联合 (NCS) 形态相关参数, 探讨 NCS 发育规律及特征, 分析儿童骶椎 NCS 对儿童骶椎骨化的影响。回顾性收集了 1~12 岁儿童盆部 CT 影像资料 240 例, 按 1 岁为一个年龄组, 共分为 12 个组, 每组 20 例。将盆部影像原始数据导入 Mimics16.0 软件中, 选择测量工具分别在冠状面及横断面上对骶椎 NCS 的解剖学形态指标、位置指标进行测量, 记录并统计各项指标。1. NCS 的横径、矢状径、周长及面积随年龄变化趋势相似, 1~2 岁组 S₁ NCS 各项指标呈上升趋势, 其横径从 1 岁组的 1.190 mm 上升至 2 岁组的 1.245 mm, 矢状径从 1 岁组的 8.925 mm 上升至 2 岁组的 10.706 mm。2 岁后逐渐下降, 直至 5 岁组所有数值降至 0.000 mm; S₂~S₃ NCS 各项指标在 1 岁后逐渐下降。2. NCS 与椎体横径及矢状径的比值随年龄增长逐渐下降, S₁ NCS 横径与椎体横径的比值从 1~2 岁组的 0.062 mm 降至 5 岁组的 0.000 mm, 矢状径与椎体矢状径的比值从 1~2 岁组的 0.634 mm 降至 5 岁组的 0.000 mm, 且 S₁ > S₂ > S₃。3. NCS 间距离及角度随年龄变化明显, S₁ NCS 间距离在 1~2 岁组从 21.225 mm 增长至 27.087 mm, 随后逐渐下降至 5 岁组的 13.373 mm; S₂~S₃ NCS 间距离在 1 岁后下降。NCS 与椎体间距离及角度随年龄变化趋势与 NCS 间距离及角度相似。NCS 骨化模式为从周围向中心进行。NCS 的位置随年龄变化显著, 可作为评估骶椎发育的重要参考。



中 B-129-0010

肌硬膜桥样结构对硬骨鱼脑脊液循环动力作用的数字解剖学研究

陈程(chencheng199411@163.com) 郑楠 隋鸿锦 大连医科大学解剖学教研室 大连 116044

肌硬膜桥（Myodural Bridge, MDB）是脑脊液（Cerebrospinal fluid, CSF）循环的动力来源之一。MDB 是位于人寰枕间隙、寰枢间隙的致密纤维组织，连接枕下肌和硬脊膜。已有研究证明 MDB 普遍存在于哺乳动物、爬行动物和鸟类中，提示 MDB 是保守的解剖结构。因此探究鱼类 MDB 的存在，并阐明其在 CSF 循环中的作用，将为 MDB 是脊椎动物中普遍存在的重要解剖结构提供比较解剖学证据。本研究采用组织学方法观察硬骨鱼肌组织与椎管膜之间的解剖学关系和结构特征；并通过在顶盖脑室注射荧光微球，追踪不同运动状态下 CSF 的流动模式；此外，通过连续组织学切片构建斑马鱼脊柱-脑脊液流固耦合模型，利用计算流体力学方法模拟和分析 MDB 在 CSF 循环中的动力作用。本研究观察到硬骨鱼脊柱两侧的肌纤维呈现从吻侧到尾侧的小角度附着模式，直接锚定在椎管膜上，存在肌硬膜桥样结构（Myodural Bridge-like, MDB-like）。通过粒子示踪技术，观察到硬骨鱼 CSF 的流动速度和流动模式在不同运动状态受到显著影响。且模拟结果表明，MDB-like 的轴向拉伸引起椎管内 CSF 脉动式的波动。本研究证明了硬骨鱼中存在 MDB-like 结构，表明 MDB 是脊椎动物中保守的解剖结构。并且证明了 CSF 的流动速度和流动模式均受到不同运动状态的影响。同时，模拟计算结果将 CSF 在椎管内的流场变化进行可视化的定量分析，进一步证明了本研究提出的观点 MDB-like 结构在脊椎动物的 CSF 循环中发挥着驱动和调节的作用。

中 B-129-0012

高清数字人颞区筋膜和筋膜间隙的精细分割和三维重建

张若琳(1924629903@qq.com) 许 瑞 刘宇微 赵振美 山东数字人科技股份有限公司研发中心 济南 250101

颞区是颅脑手术中常见的入路区域，颞肌、颞浅筋膜、颞深筋膜等多个重要结构的复杂空间关系直接影响手术安全性。传统解剖学方法受限于二维切片和标本变形，难以完整呈现三维动态结构。随着数字医学技术的发展，高精度的三维重建技术为解剖学研究提供了新的途径。本研究结合数字人断层图像（层间距 0.1mm）和人工精细分割技术，构建了高精度颞区筋膜系统三维模型，旨在为神经外科手术提供更为精确的解剖学参考。采用高清数字人体的连续薄层断面图像，将颞区图像数据导入图像分割工具中，逐层分割出颞深筋膜、颞深脂肪垫、颞浅筋膜、颞浅脂肪垫、颞肌下疏松结缔组织、颞浅筋膜下疏松网状组织层。通过人工精细分割，确保每个结构的边界清晰、层次分明。随后，利用三维重建软件，将分割后的二维图像数据重建为三维模型。模型外形准确、美观，并且可在场景中任意旋转，使得研究者能够从不同角度观察颞区的解剖结构，进一步理解其复杂的空间关系。与传统的二维切片相比，数字解剖技术依据冰冻铣切获取的真实连续高清晰断层图像，能分割重建出外形美观，毗邻关系准确的器官结构三维模型，更直观地展示颞区的解剖结构。对于神经外科手术的术前规划和术中导航具有重要的临床意义，为颞区的神经外科解剖奠定基础。



中 B-129-0014

基于 DTI 技术在视觉传导通路纤维束追踪成像特征的分析研究

杨洋, 李琨, 王星, 姜洪新, 张少杰, 李志军
(内蒙古医科大学基础医学院人体解剖学教研室)

Email: 648427312@qq.com

视觉的形成主要依靠视觉传导通路, 其纤维束的完整与否将直接影响到人体视觉功能。但由于视觉神经通路位置深潜、走行特殊, 导致如何客观精准地评定视觉功能的方法目前仍然是临床及司法鉴定中的重点和难点问题之一。本研究拟通过 DTI 技术中的 FACT 算法对视觉传导通路(简称视路)纤维束进行追踪, 由 2 名副主任医师分别对视路纤维束示踪图进行分类、分龄分析, 统计相关扩散参数 FA、ADC 值, 对比分析视路纤维束的三维构象和走行轨迹, 总结视路纤维束的三维构象、走行轨迹的特征和相关发育规律。

研究发现: 1.DTI 技术对全视路的检出率为 16.85%, 其中未成年组占比最高达 29.32%; 对视束和视辐射的检出率分别为 98.50%、76.78%, 明显高于视神经(20.97%); 并且在不同年龄组间均发现视辐射存在交叉越边走行现象, 检出率达 43.82%; 2.FA 值在 4 岁前激增, 4 岁后在 0.387-0.449 区间内波动; ADC 值随年龄变化无明显规律, 仅 30 到 60 岁期间趋于平稳, 在 1.229-1.279 区间内波动。

因此, 利用 DTI 技术对视路疾病、损伤进行定位诊断时, 直观显示视路走行轨迹、投射皮层位置, 并可明确与颅内疾病、损伤的相关性; 对视觉功能进行定量诊断时, 需根据不同年龄段的参考值范围对结果进行精确解读, 明确发育或损伤程度。

中 B-129-0015

成人与猕猴颈椎椎间盘有限元力学对比分析研究

郝韵腾 张德洲 王思敏 王超群 张少杰 李琨 马渊 史君 李志军 王星(wangxing197911@163.com) 内蒙古医科大学基础医学院数字医学中心 呼和浩特 010010 内蒙古医科大学解剖教研室 呼和浩特 010059

有限元分析能够对形状、结构、材料以及载荷条件等高度复杂的生物体结构进行应力与应变分析。本研究选取成人与猕猴各 1 例, 经 64 排螺旋 CT 薄层扫描获得原始数据, 然后构建成人与猕猴 C0-T1 全颈椎三维有限元模型, 运用有限元方法对颈椎椎间盘突受力特点进行对比分析。研究发现颈椎椎间盘应力值与位移值在 6 种工况下均随椎序递增而增大, 变化趋势相似, 整体呈“尖峰状”, 峰值均位于 C5/6; 成人与成年猕猴椎间盘应力值与位移值比较均无显著性差异($P>0.05$)。对成人与猕猴颈椎椎间盘的应力和位移值进行比较研究时, 发现成人与成年猕猴在不同工况下椎间盘应力峰值均位于 C5-6, 由此表明 C5-6 节段椎间盘退变概率最大, 且二者的椎间盘应力值与位移值变化趋势一致; 二者比较均无显著性差异, 为后续构建理想的动物模型提供了理论依据与技术支持。



中 B-129-0017

基于 CiteSpace 和 VOSviewer 的解剖学领域研究热点与趋势分析

罗紫艺 江艳玲 朱金凤 张维炊 杨春(yangchunangel@163.com) 广东医科大学人体解剖学教研室 东莞 523808

解剖学作为医学领域的基石，其发展关系着众多学科以及领域，受到国内外研究人员的广泛关注。然而，如何快速整合并掌握该领域的前沿信息，是研究者们面临的难题之一。因此，本研究旨在利用 CiteSpace 和 VOSviewer 分析解剖学领域研究，为探索解剖学领域研究热点及研究趋势提供一个新的视角。本研究从 Web of Science 核心馆藏数据库中收录 2013-2023 年解剖学相关文献 4637 篇，利用 CiteSpace 和 VOSviewer 对文献时间分布、空间分布、关键词、期刊引用等方面进行分析，构建知识图谱。时间分布上，2013-2023 年文献发表总体呈现波动状态。空间分布上，美国、英国、中国发文总量最多，其中以美国占据中心领导地位。对关键词以及引文突现进行分析可知研究热点和趋势主要集中于数字化技术在教育模式及临床应用中的改革创新以及应用推广。在解剖学教育中，出现了如 AR、VR、移动学习、可视化和 3D 打印技术等的新技术应用，这些技术克服了传统解剖教学依赖实体标本的局限性，提高了教学效果。在临床实践中，数字化技术为医生提供了精准化、个性化的解剖学知识支持，如通过数字化解剖学模型预测患者手术风险和预后效果，以及通过手术模拟器培养临床医师的实践能力。随着数字解剖学技术的不断深化，促进数字化技术在教育、临床、科研等方面的多元化应用已成为解剖学未来发展的必然趋势。

● 中 B- 人体解剖学与数字解剖学 ● Poster

中 B-129-0002

掌骨干骨折固定方式在手指运动中的生物力学评估：有限元研究

刘明瑞 (18822687636@163.com) 罗林聪 林涛 吕晓宇 Manoj Kumar Vashisth 李佳莹 沈剑麟 许林 黄文华 大理大学基础医学院 大理 671003

本研究通过有限元分析模拟了四种常用掌骨干斜形骨折固定方法在手指运动中的生物力学性能，旨在为临床选择最佳固定方法、指导早期康复治疗并减少并发症风险提供依据。通过构建近端指骨的动态运动，分析背板、髓内钉、克氏针和螺钉固定方法的应力、位移和分布情况。结果表明，背板固定在 60° 屈曲和 20° 外展时具有较高稳定性，但应力较高，增加了失败风险。髓内钉稳定性与背板相似，并在 20° 内收状态下优于背板。克氏针在屈曲时表现出最高应力，存在较大失败风险和不安定位移。螺钉在所有运动状态下应力较低，但稳定性较差。应力和位移分布显示，背板、髓内钉和克氏针应力主要集中在骨折线附近和近端掌骨处，而螺钉的应力部分由螺钉承担。综上，背板固定在多数情况下提供了最佳稳定性，特别是在屈曲和外展时，但高应力水平增加了失败风险。髓内钉与背板稳定性相近，且在某些状态下表现更佳。克氏针在屈曲时失败风险最高。螺钉则提供较低的失败风险，尽管稳定性较差。这些发现为掌骨干骨折的治疗提供了重要参考和手术选择策略。



● 中 B- 人体解剖学与数字解剖学 ● Abstract

中 B-129-0007

发现胸骨后肌 1 例

张健清 徐明伟 高森宇 孙嘉宁 武婉君 陈卓允 张金阳 张洁 李振中 刘真 (zhen@sdu.edu.cn) 山东大学基础医学院
人体解剖与神经生物学系 济南 250012

发现特殊的肌肉变异不仅可以增添新的解剖学数据，而且可为相关的临床手术操作提供新的解剖学参考依据。在解剖颈根部发现 1 例额外肌肉变异，以往未见类似报道，拟命名为“胸骨后肌”。此变异肌起点处具有浅、深两层腱膜，浅层腱膜起自右侧肩胛舌骨肌上腹前方距离舌骨止点 37.00mm 处，向下走行 18.74mm 后与深层腱膜交叉并延续为肌纤维；深层腱膜有两个头，左侧头起自右侧肩胛舌骨肌上腹后方，右侧头起自胸锁乳突肌深面的筋膜，两个头呈“Y”型向下走行，融合为一宽腱膜，继续向下走行 28.90mm 后，此深层腱膜与前述浅层腱膜汇合并继续向下走行，于甲状腺右外侧延续为肌纤维，逐渐变宽变厚，最终延续为一梭形薄肌。此变异肌位于颈内静脉左侧，左侧缘覆盖右侧甲状腺侧叶外侧部分，右侧缘覆盖右颈总动脉前方。其后与颈动脉鞘结合较紧密，而与甲状腺鞘结合较疏松，最终经胸骨柄后方止于上纵隔内右侧头臂静脉左侧缘处。此变异肌与右侧肩胛舌骨肌的关系密切，但此变异肌较肩胛舌骨肌更为薄弱，收缩能力远小于肩胛舌骨肌，因此肩胛舌骨肌对此变异肌的作用应占主导地位。当肩胛舌骨肌收缩时，可能会牵拉上提此变异肌，从而对甲状腺、颈动脉鞘以及上纵隔内结构产生影响。实施颈部或上胸部手术时，若经肩胛舌骨肌或上纵隔，亦需格外留意此变异肌，以免损伤其功能。手术缝合时单独作为一块肌肉进行缝合，以免因肌纤维对合错位而引起术后不适。

中 B-129-0011

人体节段编组的自然演化计算

王维兵 (e-mail:wangtianshou16440@163.com) 高青县水利局 淄博 256300

人体胚胎学与解剖学阐明，人体从 12~16 个卵裂球、42~44 对体节，到成人 206 块骨、16 对恒牙、12 对脑神经及终神经与 31 对脊神经、14 或 15（脊髓胸 1~腰 2 或腰 3）节交感神经低级中枢、4 对脑副交感节和 3 节骶副交感核。但对于为何演化成这些编组数据？为何寰枕关节界线的具体位置仍存在争议？为何 32~34 节脊椎形成 26 骨脊柱？为何 10 对乳牙被 16 对恒牙取代？为何大脑皮质形成 52 对 Brodmann 分区或 54 对分区？没有给出令人信服的解释。本研究根据人体由体节演化迁移而成，将骨头块数换算成与体节-神经对应的节数，建立人体节段编组演化的数学模型： $Z/\bar{n}=C$ ，式中： Z -自然数列（始于 1）中的逐个自然数， $\bar{n}$ -有限除数自然数列， C -整数或有限小数。经计算得到序号- $\bar{n}$ 数列：1- $\bar{2}$ 、2- $\bar{6}$ 、3- $\bar{8}$ 、4- $\bar{10}$ 、5- $\bar{12}$ 、6- $\bar{16}$...37- $\bar{148}$...65- $\bar{288}$ 、89- $\bar{432}$...。该自然演化数列阐明：人体 42 与 44 体节-神经、144 骨节， $\bar{2}$ 、 $\bar{6}$ 、 $\bar{8}$ 、 $\bar{10}$ 、 $\bar{12}$ 、 $\bar{16}$ 决定肋骨胸椎编组， $\bar{12}$ 、 $\bar{16}$ 决定卵裂球数， $\bar{12}$ 决定第 1~7 体节形成 5（4）枕节+2（3）颈节的枕骨与枢椎段及以 5 枕节+2 颈节为主的寰枕关节、胸骨体与胸骨柄结构与此相应， $\bar{16}$ 决定骶骨与尾骨、胸骨体与剑突结构，序号 $\times 144/\bar{n}$ 决定整个脊椎脊柱的整合。详尽计算能够较好地描述人体躯体及周围神经编组，但与内脏和脑部编组的关系尚待进一步研究。



中 B-129-0013

数字化时代下数字人系统在人体解剖学实验教学中的应用

朱凯丹 (2327240455@qq.com) 孙德鹏 严志文 刘锦峰 雷发春 段程瑞 昆明医科大学海源学院人体解剖学实验室
昆明 651200

人体解剖学作为重要的基础医学主干课程，是研究正常人体形态结构的科学，也是实验性、实践性很强的学科。在当今数字化浪潮中，数字能力已成为衡量高素质技能型人才的关键维度之一，提升大学生数字素养成为各个高校在数字时代亟待重视和应对的重要议题。在数字化时代下，数字化人体解剖实验室在实验教学中显现出重要功能和作用，数字化人体解剖学实验室的科学化管理及高效教学，为培养医学人才提供了基础，实现以学生为主导的人体解剖学教学，学生自学、阶段性测试、数字化学习、个性化学习。充分利用实验室数字化设备和仿真模型开展理论与实验教学，目的在于注重培养学生学习的自主性、能动性和积极性。数字人系统正推动解剖学从“静态记忆”转向“动态交互”，以平衡技术便利性与实践经验的积累，为精准医疗提供新范式。我院人体解剖学数字实验室由“ECDH 数字人解剖系统教师端”、“ECDH 数字人解剖系统学生端”、“医学虚拟仿真实验教学平台”等组成，已成为国内一流的数字化解剖实验室。通过数字人解剖系统进行实验教学，可以加强实验教学工作的科学化、规范化管理，建立良好的实验教学秩序，提高实验教学质量。

中 B-129-0016

臂丛变异合并肌皮神经融入正中神经变异 1 例

王常安 李芊一 曹润德 刘姿言 苏喜悦 阿尔深·叶尔哈孜 梁茗威 李振中 刘真 (zhen@sdu.edu.cn) 山东大学基础医学院人体解剖与神经生物学系 济南 250012

臂丛变异、肌皮神经变异、正中神经变异较为常见，发现特殊的变异对于臂丛的临床手术操作具有重要的参考价值。在进行腋窝解剖时，发现 1 例身高为 173cm 的成年男性右侧臂丛变异合并肌皮神经融入正中神经变异。臂丛外侧束（直径 4.12mm）向内侧发出一个较细的类似于正中神经外侧根（直径 0.83mm，长度 1.80cm）小支，向外侧发出一个直径为 0.70mm、长度为 3.20cm 的喙肱肌支后，臂丛外侧束几乎是直接延续为共干的肌皮神经和正中神经，在此称为上共干（直径 3.71mm），上共干沿肱二头肌内侧深面、肱动脉外侧下行 6.03cm 后，接受由外侧束发出的小支和内侧束发出的类似于正中神经内侧根（直径 1.93mm，长度 1.00cm）的汇合支（直径 2.49mm，长度 3.22cm），汇合成新的共干，在此称为下共干（直径 4.61mm）。下共干下行 2.88cm 后，发出一个直径为 1.45mm 的肱二头肌支，向外下方走行 2.00cm 后，分为 4 个小支进入肱二头肌。发出汇合支后，下共干的直径为 4.12mm，下共干继续下行 5.16cm 后，向外下方发出一个直径为 2.62mm、长度为 1.17cm 的汇合支，随即分为直径为 0.98mm 的一个肱肌支，向外下方走行 3.31cm 后进入肱肌，另一个直径为 1.20mm 的皮支向外下方延续为前臂外侧皮神经。发出肱肌支和皮支的汇合支之后的下共干是直径为 3.83mm 的正中神经。该例变异为臂丛手术操作的神经辨认和臂部手术操作的臂肌各肌支的来源辨认提供了有益的解剖学参考数据。



● 中 C- 体质调查 ● Podium

中 C-129-0003

肾丛神经消融的应用解剖

潘昌霖 (andypcl@sina.com) 郭金萍 乔梁 郭晓丹 黄会龙 海军军医大学人体解剖学教研室 上海 200433

为了研究肾丛神经的走行，从而为临床肾交感神经消融治疗顽固性高血压提供解剖学依据。本实验对 30 例遗体捐献者的双侧肾及肾动脉周围进行解剖，观察肾丛神经走行的位置和类型，测量和统计不攀附肾动脉的肾丛神经支的长度及其与肾动脉的距离。根据肾丛神经走行过程中与肾动脉主干及其分支的位置关系，将其分为以下 3 种类型。（1）全攀附型：所有肾丛神经全程攀附肾动脉动脉表面，即肾动脉主干（或副肾动脉）及其分支的血管外膜，直至进入肾内；（2）分支半跨越型：部分肾丛神经的分支不攀附肾动脉主干近侧段，行至肾动脉远侧段才攀附到肾动脉及其分支即肾段动脉表面，然后随分支进入肾内；（3）分支全跨越型：部分肾丛神经的分支在走行过程中全程不攀附肾动脉及其分支，直接进入肾内。按侧数统计，肾丛神经全攀附型占 60%，分支半跨越型占 30%，分支全跨越型占 10%；按个体统计，两侧肾丛神经全攀附型占 40%，单侧或双侧分支半跨越或全跨越型共占 60%。男性与女性及两侧肾丛神经的走行差异无统计学意义。因此肾丛神经单侧或双侧出现分支半跨越或全跨越的走行差异，很可能是导致不同研究中肾交感神经射频消融治疗效果不一致的重要原因之一。

中 C-129-0007

引体向上·仰卧起坐与中学生近视的相关性研究

郭鹏 (kakuchinadl@163.com) 沈阳体育学院运动健康学院 沈阳市 110102

近视是一种普遍存在的视觉障碍，是世界范围内发病率较高的眼病。我国青少年近视的患病率逐年攀升，并呈现出低龄化的趋势。2024 年国家卫生健康委员会公布的最新数据，2022 年我国儿童青少年总体近视率为 51.9%，虽然比 2018 年下降 1.7 个百分点，但是近视防控工作仍然持续加大力度。有研究表明，睡眠、生活方式以及体质条件等因素对儿童青少年近视产生影响。

因此，本研究深入探讨中学生体质条件与近视的关联，综合评价体质条件相关因素的近视风险，为提出有针对性的近视防控策略提供科学依据。

以中国教育追踪调查 2015 年数据为对象分析近视的影响因素。采用 X² 检验对数据进行单因素分析，采用多因素 logistic 回归分析模型分析近视与身体素质、日常活动和生活习惯的影响因素。

近视学生，男性占 43.3%、女性占 50.2%。男性引体向上次数 10 次以上的中学生不近视率在 50% 以上 ($p < 0.05$)，完成老师作业时间在 2 小时以下的学生不近视率在 70% 以上 ($p < 0.05$)。睡眠时间 8 小时以上的男性学生不近视率达到近 85% ($p < 0.05$)，女性学生达到 74% ($p < 0.05$)。多因素 Logistic 回归分析显示，男性引体向上次数越高，完成老师布置的作业时间越短，近视发生率越低；女性学生睡眠时间越长近视发生率越低。

提高身体素质，保证充足的睡眠与缩短用眼时间，有助于改善儿童少年的视力。



中 C-129-0008

家长的运动习惯与中学生身体素质的相关性研究

郭鹏 (kakuchinadl@163.com) 沈阳体育学院运动健康学院 沈阳市 110102

近年来学生体质呈下滑趋势，主要由于体育活动时间不足。因为重视文化课成绩以及不同家庭生活习惯的原因，学生缺乏运动意愿，所以提高学生身体素质是学校、社会和家庭共同的责任。

本研究深入探讨中学生体质条件与家长运动习惯的关联，综合评价体质条件相关因素的影响，为提出有针对性的家校共育策略提供科学依据。

以对中国某市 887 名中学生为对象分析身体素质的家庭影响因素。采用 X² 检验对数据进行单因素分析，采用多因素 logistic 回归分析模型分析家长运动习惯、中学生 BMI 与中学生身体素质的关系。本研究以 50 米跑、立定跳远成绩体现身体素质情况。多因素 Logistic 回归分析显示，家长没有运动习惯的中学生 50 米跑成绩显著低于家长有运动习惯的中学生成绩 ($p < 0.05$)，BMI 指数越大 50 米成绩越低 ($p < 0.05$)。立定跳远成绩看，家长的运动习惯有无以及 BMI 指数分别对成绩产生显著影响 ($p < 0.05$)。

家长的运动习惯对中学生提高身体素质有着显著相关性，家长参与日常运动，有助于提高中学生身体素质。

中 C-129-0010

普拉提训练改善青少年特发性脊柱侧弯的效果研究

谭旭阳 (2690173131@qq.com) 汪东明 阜阳师范大学 阜阳 236011 阜阳师范大学体育学院

背景 我国青少年特发性脊柱侧弯 (AIS) 检出率逐年上升，该病发病隐匿，易错过治疗时机，未经治疗会造成终身不可逆影响，因此有效的保守治疗意义重大。

目的：探讨普拉提训练对青少年 AIS 的干预效果。

方法 结合青少年器官机能发展及运动能力阶段性特征，研究普拉提训练如何基于青少年体质发育敏感期进行干预，即通过特定动作强化核心肌群、拉伸及加强脊柱周围肌肉，并结合核心区功能性运动与呼吸。

结果 研究表明，普拉提训练能有效增强脊柱柔韧性、机体平衡及协调性，改善躯干肌肉力量与脊柱稳定性。同时普拉提训练还能提高机体深层次肌群力量，扩大肢体和躯干活动幅度，利于脊柱侧弯的改善，矫正不良体态。

结论 普拉提训练是改善青少年 AIS 的有效手段，可根据青少年体质发育特点进行全身协调运动干预，临床应用效果显著，为青少年 AIS 的保守治疗提供了新途径。



中 C-129-0013

妊娠期浮肿指数与年龄及体成分相关性的横断面研究

黄彬彬, 黎芳采, 韦琳钰, 刘永新, 玉洪荣(gxmu_yhr@qq.com) 广西医科大学基础医学院 南宁 530021 广西高校人体发育与疾病研究重点实验室 南宁市妇幼保健院

妊娠期水肿是常见的生理现象, 但其与孕妇年龄及体成分的关联机制尚未明确。本研究基于横断面调查数据, 探讨妊娠期妇女浮肿指数的年龄分布特征及其与体成分的相关关系, 为个体化孕期健康管理提供依据。纳入 450 例健康单胎妊娠妇女, 采用生物电阻抗法测量其浮肿指数及体成分参数, 并应用 Pearson 相关分析、单因素方差分析、独立样本 t 检验及 Logistic 回归进行统计分析。结果显示: (1) 年龄相关性: 浮肿指数随年龄增长呈显著负相关 ($r=-0.161$, $P<0.01$), 20-29 岁组均值最高 (0.47 ± 0.02), 30-39 岁组次之 (0.46 ± 0.04), ≥ 40 岁组最低 (0.45 ± 0.06), 组间差异具有统计学意义 ($F=5.478$, $P=0.004$); (2) 体成分差异: 以 0.4 为界值分组, 高浮肿指数组基础代谢率 (1262.84 ± 104.03 vs. 1315.91 ± 87.78)、去脂体重 (42.43 ± 3.85 kg vs. 39.07 ± 4.32 kg) 与肌肉量 (39.08 ± 4.30 kg vs. 34.17 ± 4.55 kg) 显著低于低浮肿指数组 ($P<0.01$); (3) 体成分相关性: 浮肿指数与基础代谢率 ($r=0.132$, $P=0.005$)、去脂体重 ($r=0.141$, $P=0.003$)、肌肉量 ($r=0.138$, $P=0.003$) 有强相关性。在 Logistic 回归模型中, 校正年龄、BMI 和孕周后, 肌肉量与浮肿指数 ≥ 0.4 显著相关 ($OR=1.91$, $95\%CI=1.18-3.09$)。这表明妊娠期水肿发生与年龄相关的体成分改变密切相关, 基础代谢率和肌肉量可作为妊娠期水肿风险的预警指标。

● 中 C- 体质调查 ● Abstract

亚太 A1-129-0012

Hemp Seed Fiber Alleviates Splenic Inflammation and Apoptosis in Aged Mice via PI3K-Akt Pathway

Haojie Tang, Hanjie Jin, Zhikun Bai
Youjiang Medical University For Nationalities, Baise

Objectives Splenic senescence is closely linked to chronic inflammatory dysregulation and impaired apoptotic homeostasis in aging organisms. This study sought to determine whether hemp seed fiber exerts ameliorative effects on age-associated splenic inflammation and apoptosis, specifically investigating its interaction with the PI3K-Akt pathway.

Methods Aged mice were divided into a control group and low-, medium-, and high-dose HSDF groups, and treated for 12 weeks. Mice underwent intraperitoneal pentobarbital sodium anesthesia (50 mg/kg) before procedures, followed by humane euthanasia via cervical dislocation. H&E staining was performed to assess splenic histopathology, TUNEL fluorescence staining to quantify apoptotic rates, and qPCR/Western blot analyses to evaluate the expression levels of inflammatory mediators (TNF- α , IL-6, IL-10, Arg-1) and key signaling molecules (PI3K, Akt, Bcl-2/Bax ratio).

Results The low-dose HSDF group exhibited restored splenic white pulp architecture and reduced inflammatory infiltration ($P<0.05$). A dose-dependent reduction in TUNEL-positive cell rates was observed ($P<0.05$). Molecular analysis showed that low-dose HSDF significantly suppressed mRNA expression of pro-inflammatory factors (TNF- α , IL-6) and up-regulated mRNA levels of anti-inflammatory factors (IL-10, Arg-1) ($P<0.05$) while enhance phosphorylation levels of PI3K and Akt, as well as the Bcl-2/Bax ratio.

Conclusion Hemp Seed Dietary Fiber ameliorates splenic inflammation and cellular apoptosis in aged mice by activating the PI3K-Akt signaling pathway, which suppresses inflammatory cytokine release and modulates apoptosis-related protein expression, thereby providing a mechanistic foundation for delaying immune senescence. These findings position HSDF as a nutraceutical



candidate for immunosenescence intervention, with PI3K-Akt pathway modulation serving as a potential therapeutic target for age-related splenic dysfunction.

Key Words: Hemp seed diet fiber ; spleen; immune senescence; inflammation

Ethical approval: Laboratory Animal Ethics Committee of Youjiang Medical University For Nationalities (2024032901)

Foundation : Youjiang Medical University for Nationalities high-level Talent Project (RZ2300000823).

中 C-129-0001

中国云南镇康德昂族体质特征

张兴华(zxhwf1981@126.com) 卢政达 吕婧祎 宇克莉 肖瑶 高雯芳 程智 高新颖 姚玥彤 刘鑫 包金萍 天津师范大学生命科学学院 天津 300387 天津师范大学体育科学学院

2022 年研究组调查了云南镇康德昂族 100 例成年人的体质指标, 并与芒市德昂族的体质指标进行了对比分析。结果如下: 镇康德昂族男女 53 项指标在男女性别间存在显著性差异, 除大腿围外, 男性 52 项指标均大于女性。德昂族男女多有上眼睑皱褶与蒙古褶, 眼外角多高于眼内角, 鼻背侧面观以直型为主, 耳垂多为圆形, 下颏类型多为直型, 扣手多为右型, 交叉臂多为左型, 拇指类型多直型。男性身高矮型率最多, 女性多为亚中等型身高。镇康与芒市德昂族男女均为高头型与宽骨盆型; 镇康与芒市德昂族男性为宽肩型与中胸型; 镇康与芒市德昂族女性为狭头型、中躯干型与宽胸型。镇康德昂族男女与布朗族、佤族体质特征最为接近, 与苗族、侗族和壮族较为接近。

中 C-129-0009

体育锻炼对老年人体质干预效果的 meta 分析

黄津容, 杨渊, 唐觅 (meet_tang@163.com) 成都大学 成都市 610106

本研究通过检索中国知网、维普、Web of Science、PubMed 等数据库, 严格按照纳入排除标准筛选文献, 系统分析纳入的 20 项随机对照试验 (共 1713 例样本), 探讨体育锻炼对老年人体质的干预效果, 采用 Cochrane 量表评估方法学质量, 并采用 Revman5.3 软件进行异质性检验及亚组分析。结果显示: 体育锻炼对老年人体质整体改善效果显著 ($SMD=0.29$, $P<0.01$), 尤其在 BMI、肺活量、力量、耐力、柔韧及平衡能力方面表现突出 ($P\leq 0.01$), 但灵敏素质未见显著变化。性别差异分析表明, 男性在 BMI ($SMD=-0.43$)、肺活量 ($SMD=1.47$) 提升上优于女性 ($P<0.05$), 而女性柔韧性改善更显著 ($SMD=0.55$, $P<0.01$), 运动锻炼对老年人体质的总体干预效果男性 ($SMD=-0.05$) 优于女性 ($SMD=-0.08$)。进一步亚组分析揭示, 运动方案参数显著影响干预效果: 中等强度 ($SMD=0.21$)、每周 3-5 次 ($SMD=0.10$)、持续 42-48 周 ($SMD=0.40$)、单次 30-40 分钟 ($SMD=0.26$) 及以太极拳、瑜伽为主的养生运动 ($SMD=0.04$) 效果最佳 (均 $P\leq 0.05$)。研究表明, 长期规律的中低强度养生运动对改善老年人肺活量、预防跌倒及慢性疾病具有重要价值, 建议采用每周 3-5 次、每次 30-60 分钟、持续 42-48 周的锻炼方案。

关键词: 体育锻炼 老年人 体质 meta 分析



中 C-129-0011

达斡尔族、鄂伦春族和鄂温克族体部特征比较

于明扬(1619044548@qq.com) 温有锋 锦州医科大学生物人类研究所 锦州 121001

通过对达斡尔族、鄂伦春族和鄂温克族成人体部特征进行调查,对比三个民族体部特征的差异,为体质人类学数据库建设、民族健康政策制定及进化适应性研究提供基础数据。本次研究采用《人体测量方法》,对内蒙古自治区及黑龙江省达斡尔族 287 名成人(男性 136 人,女性 151 人),鄂伦春族 119 名成人(男性 37 人,女性 82 人),鄂温克族 267 名成人(男性 165 人,女性 102 人)的 22 项体部指标进行调查。所得数据采用 SPSS26.0 软件,进行描述性统计、单因素方差分析等统计学分析。结果显示,三个民族男性体部测量指标除体重、骨盆宽、上肢全长外均存在差异。三个民族女性体部测量指标除坐高、全臂长、胸围外均存在差异。基于聚类分析发现,达斡尔族和鄂温克族体部特征更为接近,与鄂伦春族存在一定差异。达斡尔族男性表现为超中等身高、宽肩、中骨盆、长躯干、亚短腿型;达斡尔族女性表现为中等身高、宽肩、宽骨盆、长躯干、亚短腿型;鄂伦春族男性表现为中等身高、宽肩、中骨盆、长躯干、短腿型;鄂伦春族女性表现为亚中等身高、宽肩、宽骨盆、长躯干、短腿型;鄂温克族男性表现为超中等身高、宽肩、中骨盆、中躯干、亚长腿型;鄂温克族女性表现为中等身高、宽肩、中骨盆、中躯干、中腿型。

中 C-129-0012

西藏藏族骨量减少与骨骼肌的关系研究

张秋曦(2363466990@qq.com) 锦州医科大学生物人类学研究所 锦州 121001

通过分析评价西藏藏族骨量减少与骨骼肌的关联性,筛选预测西藏藏族骨量减少发生风险的良好骨骼肌相关指标及其切点值。本研究采用整群随机抽样方法选取拉萨及日喀则市 18 岁以上的成年西藏藏族居民 2296 人(男性 895 人,女性 1401 人)为研究对象,使用超声骨密度仪测量研究对象的骨密度,使用生物电阻抗分析仪测量四肢肌肉量,并计算四肢骨骼肌质量(appendicular skeletal muscle mass, ASM)、四肢骨骼肌质量指数(appendicular skeletal muscle mass index, ASMI)、四肢骨骼肌体重比(skeletal muscle index, SMI)及四肢骨骼肌 BMI 比(ASMBMI),所得数据采用 SPSS26.0 软件进行 ROC 曲线及 Logistic 回归分析评价各骨骼肌指标与骨量减少风险的关联性。结果显示:西藏藏族骨量减少与骨骼肌存在相关关系。拉萨女性 ASM、ASMI、SMI、ASMBMI 指标曲线下面积有统计学意义,预测切点值分别为 16.10kg、6.051kg/m²、0.276、0.695;日喀则男性 SMI 指标曲线下面积有统计学意义,预测切点值为 0.380;日喀则女性 ASM、ASMI、SMI、ASMBMI 指标曲线下面积有统计学意义,预测切点值分别为 15.15kg、6.365kg/m²、0.312、0.682。Logistic 回归分析显示拉萨女性 ASM、ASMI,日喀则女性 ASM 是预测骨量减少发生风险的良好预测指标。



● 中 D-运动解剖学 ● Podium

中 D-129-0001

Exercise activity promotes social interaction behavior and ameliorates anxiety or depressive levels in mouse models.

Yan Zhibo, Sun Jinhao (Sunjinhao@sdu.edu.cn). Department of Anatomy and Neurobiology, School of Medicine, Shandong University, Jinan 250012

Increasing evidences have already suggested that exercise activities, such as running and walking can bring significant benefits to both physical and mental health. Moreover, exercise decreases stress associated anxiety or depressive behaviors which closely related with social interaction behaviors. Social dominance behavior is an important interaction pattern among individuals in a social group, which can establish hierarchies or rank orders and maintain social stability. Dominance hierarchies determine the survival and reproductive success of species. It is unclear the relationship between social dominance behavior and stress levels, and whether exercise may affect dominance hierarchies. In this study, we investigated the hierarchy orders in mice with the social dominance tube test, and the stress levels were also determined. The data showed that the subordinate mice exhibited high stress levels than the dominant mice, while exercise could increase the hierarchy order and decrease the stress behavior including anxiety or depressive behavior after five weeks running. Moreover, when inhibiting the stress levels with fluoxetine hydrochloride of subordinate mice, their dominance status was elevated. Our study indicates that exercise training could affect social dominant status through modulating stress levels.

中 D-129-0002

《运动解剖学》课程“学、讲、赛、评”四维一体教学模式的实践研究

王文龙(wangwenlong2012@yeah.net) 庞俊华 张明靖 高峰 平顶山学院体育学院 平顶山 467000

本研究聚焦于《运动解剖学》课程的教学改革，综合运用问卷调查法、深度访谈法与实验对比法，旨在通过构建学、讲、赛、评四维一体的教学模式，有效提升学生的学科素养与实践能力，积极响应国家政策文件对于深化教育教学改革、提升人才培养质量的号召。首先通过问卷调查全面把握学生的学习需求、兴趣及学习习惯，为教学模式的设计提供实证基础。随后，采用深度访谈法与学生及教师进行面对面交流，深入挖掘传统教学模式存在的问题与改进空间。在此基础上，选取两个平行班级作为实验组与对照组，实验组实施学、讲、赛、评四维一体的教学模式，对照组则维持传统教学模式。通过细致观察与量化分析，全面评估两种教学模式下的学生学习成效。研究结果显示，实验组学生在《运动解剖学》课程的理论学习、实践操作、团队协作及问题解决能力等方面均显著优于对照组。问卷调查与访谈结果亦表明，实验组学生对四维一体教学模式给予了高度评价，认为该模式有助于激发学习兴趣、提升实践技能与团队协作能力。综上所述，本研究通过科学的实证方法验证了学、讲、赛、评四维一体的教学模式在《运动解剖学》课程中的有效性，显著提高了学生的学习成效与实践能力，促进了其综合素质的全面发展。这一研究成果不仅丰富了体育教育领域的教学模式研究，还与其他专业课程的教学改革提供了有益借鉴。



中 D-129-0003

短波红外活体成像技术动态监测运动系统的解剖结构与功能评估

陈俊(biochenjun@fudan.edu.cn) 复旦大学附属华山医院运动医学科 上海 200040 复旦大学上海医学院

运动系统是人体的重要组成部分，但其结构的高度复杂性和动态演变特性给运动系统成像带来了诸多困难。传统成像技术，如 X 射线和计算机断层扫描，在时空分辨率以及捕捉瞬时动态图像方面存在固有局限性，难以满足运动系统成像的高精度需求。相比之下，短波红外活体成像技术凭借其高时空分辨率、高成像速度和无辐射等显著优势，被认为具有广阔的应用前景。本研究开发了一种基于 PbS 量子点的短波红外活体成像技术，选用 Balb/C 裸鼠和 C57 小鼠作为模型动物，通过尾静脉注射 PbS 量子点，获取骨骼及其相应血管的短波红外荧光图像，同时与传统成像结果进行对比分析。此外，还将 PbS 量子点皮下注射至小鼠尾部和后肢，以获取淋巴管的短波红外荧光图像。实验结果显示，与传统成像技术相比，PbS 量子点能够实时监测运动系统的血运情况，并借助血液循环快速识别主要骨骼结构，提供更高分辨率的骨骼结构图像，最佳观察时间点为注射后 24 小时。在小鼠尾部和后肢的淋巴管中，PbS 量子点能够清晰、快速地显示淋巴管的形态。通过分析 PbS 量子点在淋巴管中的分布，能够直接观察到淋巴泵的存在，表现为淋巴管中的分段收缩区域，大小约为 1 cm。此外，组织学和血液生化分析表明 PbS 量子点在体内具有良好的生物相容性和代谢特性。综上所述，与传统成像技术相比，基于 PbS 量子点的短波红外活体成像技术能够提供实时、全面、高分辨率的运动系统结构图像和功能评估，进而推动运动医学的进一步发展。

中 D-129-0014

疲劳状态下羽毛球爱好者优势侧与非优势侧下肢单腿落地过程踝关节的生物力学特征

黄治官 (63649658@qq.com) 广州体育学院运动与健康学院 谢中浩 广州体育学院研究生院 广州 510500

单腿落地是多种运动项目中常见且具有较高损伤风险的动作，尤其是踝关节在此过程中承受着显著的冲击载荷。本研究采用多因素混合设计探讨疲劳状态下羽毛球爱好者优势侧与非优势侧下肢在单腿落地过程中踝关节的生物力学特征。研究招募 24 名羽毛球爱好者（男女各 12 人），在个性化高度（最大垂直跳跃高度的 70%）的单腿落地平台上进行疲劳和非疲劳状态下的单腿落地测试。通过 8 个摄像头 Vicon 动作捕捉系统和 2 块 AMTI 测力台，同步收集踝关节的背伸角度、矢状面活动度、内翻力矩以及垂直地面反作用力等数据，用百分比差评估下肢间的不对称性。结果发现，疲劳状态下，踝关节的背伸角度显著大于未疲劳状态 ($p < 0.05$)，而内翻力矩的百分比差异值在疲劳状态下显著增加 ($p < 0.05$)，提示损伤风险。此外，优势侧与非优势侧在踝关节内翻力矩和背伸角度上表现出显著差异 ($p < 0.05$)。男性在踝关节背伸角度和矢状面活动度上显著大于女性 ($p < 0.05$)，而女性在踝关节内翻力矩和冠状面活动度上显著大于男性 ($p < 0.05$)。研究提示，疲劳状态下，踝关节内翻力矩的不对称性增加，可能导致踝和膝关节的损伤风险上升。性别和侧别的交互作用进一步揭示了优势侧和非优势侧踝关节在运动模式上的差异，女性更容易表现出动态膝外翻，而男性在落地时承受更高的冲击载荷。



中 D-129-0020

“数字化赋能运动医学新技术”——三维重建探究 ACL 重建位点对膝关节屈伸的影响

詹美智¹ 陈骏杰¹ 李正南² 蔡幸健²

1.南昌大学附属赣州医院 江西 赣州 318000

2.南方医科大学南方医院赣州医院（赣州市人民医院）江西 赣州 318000

第一作者：詹美智

邮箱：2363565832@qq.com

通过重建前交叉韧带断裂（ACL）患者术后三维模型，探究胫骨、股骨解剖重建位点（TCI 与 FCI）的位置区间以及与毗邻骨性标志的联系，同时进一步探究 TCI、FCI 解剖位点区间偏差对膝关节屈伸的影响。首先重建 20 例 ACL 术后胫骨、股骨三维模型，建立胫骨平面标准坐标系，观察并记录 TCI 的分布区间、角度区间以及与胫骨平台前后径左右径的比值；同法构建股骨三维模型，观察并记录 FCI 与股骨髁后皮质的垂直距离 D1、ADC 到股骨前骨缘距离 L1 以及与 FCI 的水平距离 I1，计算 I1 与 L1 的比值 P1；同时以经过股骨髁间窝中点的矢状面为截面，以髁间切迹的最大高度为高度轴，Blumensaat 线外侧髁的总矢状直径为长度轴，绘制 4X4 标准刻度的等分网格，记录 FCI 的网格长度轴与高度轴分布百分比（A%、B%），屈伸功能恢复评价指标：膝关节活动度 ROM（range of motion）评估，统计相关数据并进行分析。综上所述得出：1、TCI 位置区间为（ $0.89\pm 0.12, 3.25\pm 0.27$ ），与胫骨髁间隆起的夹角为 $62.35\pm 2.73^\circ$ ；2、D1 值为 6.31 ± 0.63 mm，P1 值为 $43.13\%\pm 3.19\%$ ；3、FCI 中 A%为 $27.5\%\pm 3.2\%$ 、B%为 $34.1\%\pm 4.1\%$ ；4、TCI、FCI 的位置区间对膝关节屈伸功能影响较大，其中 TCI 主要影响膝关节屈曲，FCI 影响伸直效果， $P<0.05$ 具有统计学意义。本研究可为胫骨、股骨止点的术中精准定位提供理论依据与参考，改善患者预后。

中 D-129-0021

主动活动促进健康的活性组织模型

刘承宜(liutcy@scnu.edu.cn) 华南师范大学体育科学学院 广州 510006

本文提出活性组织模型解释工作水平对健康的促进作用。每日的能量消耗分为食物热效应、主动活动和基础代谢，体成分可以分为骨骼肌、脂肪和其它，本文分别研究三种分量在总量的占比。每一项活动都有靶组织。主动活动是卡尼曼的系统 2 启动的活动，所增加的靶组织称为活性组织。无论是能量消耗，还是体成分，假定每个人的三个占比几何均值守恒，本文从理论上通过研究三个占比的变化讨论活性组织的健康效应。研究发现，1. 基础代谢占比就是健康标尺，基础代谢占比越低/高，健康水平越高/低。2. 工作水平越高，体力/脑力活动的主动活动占比越高/低，基础代谢占比越低。3. 主动活动分为脑力活动、普通体力活动和竞技体力活动，普通体力活动存在久坐和肥胖的副作用；脑力活动不存在久坐的副作用，肥胖的副作用也小于普通体力活动。4. 体力活动的活性组织为骨骼肌和神经回路，普通活动的主动活动占比增加引起基础代谢占比和食物热效应占比的下降，竞技活动的主动活动占比增加引起基础代谢占比的下降和食物热效应占比的增加。5. 不同物种脑质量和脂肪质量显著相关。脑力活动的活性组织是脂肪和神经回路，主动活动占比的降低引起基础代谢占比的下降和食物热效应占比的增加。因此，活性组织的增加促进健康水平的增加。



中 D-129-0024

髌股关节痛人群坐站转移过程中神经肌肉调控特征分析：基于肌肉协同与脊髓映射视角

李磊 (lilei120800@163.com) 柳璇 刘晔 北京体育大学运动解剖学教研室 北京 100080

本研究旨在从肌肉协同与脊髓映射的角度分析髌股关节痛人群在坐站转移（STS）过程中神经肌肉调控的特征，为以髌股关节痛为代表的运动功能障碍性疾病提供神经肌肉控制的理论支持。本研究招募 18 名视觉模拟疼痛量表(VAS)评分 ≥ 3 分的髌股关节痛受试者（髌股关节痛组），并配对招募 18 名健康受试者（对照组）。采用 Qualisys 三维运动捕捉系统、Delsys 无线表面肌电同步采集运动学、表面肌电数据。在 Rv4.4.2 中应用高斯非负矩阵算法提取肌肉协同指标，在 MATLAB 2024a 中计算脊髓映射相关参数。研究结果显示，髌股关节痛组与对照组在 STS 过程中均存在 3 个协同元，协同元 1 的激活中心位于离座前阶段，两组肌肉权重相似，主要由最长肌、大腿屈肌、小腿前外侧肌肉协同激活支持躯干前屈、重心前移状态的动力输出；协同元 2 的激活中心位于离座后初期阶段，髌股关节痛组的激活中心出现晚于对照组（ $P=0.028$ ），两组主要以大腿屈肌激活驱动身体向上模式，其中，髌股关节痛组比目鱼肌权重系数高于对照组（ $P=0.011$ ）；协同元 3 的肌肉激活中心位于离座后期阶段，其中髌股关节痛组激活中心出现时间晚于对照组（ $P=0.018$ ），腓骨长肌权重系数高于对照组（ $P=0.013$ ）。在脊髓映射方面，髌股关节痛组在离座前阶段的 T6、L2-L4 段及离座后阶段的 L2-L5 段脊髓运动输出均低于对照组（ $P<0.05$ ）。研究表明，髌股关节痛人群与正常人相比在 STS 过程中神经肌肉调控模式不同，主要表现为大腿屈肌群的神经驱动能力下降，进而通过小腿肌群的协同增强以代偿大腿肌群的肌力不足。

中 D-129-0027

从骨正筋柔的因果辩证浅议下腰痛的诊治思路

刘鹏
广西医科大学

骨科痛症的调理需以“骨正筋柔”为核心理念，强调骨骼正位与软组织弹性的动态平衡。源自《黄帝内经》的“骨正筋柔，气血以流”揭示了筋（肌肉、韧带等）对骨骼的约束作用及骨骼对筋的力学支撑，二者失衡可引发关节错位、椎间盘突出等问题。机械性腰痛多因脊柱生物力学功能障碍，涉及椎间盘、小关节及核心肌群失衡，而人体优势腿（如右利者右下肢发达）通过代偿机制影响骨盆稳定性，导致骶髂关节紊乱（前错位多见于右侧，后错位多见于左侧），表现为单侧腰痛、臀部痛或大腿后侧痛，并可能诱发脊柱侧弯、腰椎间盘突出等继发病变。治疗上，96%以上患者通过非手术方式改善，包括复位骶髂关节、强化核心肌群及纠正不良姿势，结合太极拳、八段锦等传统锻炼优化脊柱负荷与神经协调性。研究指出，生命活动需注重“慢动”与被动锻炼（如推拿、站桩），通过降低心率和增强柔韧性实现长效康复，最终以恢复力学平衡、预防代偿性损伤为核心目标。

中 D-129-0030

九禽戏对超重/肥胖青少年抑郁情绪影响的肠脑轴机制

张明军 张宗国(401896030@qq.com) 广东惠州学院体育学院 惠州 广东 516007



肠道微生物群与大脑之间的双向通信系统---肠脑轴，通过神经、免疫、内分泌和代谢途径连接肠道与大脑，调节情绪状态。九禽戏是东晋医学家葛洪创编的健身功，观察九禽戏对超重/肥胖青少年肠道细菌的影响及其与抑郁情绪的关联性，为抑郁症诊疗提供参考。超重/肥胖且轻度抑郁的男性青少年 66 名，随机分配为实验组和对照组，各 33 名。实验组练习九禽戏 8 周。8 周九禽戏显著增加实验组肠道抗炎细菌双歧杆菌和拟杆菌 DNA 表达（ 4.13 ± 0.41 ， 3.28 ± 0.30 ），降低致炎细菌肠球菌 DNA 表达（ 3.09 ± 0.10 ）（ $P < 0.05$ ）。8 周九禽戏显著降低实验组抑郁情绪总得分（ 4.65 ± 0.13 ）（ $P < 0.05$ ）。8 周九禽戏干预后，实验组抑郁症状总得分分别与双歧杆菌、拟杆菌 DNA 表达呈负相关（ r 分别为 -0.771、-0.604， $P < 0.05$ ）；与肠球菌 DNA 的表达呈正相关（ r 为 0.601， $P < 0.05$ ）。抑郁症状总得分与双歧杆菌、拟杆菌及肠球菌 DNA 表达均独立相关（ $b = -0.696$ 、 -0.511 、 0.405 ， $P < 0.05$ ）。8 周九禽戏能够调节肠道菌群中有益细菌和致病细菌基因表达，重建紊乱的肠道菌群平衡，通过肠脑轴机制改善超重/肥胖青少年抑郁情绪。

关键词:九禽戏;青少年;情绪;肠脑轴

中 D-129-0031

运动解剖学研究的学科方向和创新领域

刘鸿宇 (lhyxianjd@163.com) 中北大学运动医学研究所 山西省太原市 030051

本文对“运动解剖学”研究的学科方向进行梳理，并提出其可能的原始创新领域。

运动解剖学（**exercise anatomy**）是人体解剖学的应用分支学科，有其学科基础和相关的研究领域和应用领域。运动解剖学不仅是体育专业的基础课程，也构成了运动医学、康复医学和艺术学的专业基础。根据对运动解剖学的发展历史、概念内涵、研究方向和创新领域的研究思考，本文提出以下新观点。

运动解剖学拥有：营养与体格发育、组织与细胞生物学、器官生物力学、选材与体能训练、康复运动与功能解剖学、运动性疾病与运动医疗、科学健身与运动风险防控、运动生物信息与流行病学、运动数字人与影像解剖学、运动神经生物学、内脏运动解剖生理学、运动塑身与抗衰老、艺术运动解剖学、极端环境运动解剖学、运动解剖学技术与校企合作研发，等 15 个学科方向。

运动解剖学原始创新，目前可分为 4 个领域：微观运动解剖学、功能训练、运动器官发育、康复运动学。

● 中 D-运动解剖学 ● Poster

中 D-129-0028

运动干预焦虑的潜在靶点及机制分析

索海洋 1 (1083104982@qq.com) 姚瑶 1 熊柳林 2 1.昆明医科大学神经科学研究院 昆明 650000, 2.遵义市第一人民医院麻醉科 遵义 563000

运动对焦虑的调节作用已被广泛证实，但其分子机制尚不完全明确。本研究通过生物信息学方法筛选运动干预焦虑的关键靶点并解析其潜在通路。基于 GeneCards 数据库分别检索“Anxiety”“Exercise”“Running”“Swimming”相关靶点，经去重后获得 557 个焦虑相关靶点和 960 个运动相关靶点，通过 Venn 分析筛选出 156 个交集靶点。利用 STRING 数据库构建蛋白互作网络（PPI），结合 Cytoscape 软件的 CytoHubba 插件，采用 MCC 算法筛选出 BDNF、INS、IL1B、TNF、IL6、ALB、IGF1、IL2、IFNG、ESR1 共 10 个核心靶点。进一步通过 DAVID 数据库进行 GO 富集分析，结果发现，生物学过程主要富集于环核苷酸第二信使偶联的 G 蛋白偶联受体信号通路、谷氨酸受体



信号通路、肾上腺发育、树突棘发育的正调节及突触传递相关的多巴胺摄取等；细胞组分富集于细胞外空间、分泌颗粒、神经元细胞体等；分子功能富集于异源三聚体 G 蛋白结合、核受体活性、信号受体结合等。KEGG 通路分析显示，核心靶点主要富集于脂肪细胞因子信号通路、肾素分泌、T 细胞受体信号通路、生长激素合成分泌与作用及恰加斯病通路。我们还构建“行为-部位-关键靶点-KEGG 通路”网络图，直观呈现运动通过调控核心靶点及其通路影响焦虑的潜在机制。本研究通过生物信息学方法挖掘了运动干预焦虑的关键分子靶点及信号通路，为后续实验验证及运动干预焦虑的机制研究提供了理论依据。

中 D-129-0029

运动影响杏仁核的分子网络分析

郭瑶（1294723132@qq.c0mm）昆明医科大学神经科学研究院 昆明市 650000

运动可能对脑结构和功能造成影响，杏仁核是与情绪有关的重要中枢，关于运动对杏仁核的影响已有报道，但分子网络机制不清。本研究在 GeneCards 数据库中下载运动和杏仁核的相关的人源靶点信息，进行 GO、KEGG、蛋白互作等生物信息分析，结果显示：运动查询得到 930 个靶点，杏仁核查询得到 1607 个靶点，共同交集有 127 个。蛋白互作分析显示，连接关系强度排在前十的包括 GAPDH、CASP3、INS、SIRT1、IL10、CCL2、IL1A、SRC、HMOX1、HSPA4 靶点。在 STRING(string-db.org)中富集到 196 条 BP 功能、40 条 CC 功能和 42 条 MF 功能。其中 BP 主要富集在磷脂酶 C 激活 G 蛋白偶联受体信号通路、细胞周期的负调控、平滑肌细胞增殖的正向调控、G 蛋白偶联受体信号通路，与环核苷酸第二信使偶联、能量平衡；CC 主要富集在线粒体外膜、 γ 分泌酶复合物、神经元脊、核质、Rip 蛋白凋亡体；MF 主要富集在蛋白激酶 C 结合、ATP 依赖性蛋白质解聚活性、5 型代谢型谷氨酸受体结合、氧化磷酸化解偶联剂活性、ATP 依赖性蛋白折叠伴侣；KEGG 通路分析富集到 66 条通路，主要富集在生长激素的合成、分泌和作用、RIG-I 样受体信号通路、催乳素信号通路、化学致癌-活性氧、胆碱能突触、人 T 细胞白血病病毒 1 型感染、cGMP-PKG 信号通路、炎症性肠病、化学致癌-受体激活、癌症中的蛋白聚糖。结论：本研究解析了运动影响杏仁核的分子网络，为理解运动调节情绪奠定分子基础

中 D-129-0004

一次性力竭运动致 SD 大鼠肾脏结构损伤的时程效应研究—基于光镜观察的病理学分析

高迪 刘晔(liuye711218@sina.com) 北京体育大学 北京 100000

剧烈运动引发的肾脏应激反应是运动医学领域的重要议题，但针对力竭运动后肾组织结构动态变化的系统性研究仍存在不足。本研究通过建立 SD 大鼠力竭运动模型，系统观察运动后不同时间节点肾组织病理学改变特征，旨在阐明运动性肾损伤的时程演变规律。实验选用 20 只雄性大鼠，11 只雌性大鼠，随机将其分为安静组（n=8）、力竭即刻组（n=6）与力竭 24h 组（n=6），雌性个体对应分为安静组（n=3）、力竭即刻组（n=4）及力竭 24h 组（n=4）。所有运动干预组均接受为期 5 天的适应性跑台训练（坡度 0°，速度 15m/min，持续时间逐日递增），在第六天实施递增负荷力竭运动方案直至运动力竭标准达成。光学显微镜检测显示，安静组大鼠肾小球毛细血管袢形态完整，基底膜连续性良好；近曲小管上皮细胞排列紧密，刷状缘结构完整，未见明显管型或空泡变性。力竭运动干预后，即刻组即出现显著组织结构改变，表现为肾小囊壁层上皮细胞肿胀导致囊腔狭窄，部分肾小球毛细血管袢扭曲变形，局部区域观察到间质血管外渗现象。运动后 24 小时，病理损伤



呈现进行性加重趋势，空泡变性区域面积扩大，部分远曲小管上皮细胞出现核固缩现象。上述发现提示，单次力竭运动可诱发急性肾组织结构损伤，其病理进程具有显著的时间依赖性特征。

中 D-129-0005

矫形鞋垫对扁平足患者下肢生物力学指标的影响

李人杰 (1152631306@qq.com) 黄治官 广州体育学院研究生院 广州 510630

扁平足是一种常见的足部畸形，本研究旨在通过比较两种不同类型鞋垫的效果，为临床实践提供更可靠的治疗方案。通过系统的生物力学分析，本研究将探讨不同矫形鞋垫对患者步态以及相关运动学参数的影响。以全面评估治疗效果。本实验招募 16 名患有扁平足的大学生为受试者在生物力学实验室开展本次实验，采用统一的实验鞋和扁平足矫形鞋垫与正常普通鞋垫进行测试对比，研究其对影响扁平足患者下肢生物力学指标的影响。本实验采用英国 **Vicon Motion System** 公司的红外高速三维运动捕捉系统、美国 **AMTI** 公司的三维测力台来采集受试者行走过程中下肢的动力学与运动学数据，采用配对样本 **T** 检验设计，将鞋垫种类（普通鞋垫、矫形鞋垫）作为干预变量，采集人体步行运动过程中下肢运动学与动力学指标与足底压力分布情况，利用 **visual 3d** 软件建立人体肌骨模型，并进行运动学指标计算与数据分析，进行配对样本 **t** 检验，比较矫形鞋垫相对于普通鞋垫在步行条件下对人体下肢生物力学各项指标的影响与差异。研究结果发现，在步态支撑期，矫形鞋垫膝关节内翻角度与普通鞋垫相比角度更小 ($p=0.036$)，矫形鞋垫与普通鞋垫相比踝关节外翻角度减小 ($p=0.035$)，在摆动期，矫形鞋垫与普通鞋垫相比踝关节背屈角度更小 ($p=0.039$)。此外，矫形鞋垫在后足分区足底压力小于普通鞋垫 ($p=0.043$)，支撑期内垂直地面反作用力峰值较小。因此，可以得出矫形鞋垫对扁平足患者的下肢生物力学指标具有显著的改善作用。穿着矫形鞋垫的患者在行走时表现出更好的髋、膝、踝关节角度和步态模式。这是因为矫形鞋垫能够提供足弓的有效支撑和稳定性，从而纠正步态中可能出现的异常运动模式。

关键词：扁平足，生物力学，矫形鞋垫

中 D-129-0006

跑步的不同训练方式对大鼠肌纤维类型损伤的影响

刘建 刘坤祥(513322202@qq.com) 遵义医科大学解剖学教研室 遵义 563099

探讨跑步的不同训练方式对大鼠骨骼肌纤维类型损伤和转化的影响。选取 8 周龄 **SD** 大鼠，分持续训练组、间歇训练组和空白组，每组再细分为平地跑、上坡跑、下坡跑、空白组。8 周后，取大鼠双侧腓肠肌和比目鱼肌做 **HE** 染色、酶联免疫吸附试验检测酶活性、**ATP** 酶染色和 **RT-PCR**。结果在 **HE** 上发现，持续锻炼后肌纤维出现断裂、排列紊乱；与对照组相比，持续锻炼后肌纤维的横截面积均上升，间歇锻炼组，快肌和慢肌横截面积变化不明显。酶联免疫吸附试验检测骨骼肌琥珀酸脱氢酶 (**SDH**) 和乳酸脱氢酶 (**LDH**) 活性值发现，持续锻炼后，腓肠肌的 **LDH** 活性值低于比目鱼肌，持续锻炼可减少快肌纤维中的 **LDH** 活性，促进线粒体和血管的发生，但持续锻炼后损伤了肌纤维的数量，故 **LDH** 活性值均低于间歇锻炼组。持续锻炼和间歇锻炼平地跑和下坡跑 **LDH** 活性值快慢肌中变化不明显，上坡跑时变化较大；持续锻炼后腓肠肌 **SDH** 活性值均小于间歇锻炼组，比目鱼肌则大于间歇锻炼组，但都比对照组高，故锻炼可增加快慢肌的有氧氧化能力。**ATP** 酶染色发现经过锻炼后，快肌纤维中出现慢肌纤维，持续训练可促进快肌向慢肌转化。**RT-PCR** 检测发现，与对照组比，I 型纤维在持续和间歇都升高；IIa 三组都升高，IIb 和 IIx 都降低，持续锻炼引起 IIb 和 IIx 向 IIa 及 I 转变；间歇锻炼在下坡跑引起 IIb 和 IIx 向 IIa 转变。综上所述发现持续不间断的训练可促进快肌向慢肌转化，且肌纤维会出现一定程度的损伤。



中 D-129-0007

注意焦点变化对下肢落地缓冲动作的生物力学特征分析

荣雪涵 (rongxuehan71@163.com) 陈明杨 刘晔 北京体育大学运动解剖学教研室 北京 100080

本研究主要目的为探究不同注意焦点对落地缓冲动作生物力学特征的影响，为构建安全稳定的落地缓冲策略提供理论支持。研究招募 17 名健康青年男性分别以内部注意焦点-髌、膝、踝关节策略，外部注意焦点（EF）策略及自然状态，从 40cm、80cm 高度跳台进行落地缓冲。运用 Qualisys 运动捕捉系统、Kistler 三维测力台同步采集运动学、动力学数据。Visual 3D 中建立人体模型进行指标计算。本研究发现，在地面垂直反作用力峰值（vGRF 峰值）、下肢刚度（Kleg）、平均负载率（LR）方面，动态稳定性指数（DPSI）方面 EF 小于自然状态（ $P<0.05$ ）。不同下落高度对下肢落地缓冲动作角度和角速度及冲击负荷衰减能力具有显著差异，具体表现为 80cm 高度下落时各关节角度、角速度及冲击负荷衰减能力均高于 40cm（ $P<0.05$ ）。研究表明，外部注意焦点和内部注意焦点策略均能改变健康男性青年下肢落地缓冲动作的生物力学特征。其中，外部注意焦点策略下的落地缓冲比内部注意焦点策略更安全稳定，但内部注意焦点策略更有助于维持着地时的适宜下肢刚度。三种内部焦点中，踝关节焦点策略安全性和稳定性最优，膝、髌关节焦点效果相似，且随着跳台高度增加，内部焦点减少冲击负荷的效果更优。

中 D-129-0008

以肌群训练为核心的运动解剖学教学模式应用

陈淼(2429433667@qq.com) 山东数字人科技股份有限公司 济南 250100

为响应“健康中国 2030”战略及体育强国建设目标，本研究基于数字人 STEM 解剖学平台，构建以肌群训练为核心的运动解剖学教学模式，解决传统教学资源分散、数据匮乏以及功能缺失等问题。通过整合运动解剖学资源与平台升级，实现教学体系创新。

模式创新体现在三方面：其一，学科整合与数据升级，新增头颈、躯干、四肢等肌群训练模块，结合真人视频演示及解剖学原动肌、拮抗肌、协同肌协作关系，强化肌肉功能认知，系统解析肌肉功能与运动链关系。其二，教学功能优化，支持个性化肌群训练课程设计，并完善骨性标志、肌腱筋膜等结构知识库，提升教学交互性。其三，多端平台适配与资源统一，整合 PC 端与移动端，实现练习、测验、课件库一体化管理，支持历史数据迁移，确保教学连贯性。

该模式将动作机能系统分为基础动作、复杂动作、肌群训练，并结合筋膜理论深化运动解剖学应用场景，强化学生对肌群协同机制的应用能力，结合筋膜力学理论拓展运动损伤预防与康复教学场景，引入肌腱筋膜知识体系，填补了肌群训练系统性教学的空白。实践表明，该模式可提升学生肌群功能分析与运动设计的能力，为健康服务业与体育产业发展提供数字化支持。未来将进一步结合临床医学反馈优化数据内容，推动运动解剖学教育的标准化与智能化发展。



中 D-129-0009

不同鞋垫对拇外翻患者跑步前后步态的影响

陈博思 (1411460786@qq.com) 广州体育学院研究生院 广州 510000

拇外翻是常见的前足畸形。矫形鞋垫能够有效缓解症状。本研究旨在比较两种不同鞋垫：包括一双普通鞋垫和一双矫形鞋垫对拇外翻患者跑步前后步态的影响，主要研究方法：招募 11 名轻中度拇外翻患者，拍摄 X 光片以确认拇外翻角度为中度或轻度。通过双足足型扫描记录受试者足型特征。受试者换上不同鞋垫后，使用 Zebris 步态测试系统，Vicon 光学动作捕捉系统，AMTI 三维力台记录行走时的步态数据，后穿着不同鞋垫进行跑步，达到疲劳状态后，再次记录行走时的步态数据。使用 Visual3D 牛津足模型进行数据分析，采用双因素重复测量方差分析，结果得出：1.与普通鞋垫相比，穿矫形鞋垫疲劳前后步长显著增加、步频显著下降，支撑相平均足偏角度减小，足跟抬离地面的最大角度显著减少($p<0.05$)。2.穿着矫形鞋垫的患者支撑期增加 3.穿普通鞋垫的受试者在疲劳后，前足中部区域和前足外侧区域的压力会显著增大，而穿矫形鞋垫的受试者压力增幅不大或无显著变化($p<0.05$)。4.矫形鞋垫加强了内侧足弓的支撑作用，使受试者支撑期踝关节外翻角度改善($p<0.05$)。5.受试者穿着不同鞋垫的受试者疲劳前后髌关节，膝关节支撑期角度变化，力矩变化无明显差异($p>0.05$)。结论：与普通鞋垫相比，矫形鞋垫有助于降低拇外翻患者跑步疲劳引起的足部不适。

中 D-129-0012

被动助力外骨骼影响搬运行走过程的下肢生物力学研究

吴星昱(wuxingyu200104@163.com) 梁慧婷黄治官 广州体育学院研究生院 广州 510000

腰部被动助力外骨骼已经逐渐走向成熟，但对其研究多局限于搬运动作中腰部省力效果，而少有行走过程中的下肢生物力学研究。旨在评估外骨骼对搬运物品行走过程中的下肢运动学和动力学表现的影响。本研究招募 9 名受试者，通过 Vicon 动作捕捉系统以及 AMTI 测力台分别采穿戴和对照组步态数据，过程中搬运物品尺寸为 42*28*15mm 的方型箱子(内置有沙袋)，总重量 20kg。在 Visual3D 分析软件中以单足支撑期做为周期计算峰谷值并标准化数据，最后在 SPSS 中进行配对样本 T 检验，通过自身对照实验比较穿戴或不穿带外骨骼搬运行走过程中下肢生物力学的影响。结果表明：①两组步长、步幅等步态参数不存在显著性差异。②与对照组相比，穿戴组伸髋角度峰值(10.24 ± 2.61 vs $8.23 \pm 1.52^\circ$)显著增加，除膝关节屈曲角度($62.91 \pm 4.75^\circ$)显著增大以外其余运动学指标无显著性差异。③与对照组相比，穿戴组髌关节伸髋力矩峰值(1.48 ± 0.46 vs 1.14 ± 0.34 BW)显著增大，屈髋力矩峰值具有增加的趋势。说明可能是由于在屈髋时被动外骨骼的弹簧压缩产生形变，伸髋时弹性势能转换使得伸髋更充分引起伸髋角度增大，也对应了实验组伸髋角度以及力矩峰值的显著增加。综上，被动助力外骨骼的效果并不显著体现在步态的时间和空间特征，而更多体现在弹簧系统的弹性势能转换可以为髌关节伸展产生积极影响上。

关键词：被动外骨骼；搬运行走；运动生物力学



中 D-129-0015

运动解剖学课程思政案例教学研究

史晓伟(wangliangkeai@163.com) 龙丽娟 渭南师范学院体育学院 渭南 714099

运动解剖学是体育专业学生必修的一门基础和先导课程，该课程开展思政教学对于学生价值观和健康观的树立发挥积极作用。运动解剖学课程思政建设应积极加强价值引领、推进全面浸润、打造特色思政，在教学中着力将理论与案例相结合，最终发挥育人成效。本研究旨在探索运动解剖学课程思政教学案例的形成路径，主要探讨思政案例来源、案例教学表现形式、案例教学实施成效。以运动解剖学、课程思政、案例教学为主题词，在中国知网数据库检索并梳理相关文献资料，研究显示：首先，应坚持课程思政案例教学理念，以习近平新时代中国特色社会主义思想为引领，结合健康中国、体育强国等政策文件，培养学生的专业志向，明确运动解剖学课程思政案例教学的重要作用；其次，应建立课程思政教学案例库，结合运动解剖学基础理论，通过讲好中国故事、学习榜样事迹、探析生命奥义等形成教学案例，并不断完善教学案例库；最后，应反思课程思政案例教学成效，重视过程性评价与终结性评价相结合，通过采用翻转课堂等教学方式，使得学生对思政教学案例精神入脑入心，厚植思政基因、拓展健康视野，体现课程的育人价值，最终形成特色鲜明的运动解剖学课程思政教学案例路径。研究指出，在坚持课程思政案例教学理念的基础上，建立教学案例库、反思案例教学成效，对于推进运动解剖学课程思政建设极为重要。

中 D-129-0017

骨盆手法对骨盆旋移综合征患者疗效和足底压力即刻影响

李旭明 (754791179@qq.com) 梁慧婷 黄治官 广州体育学院研究生院 广州体育学院运动与健康学院 广州 510630

骨盆旋移综合征（Pelvic Rotation Syndrome）是一种由骶髂关节急性或慢性损伤、耳状关节缝错位或关节韧带张力失衡引起的腰臀部疼痛及相关症状的临床综合征。本研究旨在评估骨盆手法在改善骨盆旋移综合征患者症状方面的疗效，探讨下腰痛与骨盆位置、长短脚及足底压力分布之间的潜在关联，为下腰痛的康复治疗提供理论依据。本研究纳入符合诊断标准的骨盆旋移综合征患者 11 例，均接受骨盆手法治疗，评估其即刻疗效。采用德国 Novel Pedar-X 压力鞋垫系统采集治疗前后静态及动态足底压力参数，结合视觉模拟评分法（VAS）量化疼痛程度。通过配对样本 T 检验分析治疗前后足底压力变化，并比较 VAS 评分差异。研究结果显示，骨盆手法治疗后（ 1.56 ± 1.03 分）较治疗前（ 4.54 ± 1.49 分）患者的 VAS 评分显著降低（ $p < 0.001$ ）。在足底压力分析中，治疗前后双侧足底峰值压力和峰值力无显著差异，但左侧（ $0.34 \pm 0.13s, p = 0.014$ ）和右侧（ $0.36 \pm 0.15s, p = 0.033$ ）的平均支撑时间较治疗前（左： $0.50 \pm 0.16s$ ；右： $0.51 \pm 0.17s$ ）显著减少。这些发现表明，骨盆手法治疗能有效缓解急性疼痛症状并改善步态效率，其作用机制可能与神经肌肉调控和运动模式优化有关。



中 D-129-0023

不同方式一次性拉伸对半腱肌腱划的影响

李康 (528053749@qq.com) 李晨 刘晔 北京体育大学运动解剖学教研室 北京 100084 北京体育大学运动解剖学教研室

拉伸 (Stretching) 是体育训练中不可或缺的一部分, 不同拉伸方式具有不同的效果。为了解不同拉伸方式在训练后对半腱肌腱划 (Semitendinosus Tendon Transfer Incision, STTI) 结构的即刻影响。招募 10 名健康男性 (无腘绳肌损伤), 随机分为两组 ($n=5$)。两组受试者以相反顺序分别进行跑步 (9km/h, 5min) 后动态 (燕式平衡, 5 组 $\times$ 10 次 $\times$ 3s) 以及跑步后静态 (直膝压腿, 5 组 $\times$ 1 次 30s) 拉伸实验, 每次实验间隔 72h。采用飞利浦彩色多普勒诊断仪, 由同一名职业影像科医师收集受试者实验前后 STTI 的全景超声图。基于 Image Pro Plus 6.0, 在收集的全景超声图中人工测量腱划短臂 (SATI) 与浅腱膜 (SA)、腱划长臂 (LATI) 与深腱膜 (DA) 及 SATI-LATI 间角度。采用 Microsoft Excel 2019 进行数据预处理, 而后在 SPSS 21.0 中针对相关变量使用双因素 (拉伸前后 $\times$ 拉伸方式) 方差分析, 若拒绝原假设, 则进一步针对拉伸前后/方式因素进行事后配对/独立样本 t 检验, 分析统计学差异。研究结果显示, 动态拉伸和静态拉伸均能影响 STTI 的解剖形态; 动态拉伸后 SATI-SA 夹角显著减小, SATI-LATI 夹角亦明显降低, 而 LATI-DA 夹角未见显著改变; 静态拉伸后, SATI-SA、LATI-DA 及 SATI-LATI 三组夹角均显著减小; 两种拉伸方式对各项角度改变幅度的组间差异均无统计学意义。研究结果表明, 一次性动态拉伸主要影响 SATI 的解剖形态, 而对 LATI 的影响相对有限, 而一次性静态拉伸对 TI 整体解剖形态均具有显著影响。

中 D-129-0026

足弓高度与刚度的性别差异及相关性分析

郑鸿漩 (Zhxbwxcx1998@163.com) 李磊 柳璇 刘晔 北京体育大学运动解剖学教研室 北京 100080

目的 本研究旨在探讨性别差异对足弓高度与足弓刚度的影响, 并分析两者之间的相关性, 以期为足部形态-力学调控机制的深入理解及基于性别差异的足部健康评估体系构建提供理论依据。

方法 研究共招募 102 名健康青年志愿者 (男性 47 人, 女性 55 人), 采用标准化测试程序测量受试者在站姿与坐姿条件下的足弓高度, 并基于足弓高度指数 (Arch Height Index) 和足弓刚度计算公式 (Arch Stiffness) 提取关键指标。采用独立样本 t 检验比较男性与女性在足弓高度及刚度方面的差异, 进一步运用 Pearson 相关分析各性别组内足弓高度与足弓刚度之间的线性关系。

结果 研究发现, 性别差异在足弓高度方面未有统计学差异 ($P = 0.270$), 但在足弓刚度方面存在显著差异 ($P = 0.039$), 男性表现出更高的足弓刚度值。相关性分析结果显示, 男性群体中足弓高度与足弓刚度之间存在中等强度正相关 ($r = 0.328$, $P = 0.025$), 而女性群体中虽呈现出相似趋势, 但未达统计学显著水平 ($r = 0.220$, $P = 0.106$)。

讨论 研究结果表明, 足弓刚度具有显著性别差异, 且足弓形态与其力学特性之间的结构-功能耦合关系在男性群体中更为显著, 提示在足部生物力学评估与功能干预策略制定中应充分考虑性别因素的调节作用。

关键词: 足弓高度; 足弓刚性; 性别差异; 相关性分析



● 中 D-运动解剖学 ● Abstract

中 D-129-0010

基于学习通平台图片在运动解剖学教学中的应用

王丹 (595680903@qq.com) 沈阳体育学院运动健康学院 沈阳 110102

《运动解剖学》课程是体育科学中一门重要的应用基础理论学科,是《普通高等学校本科专业类教学质量国家标准》中体育专业学生必需开设的专业核心课程。目前,我国高校体育教育、运动训练、休闲体育、社会体育指导与管理等专业大学生均开设有《运动解剖学》课程,且均开设在大学一年级。探讨体育学院《运动解剖学》教学的过程中应用图片练习题的教学效果,以期提高《运动解剖学》教学质量。通过教学实践和调查研究,针对发现的这些学生在学习《运动解剖学》中存在的问题和学习困难。梳理课程内容中知识点,制作教学 PPT,精心选择图片,以选择题文字+图片的形式制作练习题,在学习通平台及时发布练习。以学生不离手的智能手机为桥梁,通过课前研学、课上研展、课后研做三个环节,盘活教学资源,激发教学主体,提升教学效果,可以激发学生的学习兴趣,提高对课堂的满意度,并加强记忆提高成绩。

中 D-129-0011

基于生物信息学分析氧化应激相关基因的运动对近视的影响

王丹 (595680903@qq.com) 沈阳体育学院运动健康学院 沈阳 110102

应用网络药理学研究方法挖掘运动改善近视的作用机制。从 GEO 数据库下载数据集 GSE61225,筛选出差异基因,通过 GeneCards 数据库检索近视、氧化相关靶点,取交集得到交集靶点。同时使用 String 数据库与 Cytoscape 软件构建蛋白互作网络,用 CytoHubba 插件筛选出关键基因,CTD 数据库验证关键基因与近视之间的相互作用关系。利用 DAVID 数据库,对交集靶点进行功能(GO)和通路(KEGG)富集分析。运动、氧化、近视共同靶点 84 个。得到 8 个基因(HIF1A、FOS、STAT3、NOTCH1、MMP9、IGF1R、CEBPB 和 CREBBP)为关键基因;GO 功能结果显示主要富集于细胞成分。KEGG 通路富集分析表明主要为 Pathways in cancer, HIF-1 signaling pathway 等。运动可通过调节 HIF1A、FOS 等基因靶点,通过调控细胞成分、HIF-1 signaling pathway、Huntington's disease 等来实现改善近视作用。

中 D-129-0016

Sestrin2 保护心脏的作用研究

龙丽娟(564332120@qq.com) 史晓伟 渭南师范学院体育学院 渭南 714099

Sestrin2 是亮氨酸感受器,在调控 mTORC1 形成 Sestrin2/mTORC1 信号通路发挥重要作用。本研究梳理 Sestrin2 保护心脏的作用及途径,为其在运动科学领域的应用价值提供思路。在国内外文献数据库中检索 Sestrin2、心脏、运动等主题词汇,搜索相关文献,梳理 Sestrin2 在心脏中的保护作用,研究显示:(1)作为高度保守蛋白,Sestrin2 可被多种应激信号(P53, NF- κ B, HIF-1 α 等)诱导表达,发挥重要作用;(2)Sestrin2 参与缺血性心脏病、糖尿病心肌病、心肌毒性心脏病、衰老心脏、心肌肥厚、心衰、动脉粥样硬化、高血压等多种心脏疾病及其危险因子的病理进程,发挥调控心肌氧化应激、炎症、细胞凋亡、能量代谢、自噬、纤维化等功能,相关的信号通路包括 Sestrin2/Keap1/Nrf2、Sestrin2/AMPK/mTOR、Sestrin2/Angiotensin II、Sestrin2/AMPK/PGC-1 α 、GCN2/Sestrin2/mTOR 等;(3)Sestrin2 在运动改善心肌缺血、心衰中的作用研究目前还较少,



已有的报道发现运动能引起心肌 **Sestrin2** 表达升高，在心肌缺血、心衰病理过程中发挥重要保护作用；（4）**Sestrin2** 可能成为心脏病理的潜在生物标志物，通过检测患者血清 **Sestrin2** 的变化，可对心脏疾病及心血管事件进行辅助诊断/预测，有望成为重要的临床参考指标。研究指出，**Sestrin2** 发挥心脏保护作用，可能成为心脏类疾病新的治疗靶点。结合运动对心脏的作用、**Sestrin2** 能对运动做出应答，未来在机制方面应通过 **Sestrin2** 敲除、**Sestrin2** 过表达等方式多种角度探索 **Sestrin2** 在运动对心脏中的保护作用，探索并验证更多相关的信号通路，为临床靶向药物的研发以及运动处方的精准化实施奠定基础。

中 D-129-0019

最大离心与向心运动所导致的肌肉疲劳差异

谈纪同（2449781925@qq.com）刘永 北京体育大学运动解剖学教研室 北京 10084

本文综述了最大离心和向心抗阻运动对肌肉疲劳的影响，旨在回答两种运动模式是否会导致不同的疲劳表现。通过对 30 项相关研究的分析，主要总结了以下发现：①离心和向心运动均会导致显著的急性力量损失，但损失幅度通常不超过基线的 60%，表明肌肉在重复最大努力中具有一定的力量保留能力；②离心和向心运动所造成的上下肢肌肉力量损失表现不同，在上肢肌肉中，离心和向心运动导致的急性力量损失相似，约 30%；而在下肢肌肉中，离心运动的力量损失显著低于向心运动，分别为约 15%和 40%，这可能与下肢肌肉的结构特征和日常使用频率有关；③在相同相对负荷下，离心运动通常能完成更多重复次数，尤其是在较高负荷（如 70%-95%1RM）时，因其较低的心血管压力和更高的重复次数能力，可能更适合心血管疾病患者或需要较低努力感知的人群；④在制定抗阻训练计划时，应根据肌肉群的特性调整离心和向心运动的强度和容量，尤其是对于初学者或易受肌肉损伤影响的人群；⑤本主题研究的局限性在于样本量较小且研究方法存在异质性，大部分研究集中在肘屈肌和膝伸肌，其他肌肉群的研究较少。综上所述，离心和向心抗阻运动对肌肉疲劳的影响因肌肉群而异，肘屈肌在两种运动模式下的疲劳表现相似，而膝伸肌在离心运动中的疲劳更小。未来研究需进一步探讨个体差异和肌肉群特性对疲劳的影响，以优化抗阻训练处方。

中 D-129-0025

脊柱侧弯成年人坐站转移时的双侧下肢肌肉激活不对称性

作者：喻羽佳 通讯作者：刘晔教授
北京体育大学 北京 中国

目标 分析成年脊柱侧弯（IS）患者坐站转移时双侧下肢肌肉激活的左右侧差异及对称性特征。

方法 纳入 15 例 IS 患者（Cobb 角 $\geq 15^\circ$ ），采用 Delsys 无线表面肌电系统采集坐站转移起身阶段双侧下肢各肌肉的肌电信号。计算各肌肉的均方根值（RMS），并计算对称指数 SI。

结果 患者坐站转移时股二头肌（ $p=0.22$ ），股直肌（ $p=0.38$ ）和胫骨前肌（ $p=0.08$ ）的激活存在显著性差异。下肢肌肉的整体 SI 均值为 $9.2\pm 4.1\%$ 。结论：成年脊柱侧弯患者坐站转移时双侧下肢肌肉激活存在显著不对称性，凸侧优势激活模式可能影响功能性动作效率，提示需针对性优化双侧协调训练策略。

关键词：脊柱侧弯；坐站转移；肌肉激活；对称指数



● 中 E1-临床解剖学 ● Podium

亚太 A1-129-0001

小儿 II 型副舟骨疼痛切除后胫后腱重建的改良方法

刘粲 Ms

(787871969@qq.com) 李玉飞 PhD 文捷 PhD 简晓红 PhD 宁可 Ms 丁一通 Ms 湖南师范大学医学部解剖教研室
长沙 410000

副舟骨 (AN) 的手术治疗分为单纯切除 AN 和切除后重建胫骨后腱 (PTT) 的 Kidner 手术。然而, 这两种方法都有一定的缺点。在此, 我们提出了一种改进的方法来重建 PTT, 并比较了我们的方法与改进的 Kidner 手术的短期临床效果。收集 2015 年 1 月至 2020 年 6 月在我科治疗的 23 例疼痛性 II 型 AN 青少年儿童的数据。术前、术后记录美国骨科足踝学会踝后足 (AOFASAH) 评分、侧位负重平片侧角、俯仰角状态, 评价治疗效果。改良肾外科 (MK) 组中位 AOFAS-AH 由 61 (59-68) 上升至 87(83-91), 差异有统计学意义 ($P<0.05$); 侧位负重平片俯仰角由 13.0 (8-18) 增加到 17.4(14-22), 俯仰角由 18.3 (14-24) 减少到 14.2 (8-20) ($P<0.05$)。PTT 保存折叠缝合 (FS) 组中位 AOFAS-AH 由 61 (59-68) 上升至 87 (85-91)($P<0.05$); 侧位负重平片俯仰角由 12.3 (7-18) 增加到 18.4(15-26), 俯仰角由 17.8 (13-23) 减少到 5.7 (3-8) ($P<0.05$)。FS 组与 MK 组术后 AOFAS-AH 评分差异无统计学意义; 但 FS 组侧位负重平片俯仰角和角度的改善明显优于 MK 组 ($P<0.05$)。对于青少年疼痛性 II 型 AN 患者, 保留插入折叠缝合方法在 AOFAS-AH 评分方面具有相似的短期效果, 但在 Meary 角和 Pitch 角方面比改良的 Kidner 方法有更大的改善

亚太 A1-129-0004

肌硬膜桥与风府穴解剖学位置及功能的研究

姬冠佳, 赖华勋, 孙溢彤, 迟彦艳, 唐炜, 张健飞 (zjfdlmedu@163.com), 隋鸿锦 (suihj@hotmail.com)
大连医科大学解剖学教研室

肌硬膜桥为枕下肌及多个韧带通过寰枕及寰枢间隙连于硬脊膜的结缔组织桥, 寰枕间隙的 MDB 与中医风府穴体表定位高度重合且均与头痛相关。为明确二者的解剖学位置及功能的关系, 本研究对 SD 大鼠开展激光散斑血流成像、小动物超声、大体解剖、组织切片, 并对 SD 大鼠头痛模型进行穴位电针治疗, 观察电针前后 MDB 形态及头痛行为学改变, 分析脑内核团 CGRP 及 5-HT 表达分布。结果显示风府穴得气时, 针灸尖端位于寰枕间隙的肌硬膜桥处, 电针 SD 大鼠头痛模型风府穴前后, MDB 形态、行为学评分、CGRP 及 5-HT 表达均出现显著统计学差异。本研究证实寰枕间隙的 MDB 为风府穴的洞底结构, 电针风府穴的洞底结构, 可通过减轻该区域的纤维增生、减少疼痛信号肽 CGRP 的表达、上调 5-HT 镇痛系统实现头痛治疗。



中 E1-129-0001

尺骨冠突桡骨髁板间长度比例在孟氏骨折肘关节稳定性中的影响

易杨非 PhD (1064554562@qq.com) 李玉飞 PhD 文捷 PhD 宁可 Ms 刘粲 Ms 丁一通 Ms 湖南师范大学医学部解剖教研室 长沙 410000

肘关节的稳定性对上肢功能至关重要，尺骨冠突和桡骨头是维持肘关节稳定性的关键结构。尺骨冠突与桡骨髁板间长度比例可能影响肘关节稳定性，但其机制尚不明确。本研究旨在探讨儿童尺骨冠突与桡骨髁板间长度比例的正常范围及其在新鲜和陈旧性 Monteggia 骨折中对肘关节稳定性的影响。回顾性分析 2017 年 1 月至 2022 年 12 月湖南省人民医院、东安县人民医院、沅陵县人民医院收治的 1-14 岁儿童的前臂正侧位 X 线片。纳入 352 名正常儿童、30 例新鲜孟氏骨折患儿和 28 例陈旧性孟氏骨折患儿。测量尺骨冠突与桡骨髁板间长度比例，分析其与肘关节功能及桡骨头复位质量的相关性。正常儿童尺骨冠突/桡骨髁板间长度比例均值为 0.986 ± 0.022 ，95% 参考值范围为 0.964~1.008。新鲜孟氏骨折组术后比例恢复至 0.969 ± 0.008 ，肘关节功能（旋前 $79.667^\circ \pm 1.826^\circ$ ，旋后 $83.667^\circ \pm 2.249^\circ$ ，屈伸 $139.333^\circ \pm 4.686^\circ$ ）及 Mayo 评分（ 90.667 ± 3.407 ）均恢复良好。陈旧性孟氏骨折组术后比例恢复至 0.975 ± 0.015 ，（旋前 $71.607^\circ \pm 12.842^\circ$ ，旋后 $77.143^\circ \pm 5.516^\circ$ ，屈伸 $124.393^\circ \pm 12.321^\circ$ ，Mayo 评分 87.321 ± 7.263 ）。5 例比例未恢复至正常范围的患儿中，3 例桡骨头复位差，肘关节功能显著降低。术后尺骨冠突与桡骨髁板间长度比例与肘关节功能及稳定性显著相关（ $P < 0.05$ ）。尺骨冠突与桡骨髁板间长度比例在正常儿童中具有相对稳定的均值区间（ 0.986 ± 0.022 ）。恢复该比例至正常范围（0.964~1.008）对维持肘关节稳定性至关重要，陈旧性孟氏骨折患儿术后功能恢复较差，可能与比例恢复不完全及受伤至手术间隔时间较长有关。

中 E1-129-0002

肌硬膜桥与风府穴解剖学位置及功能的研究

姬冠佳，赖华勋，孙溢彤，迟彦艳，唐炜，张健飞 (zjfdlmedu@163.com)，隋鸿锦 (suihj@hotmail.com)
大连医科大学解剖学教研室

肌硬膜桥为枕下肌及多个韧带通过寰枕及寰枢间隙连于硬脊膜的结缔组织桥，寰枕间隙的 MDB 与中医风府穴体表定位高度重合且均与头痛相关。为明确二者的解剖学位置及功能的关系，本研究对 SD 大鼠开展激光散斑血流成像、小动物超声、大体解剖、组织切片，并对 SD 大鼠头痛模型进行穴位电针治疗，观察电针前后 MDB 形态及头痛行为学改变，分析脑内核团 CGRP 及 5-HT 表达分布。结果显示风府穴得气时，针灸尖端位于寰枕间隙的肌硬膜桥处，电针 SD 大鼠头痛模型风府穴前后，MDB 形态、行为学评分、CGRP 及 5-HT 表达均出现显著统计学差异。本研究证实寰枕间隙的 MDB 为风府穴的洞底结构，电针风府穴的洞底结构，可通过减轻该区域的纤维增生、减少疼痛信号肽 CGRP 的表达、上调 5-HT 镇痛系统实现头痛治疗。



中 E1-129-0005

55-84 岁正常人群髌臼临床解剖三维数字化研究

胡忆涵 王振宇 史国鹏 张云凤 孙瑞芬 李筱贺 (798242742@qq.com) 内蒙古医科大学基础医学院人体解剖学教研室 呼和浩特 010110

本研究以 55 - 84 岁人群髌臼为对象，通过获取精确形态数据、剖析解剖参数特征，为髌关节疾病诊疗及假体设计提供关键依据。研究从内蒙古医科大学附属医院选取 360 例符合条件的患者，依据年龄（每 5 岁分组）和性别进行细致划分。运用 256 层螺旋 CT 扫描，并借助 Mimics 21.0 软件构建三维模型，精准测量髌臼上下径、前后径、外展角、前倾角、深度等参数。在性别差异上，男性髌臼上下径 (56.44 ± 3.38 vs 52.16 ± 2.36 mm)、前后径 (51.79 ± 2.85 vs 47.96 ± 2.22 mm) 及深度 (27.07 ± 3.18 vs 25.59 ± 2.65 mm) 均显著大于女性 ($p < 0.01$)。女性前倾角较男性增加 1.78° ($20.57 \pm 5.52^\circ$ vs $18.79 \pm 5.07^\circ$, $p = 0.032$)，而外展角无性别差异。双侧参数在同性别内均保持对称性。在年龄趋势上，男性上下径在 70-74 岁达峰值 58.95 ± 0.36 mm 后下降，前后径自 75 岁后降幅加剧 (75-79 岁 52.64 ± 0.38 mm 至 80-84 岁 51.09 ± 0.35 mm)，深度则在 75-79 岁出现最大值 28.26 ± 0.55 mm。女性上下径与前后径随增龄持续递减，外展角于 65-69 岁达峰值 $54.99 \pm 4.61^\circ$ ，髌臼深度在 65-74 岁维持 27.13 ± 2.99 mm 高位后显著下降，至 80-84 岁减少 6.9% (25.26 ± 2.46 mm)。本研究明确了 55 - 84 岁人群髌臼形态的性别、年龄差异及参数相关性，填补数据空白，为临床诊疗和假体设计提供了参考。

中 E1-129-0006

下尺桡关节解剖对应关系改变在尺骨撞击综合征治疗中的观察

李征 吴文溢 秦晓彬 谭思琪
深圳市中西医结合医院 骨伤科手外科，广东，深圳

目的 对比研究 Wafer 手术及尺骨截骨短缩术治疗尺骨撞击综合征的临床效果，并对两种方式手术前后下尺桡关节解剖学对应关系改变进行观察，探究手术方式的合理性。

方法 自 2019 年 6 月至 2024 年 7 月之间，对 17 例尺骨撞击综合征并采取手术治疗的患者进行对比研究，其中行 Wafer 手术 8 例，尺骨截骨短缩术 9 例，均为单侧。采用改良 Mayo 腕关节功能评分系统判定疗效进行对比。

结果 本组 17 例，Wafer 手术组，男 5 例，女 3 例，左侧 3 例，右侧 5 例；尺骨截骨短缩术组，男 7 例，女 2 例，左侧 4 例，右侧 5 例。术后随访 4~36 个月（平均 23 个月），术前所有患者均有腕部尺侧疼痛，X 线片显示尺骨正变异，MRI 显示尺骨撞击表现。所有患者术后均给予康复治疗及指导下功能训练，根据改良 Mayo 腕关节功能评分，Wafer 手术优 5 例，良 2 例，可 1 例，尺骨截骨短缩术优 4 例，良 3 例，可 1 例，差 1 例。术后 CT 平扫及三维重建显示 Wafer 手术组解剖学关系良好，尺骨截骨短缩术组下尺桡关节解剖对应关系发生改变。结论 Wafer 手术及尺骨截骨短缩术治疗尺骨撞击综合征总体疗效无明显差异，但术后解剖学变化差异明显，尺骨截骨短缩术组出现下尺桡关节非生理性解剖对应关系改变，有待长期随访验证手术合理性。

关键词：尺骨撞击综合征；Wafer 手术；尺骨截骨短缩术；下尺桡关节



中 E1-129-0008

颈椎钩突与椎动脉间的临床应用解剖学研究

邵鹏远 史君 李琨 王超群 郝韵腾 张德洲 王思敏 李志军 王星(wangxing197911@163.com) 内蒙古医科大学基础医学院 呼和浩特市 010000

通过测量不同年龄段的颈椎钩突与椎动脉间的相关参数，揭示钩突与椎动脉间位置关系的变化规律。采取回顾性研究收集内蒙古医科大学附属医院影像科 2018-2021 年实验要求的颈椎影像学资料 1240 例，按照年龄分组对钩椎关节区域内钩突尖与椎动脉的间距，椎弓根的最大横倾角、最小横倾角及横倾角范围和椎弓根宽等进行测量。钩突尖与椎动脉的间距随增龄呈递增趋势；椎弓根最大横倾角、最小横倾角和横倾角范围随增龄均呈减小趋势；椎弓根宽随增龄和椎序递增呈增大趋势；C3 和 C7 在测量指标的年龄组间比较中均表现出显著性差异（ $P<0.05$ ）；相关性分析中，年龄与钩突尖与椎动脉的间距（ $r=0.13$ ）、椎弓根宽（ $r=0.29$ ）呈正相关，与椎弓根最大横倾角（ $r=-0.06$ ）、椎弓根最小横倾角（ $r=-0.03$ ）、椎弓根横倾角范围（ $r=-0.05$ ）呈负相关。了解不同节段颈椎钩突与椎动脉间解剖参数在年龄组间、椎序间和侧别间的显著性差异，可以保障手术的安全，为椎动脉型颈椎病的影像学评估及颈椎前路/后路手术的置钉角度选择、螺钉直径匹配提供重要的理论依据和技术支持。

中 E1-129-0009

肩胛上动脉解剖变异类型及临床意义

肖晨曦¹，周浩瑞¹，郑心彤¹，章浩民¹，赖嘉豪²，苏继东³，周坤³，孙诗竹^{3*}，付饶^{4*}

1.中山大学医学院，广东 深圳，510080

2.中山大学孙逸仙纪念医院放射介入专科，广东 广州，510120

3.中山大学医学院基础与临床医学教学实验室，广东 深圳，510080

4.中山大学医学院人体解剖学教研室，广东 深圳，510080

Anatomical variant types and clinical significance of suprascapular artery

Xiao Chenxi¹, Zhou Haorui¹, Zheng Xintong¹, Zhang Haomin¹, Lai Jiahao², Su Jidong³, Zhou Kun³, Sun Shizhu^{3*}, Fu Rao^{4*}

1. School of Medicine, Sun Yat-sen University, Shenzhen, China 518100; 2. Department of Radiology, Sun Yat-sen Memorial Hospital., Sun Yat-sen University, Guangzhou, China 510120; 3. Basic and Clinical Medicine Teaching Laboratory, School of Medicine, Sun Yat-sen University, Shenzhen, China, 518100; 4. Department of Anatomy, School of Medicine, Sun Yat-sen University, Shenzhen, China 518100

E-mail: sunshzh5@mail.sysu.edu.cn

肩胛上动脉是供应肩胛骨及其周围骨骼肌的重要血管之一，其解剖变异及临床意义备受关注。本文通过汇总分析中山大学医学院解剖教研室标本变异情况及国内外相关文献报道，对肩胛上动脉的起源、走行、内径等形态学特点及其临床意义进行了综述。肩胛上动脉多起源于甲状颈干（45.8%）、锁骨下动脉（31.9%），与颈横动脉共干起自甲状颈干（15.3%），罕见起源于胸廓内动脉（1.4%）。肩胛上动脉的走行与前斜角肌、臂丛神经及肩胛上横韧带的关系存在变异，其变异在肩袖损伤、锁骨骨折、前斜角肌综合征等临床疾病中具有重要意义，可能导致手术操作困难及并发症。在外科手术中，了解肩胛上动脉的解剖特点及变异类型对于减少医源性损伤、提高手术效果具有重要作用。例如，在肩胛上神经卡压治疗、臂丛神经阻滞麻醉、锁骨下动静脉穿刺及头颈部肿瘤手术淋巴结清扫等操作中，熟悉肩胛上动脉的解剖位置及变异情况可有效避免血管损伤。此外，肩胛上动脉在皮瓣移植中也具有重要应用价值。总之，正确认识肩胛上动脉的解剖变异及其临床意义，对于临床医护在诊断、治疗及手术操作中具有重要的指导作用。



中 E1-129-0010

基于深度学习和 X 线构建颈椎曲度参数的智能测量软件与模型验证

王星 (wangxing197911@163.com) 王思敏 史君 张德洲 郝韵腾 内蒙古医科大学基础医学院人体解剖学教研室/数字医学中心 呼和浩特 010059

基于 RTMpose 深度学习模型，构建颈椎矢状位 X 线曲度参数的智能测量软件并验证其有效性。收集三所医院的颈椎 X 线矢状位数据 2000 例，按照 8:1:1 的比例分配至训练集、验证集和测试集进行模型的构建和评估。训练集和验证集数据经 LabelMe 软件进行关键点的标注，标注后数据以 JSON 格式输入模型训练和验证。测试集包含 100 例的内部数据集和 100 例独立的外部数据集。分析模型和参考标准间标注关键点的一致性，评估模型与参考标准间测量颈椎 X 线片矢状位参数的准确性。模型与参考标准标记的距离差值在内部测试集中为 1.01 ± 0.72 mm，在外部测试集中为 1.10 ± 0.83 mm。模型与参考标准间的 ICC 为 0.968 ($P < 0.05$)。模型在内部测试集中的 ICC 为 0.973 ($P < 0.05$)，在外部测试集中的 ICC 为 0.963 ($P < 0.05$)。基于 RTMpose 的深度学习模型能够准确识别颈椎矢状位 X 线的解剖关键点。该模型测量的颈椎矢状位 X 线参数与参考标准具有高度一致性，可有效提高检测效率，为临床诊疗提供快速、精准的数据参考。

● 中 E1-临床解剖学 ● Abstract

中 E1-129-0003

RIPK3 通过诱导线粒体稳态失衡介导失神经肌萎缩

沈筠恬 张晨 魏丽 龚佳欢 姚新蕾 孙华林 (sunhl@ntu.edu.cn) 南通大学神经再生重点实验室 南通 226000

周围神经损伤所致靶肌萎缩严重损害患者功能康复，其机制不明制约临床治疗突破。本研究拟探讨 RIPK3 在失神经肌萎缩中的调控作用及机制。通过建立坐骨神经离断模型，发现失神经 36 小时后骨骼肌中 RIPK3 蛋白水平显著升高。与野生型小鼠相比，RIPK3 敲除小鼠的腓肠肌失神经肌萎缩减轻，泛素-蛋白酶体通路的激活被抑制。转录组分析显示，RIPK3 敲除导致下调基因主要富集于炎症反应和纤维化通路，而上调基因涉及肌肉收缩及线粒体 ATP 代谢，其氧化磷酸化通路活性显著增强。透射电镜观察证实 RIPK3 敲除可修复线粒体嵴断裂和空泡变性，呼吸链复合物 I/IV 活性恢复，同时线粒体生成相关蛋白表达升高而分裂相关蛋白表达降低。蛋白互作网络分析发现 RIPK3 直接调控 NOX4，其敲除使肌肉 ROS 水平明显下降，并抑制炎症细胞浸润。药理学抑制实验证实，RIPK3 抑制剂处理可改善失神经肌萎缩。本研究揭示失神经损伤通过激活 RIPK3 诱发线粒体功能障碍、氧化应激及炎症反应，进而驱动骨骼肌萎缩的分子机制，为靶向干预提供了新策略。

中 E1-129-0004

T8-T12 脊神经后支在椎间孔及背部穿出点的解剖学研究

孙烨 (sy2283000240@163.com) 秦向征 延边大学医学院解剖学教研室 延吉 133000

当前，胸部的脊神经后支的解剖学研究尚存在空白。本研究旨在通过对胸部 (T8-T12) 脊神经后支及其分支的解剖学研究，探讨其从椎间孔到背部的分支走行，以为下胸部疼痛的临床治疗提供明确解剖学定位和理论依据。研究采用了 16 具固定于福尔马林的下胸部脊柱标本 (9 男 7 女)，无脊柱侧弯、创伤及相关手术史。通过腹侧入路解剖、背部竖脊肌分离及断层解剖等方法，暴露脊神经后支的分支及走行情况，并使用显微镜观察其在背部的分支，测量其与周围骨性结构的关系。结果



显示，脊神经后支在穿过椎间孔后，沿肋骨横突下行分支、内侧支、外侧支。其中，内侧支和外侧支在胸椎小关节周围的解剖结构呈现较为恒定的位置关系，具备潜在的临床治疗靶点意义。本研究首次提出了脊神经后支的背部穿出点概念，并对其与周围骨性结构（包括乳突中点、上关节突头部、下关节突、后正中线（棘突）、肋头、上位关节突关节下部底点、下位关节突关节上部顶点）的距离进行了测量，发现其位置恒定，可为以脊神经后支为靶点的临床治疗提供了可靠的解剖学参考。研究的创新之处在于首次系统展现了脊神经后支解剖学走行及背部穿出点，并提供解剖数据支持。这些成果将为射频治疗及其他脊柱相关术式的进一步发展奠定坚实基础，同时也为胸部疼痛的病因探索及精准治疗提供了新的可能性。

中 E1-129-0007

胫骨骨膜的神经支配及分布模式研究

吴俊徽 樊锐 杨波 曾雪 余虹 熊鑫鑫 黎小池 杨胜波 (Wujunxi1996cys@163.com) 遵义医科大学解剖学教研室 遵义 563099

为了揭示胫骨骨膜的神经支配及整体分布模式，在 12 具中国成人尸体上行大体解剖，观察胫骨骨膜神经的来源及走行，改良的 Sihler's 染色法显示骨膜内神经的整体分布模式。结果发现，胫骨骨膜神经支配为多节段来源。胫骨内侧面的骨膜主要由隐神经支配，外侧面主要由腓深神经的直接分支和胫骨前肌神经穿支支配，后面由胫神经的直接分支和腓长屈肌神经穿支支配。神经进入骨膜后的树枝样分支，以胫骨骨膜内侧面和外侧面的中 1/3 部、后面的下 1/3 部分布最为密集，分支之间存在交通。这些结果可为胫骨骨膜移植促进神经功能重建的选材匹配、避免手术损伤其骨膜神经以及骨膜内镇痛药物注射靶点选择等提供形态学指导。

● 中 E2-骨科解剖学 ● Podium

中 E2-129-0001

不同骨盆截骨手术对髋臼中心和骨盆形态的影响

丁一通 Ms (2044916092@qq.com) 李玉飞 PhD 文捷 PhD 简晓红 PhD 易杨非 PhD 刘粲 Ms 湖南师范大学医学部 解剖教研室 长沙 410000

比较 Salter 骨盆截骨术、Pemberton 骨盆截骨术和三重骨盆截骨术对髋关节疾病患儿髋臼中心和骨盆形态的影响。收集 2011 年 1 月至 2020 年 12 月期间接受 Salter 骨盆截骨术（男 2 例，女 14 例，平均年龄 2.49 岁）、Pemberton 骨盆截骨术（男 4 例，女 11 例，平均年龄 6.11 岁）和三联骨盆截骨术（男 4 例，女 8 例，平均年龄 9.59 岁）治疗的儿童数据。出院后，门诊复查随访至少 1 年。所有患者均在术前、术后第一年的三个月以及术后每半年接受一次骨盆前后 X 光扫描。分析的 X 光片特征包括：双侧骨盆高度（PH）、髂嵴倾斜度（ICI）、髋臼中心水平距离（HD）和髋臼中心垂直距离（VD）。Salter 组的平均随访时间为（16.9 ± 4.9）个月，Pemberton 组为（20.7 ± 5.1）个月，三联组为（18.0 ± 5.4）个月（均为 $P > 0.05$ ）。在术前的 AP 骨盆 X 光片上，两侧的 PH、HD 和 VD 没有发现明显差异。然而，在最后一次随访时，Salter 组的 PH、HD、VD 和 ICI 均有所增加（均为 $P < 0.05$ ），Pemberton 组的 PH 和 VD 均有所增加（均为 $P < 0.05$ ），而 Triple 组的 VD 则有所减少（ $P < 0.05$ ）。Salter 骨盆截骨术可能会导致骨盆高度增加，髋臼中心向外和向下移动。相比之下，Pemberton 骨盆截骨术可能会导致骨盆高度增加，髋臼中心向下移动。三骨盆截骨术只会导致髋臼中心向下移动。



中 E2-129-0003

脊柱压缩性骨折术后疼痛解剖学基础

赵庆豪 1, 黎庆初 1

1.南方医科大学第三附属医院, 脊柱外科

作者简介: 赵庆豪 男(1990—), 医学博士, 研究方向: 脊柱临床解剖学

电话: (020)62784309 E-mail: qinghao.z@foxmail.com

目的 对 T1~12 椎间孔外口区域的韧带进行解剖学研究并探讨其临床意义。

方法 对 10 具成人尸体标本的 240 个 T1~12 椎间孔进行解剖观测。鉴别所有出现的韧带, 观察并记录 T1~12 椎间孔外口区域椎间孔外韧带的数量、形态、分布、起止位置和毗邻, 并用游标卡尺分别测量每条韧带的长度、宽度和厚度。

结果 在 229 个胸椎椎间孔外口区域共发现 564 个椎间孔韧带, 另 11 个椎间孔外口区域未发现韧带, 椎间孔外韧带的出现率为 95.42%。韧带分为 2 种类型, 放射型占 24.11% (136 个), 横跨型占 75.89% (428 个)。放射型韧带在 T1 及 T9~12 节段较为常见, 而在 T2~8 节段则相对较少。其中有 43.44% (245 个) 韧带分布于椎间孔外口区域的前部, 39.89% (225 个) 分布于后部, 11.35% (64 个) 分布于上部, 5.32% (30 个) 分布于下部。

结论 胸椎椎间孔外口区域存在 2 种类型的韧带; 其中放射型韧带可能是一种脊神经抗牵拉的结构, 对脊神经起到固定和保护作用, 横跨型韧带可能是胸椎压缩性骨折后肋间神经痛的潜在原因之一。

中 E2-129-0005

二甲双胍通过抑制铁死亡与细胞凋亡双通路改善骨关节炎软骨退变的机制

贾祥 1,2, 樊佳欣 1,2, 崔永萍 1,2, 王茜 1,2*

1 华北理工大学基础医学院, 唐山 063210; 2 河北省慢性疾病基础医学重点实验室, 唐山 063210

*通讯作者: tswqxx008@126.com

近年研究发现二甲双胍对骨关节炎 (OA) 具有潜在治疗作用, 但其多靶点机制尚未完全阐明。本研究通过构建大鼠 OA 模型探究其软骨保护机制。30 只雄性 SD 大鼠随机分为假手术组、模型组与二甲双胍组 (200 mg/kg/d 灌胃), 干预 4 周后发现: 二甲双胍组软骨表面纤维化程度显著减轻, 软骨细胞层数增加, 蛋白多糖含量恢复。机制研究显示, 二甲双胍通过调控铁死亡通路发挥作用: Western blot 检测显示软骨组织 GPX4 蛋白表达上调 ($P<0.05$), 血清铁离子 (Fe^{2+}) 和脂质过氧化产物 MDA 显著降低 ($P<0.01$), 同时显著抑制软骨细胞凋亡: TUNEL 染色显示凋亡细胞数较模型组减少 41.3% ($P<0.001$), 免疫荧光证实 SIRT1 表达显著升高 ($P<0.01$), 伴随 P53 表达显著下降。进一步检测显示, 二甲双胍组软骨基质合成关键蛋白 SOX9、Aggrecan 表达量显著升高 ($P<0.01$), 抗凋亡蛋白 Bcl-2 上调而促凋亡蛋白 BAX、Caspase-9 降低 ($P<0.05$), 炎症因子 IL-6、TNF- α 水平下降超 30% ($P<0.01$)。研究表明, 二甲双胍通过双重机制延缓 OA 进展: 一方面通过 P53/SLC7A11/GPX4 通路改善铁代谢紊乱与氧化应激, 另一方面激活 SIRT1/p53 信号通路促进软骨细胞存活、抑制细胞外基质降解。该发现揭示二甲双胍同时靶向铁死亡与凋亡通路协同保护关节软骨, 为其临床转化提供新依据。



中 E2-129-0006

药膳“续断然铜酒”对骨整合形成作用的影响

张智钧 杨苜梓 徐红 唐炜于胜波(ysbdu@126.com) 大连医科大学解剖学教研室 大连 116000

探究药膳“续断然铜酒”对骨整合形成作用的影响，为关节置换术后患者的居家康养策略提供实验基础。本研究用成年雄性新西兰兔 12 只，均在左侧股骨外侧髁处行钽钉植入术，术后随机分为空白对照组、实验组和阳性对照组，每组 4 只。术后一周开始灌胃，实验组给予药膳续断然铜酒灌胃，剂量为 0.76ml/kg；阳性对照组给予临床上常用的中药汤剂逐瘀生骨汤灌胃，剂量为 4.251g/kg；空白对照组给予等量生理盐水灌胃；各组均灌胃 1 个月。灌胃结束后通过 Micro CT 3D 重建出钽钉及表面骨质，酶联免疫吸附测定法检测血清中骨形成标志物骨特异性碱性磷酸酶（BALP）和骨吸收标志物 I 型胶原交联 C-末端肽（CTX-I）的水平，硬组织切片染色后计算新生骨形成率（甲苯胺蓝染色）及骨结合率（Van Gieson 苦味酸品红染色）。结果显示，与空白对照组比较，实验组 3D 重建的钽钉表面可见更为密集的新生骨质包裹，新生骨形成率及骨结合率显著增加（ $P<0.05$ ），血清中 BALP 和 CTX-I 水平显著升高（ $P<0.05$ ）；与阳性对照组比较，实验组 3D 重建的钽钉表面可见与其相当的新生骨质包裹，新生骨形成率及骨结合率无显著差异（ $P>0.05$ ），血清中 BALP 和 CTX-I 水平无显著差异（ $P>0.05$ ）。结果证实药膳“续断然铜酒”能增加钽钉表面骨质的生成，提高骨代谢水平，增加新生骨的形成及骨结合。综上，药膳“续断然铜酒”能促进钽钉与骨的骨整合，为关节置换术后患者的居家康养提供了中医药膳方案。

中 E2-129-0007

青少年腰椎间盘突出腰椎小关节角三维数字解剖学研究及临床意义

常屹华 李筱贺(798242742@qq.com) 内蒙古医科大学基础医学院人体解剖实验室 呼和浩特市 010010

青少年腰椎间盘突出症（LDH）在青少年群体中发病率逐年上升，但其病因尚未完全明确，腰椎小关节角度不规则变化（IAFO）与青少年 LDH 的关联性缺乏充足数据支持。本研究旨在通过三维数字解剖学方法探讨 IAFO 与青少年 LDH 的关系，为临床病因分析及防治提供依据。研究采用病例对照设计，纳入 25 例确诊为 LDH 患者（实验组）及 25 例健康青少年（对照组）。基于 MRI 和 CT 图像测量腰椎小关节角度，正常小关节角度变化由小变大，故将此类变化概括为正常型“小大大”（SLL），不规则变化包括小关节角度由大变小再增大、由小增大再减小以及不断减小，即概括为“大小大”（LSL）、“小大小”（SLS）、“大小小”（LSS）三种类型。双人独立测量取均值，采用 SPSS 27.0 进行统计分析。结果显示，实验组 IAFO 占比显著高于对照组：实验组中正常型（SLL）仅 5 例（20.0%），不规则型中 LSL 占 16 例（64.0%）、SLS 占 4 例（16.0%）；对照组正常型（SLL）21 例（84.0%），仅 4 例（16.0%）为 LSL 型 IAFO。组间差异显著（ $p<0.001$ ）， $OR=12.6$ （95%CI:3.4 - 46.8），表明 IAFO 与青少年 LDH 高度相关。此外，数据分析发现实验组内同一病例内相邻腰椎节段的小关节角度变化极值差异显著，实验组最大差值可达 15.5° ，而对照组普遍低于 5° 。异常波动集中于 LSL 和 SLS 型病例，研究表明，腰椎小关节角度不规则变化（IAFO）是青少年 LDH 的重要危险因素，两者关联性显著。这一结论为临床明确病因、早期筛查及预防提供了数据支持。



中 E2-129-0011

慢性社交挫败应激诱导小鼠骨代谢功能障碍的中枢神经调控机制研究

赵文君 (wjzhao7296@163.com) 路宇馨 董玉琳 胡学昱 空军军医大学西京医院骨科 西安 710032 空军军医大学基础医学院人体解剖与组织胚胎学教研室 空军军医大学口腔医院口腔颌系统重建与再生全国重点实验室

探究中枢神经环路在慢性社交挫败应激 (CSDS) 致骨代谢紊乱的机制, 为研究应激性骨质疏松的致病机理和治疗手段提供理论依据。综合利用神经环路示踪和调控、钙成像光纤记录、全细胞膜片钳、基因沉默、微型 CT (micro-CT) 等技术, 探究杏仁中央核 (CeA)-蓝斑 (LC) 通路在应激性骨质疏松中的作用机制。与对照组小鼠相比, CSDS 小鼠在造模 10 d 后出现社交回避、骨内 NE 释放增多、骨小梁微结构破坏和骨量减低。CSDS 小鼠 LCNE+神经元的动作电位发放频率和钙活动均显著增强。特异性抑制 LCNE+神经元缓解 CSDS 对小鼠骨骼结构的损害, 激活正常小鼠 LCNE+神经元诱发骨量减低。CSDS 致 CeA-LC 通路中促肾上腺皮质激素释放激素 (CRH) 和 γ -氨基丁酸 (GABA) 释放失衡, 特异性敲低 CRH 显著增加 CSDS 小鼠骨量。本研究发现了慢性应激增加骨内 NE 释放导致骨质疏松, 揭示了 LCNE+神经元在 CSDS 致骨质疏松中的核心作用, 阐明了 CeA-LC 通路中 GABA 和 CRH 失衡致骨质疏松的机制。这些发现加深了对骨代谢中枢调控机制的理解, 为应激性骨质疏松的治疗提供理论依据和潜在靶点。

中 E2-129-0013

0-6 岁儿童枕-寰-枢复合体区发育特征的影像解剖学研究

赵海岩 1,2 杨洋 1 郝韵腾 1 李志军 1 (13904717040@qq.com) 1.内蒙古医科大学基础医学院, 数字医学中心 呼和浩特 010059 2.内蒙古医科大学通辽临床医学院医学影像中心

目的 聚焦于 0-6 岁儿童 (简称幼童) 枕寰枢复合体区形态发育特征, 通过 CT 三维重建观测其发育特征和增龄变化规律, 为幼童枕颈固定术设计标准化手术路径、制定个性化手术方案、开发适配性器械提供理论依据。

方法 1.根据纳除标准回顾性收集三甲医院影像中心幼童头颈部 CT 数据 194 例 (男 98、女 96)。

2.CT 工作站软件测量枕骨、枕髁、枕骨大孔、寰枢椎等发育参数。

结果 1.幼童枕骨厚随年龄增长呈递增趋势且枕外隆凸处厚大于两侧 ($P < 0.05$)。2.枕鳞部形态学参数 0-1 岁组与其他年龄组间差异显著 ($P < 0.05$)。3.枕骨大孔前后径、宽和面积均男大于女 ($P < 0.05$)。4.枕髁长、宽、高性别和侧别间差异显著 ($P < 0.05$)。5.枕骨大孔径线、面积和枕髁长、宽、高、角度均随年龄增长呈递增趋势。

结论 1.幼童枕骨厚枕外隆凸处最为显著。2.枕骨大孔长、宽、面积及枕髁长、宽、高均随年龄增长变化显著, 而枕髁角与年龄增长无显著相关性。幼童寰椎前、后弓间尚存软骨连接, 临床内固定应予特别关注。3.枕骨大孔及枕髁角男显著大于女, 故针对女童手术时需适当扩大骨窗并限制螺钉规格。4.寰椎侧块与枢椎椎弓根宽、高和长均随增龄而增加。4 岁以上儿童可置入 3.5mm 螺钉。

关键词: 枕寰枢复合体; 0-6 岁儿童; 发育特征; CT 三维重建



● 中 E2-骨科解剖学 ● Poster

中 E2-129-0002

猪股骨外侧髁骨瓣的血管解剖和切取方法

作者：左衍海 1；肖首允 2；周新初 3；易磊 4

作者单位：1：上海市松江区泗泾医院，骨科；2：南京明基医院，骨科；3：上海交通大学农业与生物学院，动物科学系；上海交通大学医学院附属瑞金医院烧伤科

目的 股骨外侧髁骨瓣有越来越多的临床应用，本研究的目的是：（1）探索猪股骨外侧髁的血管解剖；（2）探索猪作为股骨外侧髁骨瓣动物模型的可行性；（3）比较猪与人股骨外侧髁骨瓣的异同。

方法 选用 20 个 4 月龄杂交猪的后肢，其中 15 个后肢用于股骨外侧髁骨瓣血管蒂的解剖学研究，5 个猪后肢用于切取股骨外侧髁骨瓣。主要研究指标是股骨外侧髁骨瓣血管蒂的源动脉、行程、分支、解剖变异、长度和直径。结合现有关于人股骨外侧髁骨瓣的解剖学研究，比较猪与人股骨外侧髁骨瓣的解剖学异同。

结果 猪股骨外侧髁骨瓣的源动脉包括第一膝上外侧动脉和第二膝上外侧动脉（15/15），第一膝上外侧动脉是股骨外侧髁骨瓣的主要源动脉，直径和长度分别是 1.99mm, 2.27cm。股骨外侧髁骨瓣的切取取卧位，沿股二头肌和股外侧肌间隙钝性分离即可显露血管蒂全长，手术切口约 10cm。

结论 猪和人股骨外侧髁骨瓣的血管解剖有很大的相似性，切取过程简单，猪可以作为人股骨外侧髁骨瓣的动物模型。

中 E2-129-0008

基于三维骨折地图技术的桡骨骨折线分布研究

史国鹏 高升 王海燕 李筱贺（798242742@qq.com）内蒙古医科大学基础医学院人体解剖实验室 呼和浩特市 010010

本研究旨在利用三维骨折地图技术，深入分析桡骨骨折线的分布特征，以期为临床治疗提供更加精准的指导。回顾性审查了内蒙古医科大学第二附属医院的 40 例桡骨骨折患者，其中男性 24 例，女性 16 例，平均年龄为 45 岁。通过 Mimics 21.0 软件完成骨折模型重建及骨块分割，3-matic 12.0 软件用于骨折块复位及骨折线绘制，E-3D 系统用于生成红蓝渐变骨折热图。研究发现，不同 AO/OTA 分型的骨折线分布具有显著差异。A 型骨折线多呈横向，集中在干骺端背侧；B 型斜行或垂直，累及月骨关节面背侧；C 型呈现复杂网状，乙状切迹背侧骨块移位明显。热图显示，骨折线高密度区主要位于背侧关节面和桡侧柱，低密度区则在掌侧皮质及尺侧柱远端。这一分布与桡骨远端的解剖结构和生物力学特性密切相关，如背侧骨皮质的灰度值低于掌侧（173.60>294.38），这表明背侧骨皮质的骨密度相对较低。因此，在沿桡骨干方向的负荷作用下，背侧骨皮质更容易发生骨折。本研究通过三维标测技术全面揭示了桡骨远端骨折的骨折线和形态特征，为骨折诊断及手术固定设计等提供了重要参考，从而提高治疗效果和患者预后质量。



中 E2-129-0010

柯里拉京通过抑制 JNK 介导的糖酵解缓解 MSU 晶体诱导的关节软骨损伤

何英芃 张莹 何乐冉 谢曹宇 潘浩 (hao.pan25@foxmail.com) 广州中医药大学基础医学院人体解剖学系 广州 510006

痛风患者关节内尿酸钠 (MSU) 晶体沉积会导致软骨损伤。中药老鹤草有治疗风湿痹痛的潜力，其活性成分柯里拉京有较好的药理作用，但是其对痛风引起的软骨损伤未见详细报道。本论文拟探究柯里拉京是否通过调节软骨细胞内的糖酵解缓解 MSU 晶体诱导的软骨损伤。在体外用 MSU 晶体刺激小鼠原代软骨细胞，评估柯里拉京对细胞活性和糖酵解的影响。结果发现柯里拉京能抑制 MSU 诱导的软骨细胞死亡和基质金属蛋白酶 3 蛋白表达，以及阻止 II 型胶原蛋白的降解。柯里拉京能抑制糖酵解相关蛋白 GLUT1、HK2、LDHA 的表达和乳酸的释放。阿利新蓝染色结果显示柯里拉京能阻止 MSU 诱导的软骨细胞胶原减少。网络药理学和分子对接分析及实验证明柯里拉京能够抑制 JNK 信号。此外，往小鼠膝关节注射 MSU 晶体建立急性痛风模型，在体内柯里拉京能阻止 MSU 诱导的 II 型胶原蛋白减少和软骨基质的降解。以上结果表明柯里拉京通过抑制 JNK 信号限制糖酵解途径，以及减少 MSU 诱导的软骨细胞基质降解和细胞死亡，从而缓解痛风致病因素 MSU 晶体诱导的关节软骨损伤。

中 E2-129-0012

温和热疗在早期通过动态调控 iNOS/Arg1 平衡促进骨修复

赵锦辉^{#,1}, 郑龙坡^{*,1}

1 上海市静安区延长中路 301 号同济大学附属第十人民医院骨科

第一作者邮箱: bonezhaojinhui@163.com

温和热疗作为一种辅助性骨修复治疗策略，近年来备受关注。然而，其最佳干预时机、作用持续时间及具体机制仍不明确。本研究聚焦于温和热疗在骨修复早期阶段的作用，结果显示其通过动态调控诱导型一氧化氮合酶 (iNOS) 与精氨酸酶 1 (Arg1) 之间的平衡，加速骨再生进程。具体而言，温和热疗在最初阶段通过激活 iNOS 诱导巨噬细胞向 M1 表型极化，而在持续处理 3 天后，又通过激活 Arg1 促使其迅速向 M2 表型转化。RNA 测序结果显示，单日温和热疗即可引发免疫反应的早期重塑，这一过程与骨修复初期的炎症阶段密切相关，其特征包括破骨细胞的激活、种子细胞的募集以及新生血管的形成，从而为后续的修复阶段奠定基础。通过皮下脓肿模型、皮下包埋及颅骨临界性骨缺损模型进一步验证了温和热疗对巨噬细胞表型的动态调控作用。该调控不仅增强了早期的抗菌效应，还促进了血管生成，并有效推动了炎症向修复阶段的过渡，从而显著加速骨缺损的愈合。本研究首次系统阐明了温和热疗在骨修复初期对免疫反应的双时相调控机制，为术后光热治疗的最佳干预时机与持续周期提供了重要的理论依据与实践指导。



中 E2-129-0014

3D 打印腰椎技术助力脊柱外科从经验医学迈向数字医学

刘阳（2317459615@qq.com） 山东数字人科技股份有限公司研发中心 济南 250101

据统计，我国腰椎间盘突出症患者已突破 2 亿人，且呈持续上升趋势。脊柱的解剖较其他骨骼更为复杂，传统的教学是通过尸体标本，但尸源少，故多是采用一种平面教学，比较抽象。由此，我司进行了 3D 打印脊柱医学数据体系的构建与产品研发。我司研发的 3D 打印腰椎可重现人体脊柱解剖结构，提高学生对脊柱解剖的理解和记忆，也可以通过病理脊柱模型掌握疾病的发病机制及病理改变，从而提高教学质量。临床医师可根据脊柱模型进行术前规划，模拟，过程中明确钉道的角度及深度，选择合适的内固定物，在手术过程中避开重要的神经、血管等，提高手术的安全性，减少手术时间及出血量、术中透视次数及暴露时间。我们提取高清晰断层数字人体数据中脊柱数据，构建脊柱解剖结构的三维数字模型，以数据集中的体素作为模型的纹理贴图，获取不同典型形态腰椎间盘突出患者的 CT 影像数据，构建腰椎间盘突出数字模型。市面其他产品对于构建软组织的重视程度不够，仿真性差，多为纯色打印，可操作型较少，且无法进行系统的手术操作。我们的产品腰部结构准确，体表标志明显，可真实触知，仿真度高。可进行腰椎间盘突出症、腰椎管狭窄症训练等疾病的训练。模拟手术腔可更换，可反复进行练习。此产品可用于手术计划制定，手术排练演习，手术教学等。

● 中 E2-骨科解剖学 ● Abstract

中 E2-129-0009

Lenke1 型青少年特发性脊柱侧凸冠状面、矢状位面参数性别差异的数字化分析

张若帆 李筱贺(798242742@qq.com) 内蒙古医科大学基础医学院人体解剖实验室 呼和浩特市 010010

深入研究 Lenke1 型患者性别间冠状面、矢状面参数差异及相关性，旨在理解不同平面下各参数之间的作用关系，进而为 Lenke1 型患者的术前评估及拟定手术方案提供参考。筛选纳入 50 例 Lenke1 型男性患者和 50 例 Lenke1 型女性患者的图像作为研究对象。将图像导入 Mimics 21.0，测量 Cobb 角、顶椎平移距离（AVT）、腰椎前凸角（LL）、胸椎后凸角（TK）、骨盆倾斜角（PT）、骨盆入射角（PI）、骶骨倾斜角（SS）、矢状面垂直轴（SVA），利用 SPSS 比较性别间参数差异及相关性。结果显示，Lenke1 型中女性患者的 Cobb 角、AVT、PT、PI 均显著大于男性患者（ $Z=-4.581$, $p<0.001$; $Z=-2.192$, $p=0.028$; $Z=-2.275$, $p=0.023$; $t=-2.355$, $p=0.021$ ）。相关性分析也显示存在性别差异，Lenke1 型女性患者 Cobb 角与 AVT 呈显著正相关（ $r=0.62$ ）。Lenke1 型男性患者 Cobb 角与 AVT 呈显著正相关（ $r=0.726$ ），PI 与 Cobb 角、AVT 呈弱正相关（ $r=0.341$; $r=0.351$ ）。因此，建议在 Lenke1 型患者的术前评估以及术中矫正时，应特别关注女性患者的冠状面偏移情况，而男性患者除了关注冠状面偏移，还需特别关注骨盆倾斜程度。



● 中 E3- 临床神经解剖学 ● Podium

中 E3-129-0002

关节镜下腕管松解术与传统的腕管松解术治疗腕管综合征的临床疗效对比分析

周勇(975004380@qq.com) 张政 黄建新 天津医科大学附属宝坻医院 手足外科 天津 301800

本研究探讨对比分析关节镜下腕管松解术与传统的腕管松解术治疗腕管综合征的临床疗效。本研究为临床资料回顾性研究，选取我科自 2023 年 1 月至 2024 年 6 月收治的腕管综合征患者 71 例，以手术方式分为微创关节镜组和传统切开组，微创关节镜组采用关节镜下腕管松解术，传统切开组采用传统切口行切开手术松解腕管，术后对比两组的临床疗效。依照顾玉东院士推荐的腕管综合征功能评定标准，于术后 1、3、6 个月比较两组的示指末节两点辨别觉、肌力功能恢复情况、症状改善情况评分，以综合评定分级（优、良、中、差）评价两种手术方式的临床疗效。结果显示 71 例施行手术治疗的腕管综合征患者中，微创关节镜组有 31 例，传统切开组有 40 例，两组患者术后示指末节两点辨别觉、肌力功能恢复情况、症状改善情况评分、综合评定分级比较差异没有统计学意义。关节镜下腕管松解术与传统的腕管松解术两种手术方式治疗腕管综合征的临床效果相似，但关节镜下腕管松解术较传统的手术方式切口更小、出血更少、恢复更快，患者接受度更高。

中 E3-129-0008

上肢综合感觉刺激康复方案脑卒中应用研究

董银凤 邹冬冬 王旭阳 上海交通大学医学院附属上海市第六人民医院神经外科 上海 200233

肢体功能障碍是脑卒中患者最常见、最严重的并发症，尤其是上肢运动功能障碍发生率高、治疗较为困难，康复耗时和预后效果不佳。感觉刺激及感觉训练有助于加强神经可塑性、提高运动控制能力、促进肢体功能的恢复。本研究通过构建脑卒中患者上肢功能障碍的综合感觉刺激方案，评价其临床应用效果，为脑卒中患者临床康复提供科学、规范的合理化指导依据。采用系统文献回顾方法为基础确定感觉刺激干预方案的框架，通过半结构化访谈全面了解目标人群接受度、参加意愿以及方案实施的建议与要求后进行具体条目的删减和补充，拟定干预方案，涵盖被动感觉刺激+主动感觉训练（各包含 7 步干预内容，略）。采用便利抽样法，对 2024 年 6 月至 2024 年 12 月在我院康复的招募患者，按照自选分组法分为对照组和干预组，对照组仅实施常规康复措施，干预组在常规康复的基础上结合综合感觉刺激方案。通过连续 14 天的类实验研究观察干预方案的应用效果，分别在干预前（基线）、干预第 1 周、第 2 周进行上肢运动功能相关指标、生活自理能力水平进行评估。采用 SPSS 26.0 统计软件，分别对干预组和对照组患者的上肢功能改善情况进行组内及组间比较分析。本次研究共纳入 61 例脑卒中患者，其中干预组 28 例、对照组 33 例，男性患者 42 例，女性患者 19 例；基线数据分析显示，两组患者在人口学特征及临床指标方面均无统计学差异（ $r > 0.05$ ）。BI 评分结果显示：干预 7 天后，两组患者评分差异具有统计学意义（ $r < 0.05$ ），且干预 7 天后、14 天后两组的评分较基线水平显著提升（ $r < 0.05$ ），且组间差异进一步扩大（ $r < 0.05$ ）；ARAT 评分结果显示：干预 7 天及 14 天后，两组评分较基线水平的差值具有统计学意义（ $r < 0.05$ ）；FMA-UE 评分结果显示：两组评分较基线水平的差值具有统计学意义（ $r < 0.05$ ）。混合效应模型分析结果显示，发病天数（ $z = -2.536, r < 0.05$ ）、损伤部位（ $z = 3.619, r < 0.05$ ）和 Brunnstrom 分期（ $z = 2.058, r < 0.05$ ）显著影响 14 天 BI 评分。此外，BI、ARAT 和 FMA-UE 的基线值对干预后评分有显著影响。结论：构建的感觉刺激干预方案显著促进了患者上肢及手部功能的恢复，提高了其生活自理能力。表明该方案对脑卒中患者上肢日常的自主康复训练有效，可为提高卒中患者上肢康复效果制定个性化的康复方案提供参考依据。同时发现，脑卒中发生时间、脑损



伤部位、基线值和 Brunnstrom 分期等因素可影响综合感觉刺激方案的干预效果，临床康复过程中须重视康复时间的选择，进行早期康复。

关键词：脑卒中；综合感觉刺激训练；感觉运动皮层；上肢

● 中 E3- 临床神经解剖学 ● Poster

中 E3-129-0004

首次急性脑梗死合并高血压和糖尿病患者的梗死灶发病部位对再复发的影响

孙建政（2370202997@qq.com） 郑强 宋丽梅 董鹏 山东第二医科大学影像学院 潍坊 261053 烟台大学

目的 分析首次急性脑梗死合并高血压和糖尿病患者的不同梗死灶部位对复发的影响，为临床医生对急性脑梗死复发的预防提供参考。

方法 回顾性收集潍坊市中医院与山东第二医科大学附属医院首次急性脑梗死合并高血压、糖尿病患者 164 例，并进行为期一年的随访，以 DWI 观测到新的梗死灶为准，根据是否复发分为复发组和未复发组。将原始图像基于 matlab2022 的 spm 工具箱配准到 MNI 和 ch2bet 标准脑图谱并覆盖各脑区域模板，记录梗死灶在各解剖区域（额叶、顶叶、枕叶、颞叶、基底节区、放射冠等）和各供血区域（大脑前、中、后动脉和椎基底动脉）的分布情况。

结果 在各解剖区域中，发生在额叶、放射冠的梗死灶对脑梗死复发的影响有统计学意义（ $P<0.05$ ）；在各供血区域中，发生在大脑中动脉的梗死灶对脑梗死复发的影响有统计学意义（ $P<0.05$ ）。

结论 当首次急性脑梗死患者合并高血压和糖尿病的梗死灶发生在大脑中动脉、额叶、放射冠时，患者更易复发。

中 E3-129-0005

术中 B 超引导功能区胶质瘤手术后患者生活质量影响的应用

王小峰，渭南市中心医院神经外科

目的 本研究探讨术中超声在功能区胶质瘤切除术中的临床应用及价值。并评价手术治疗的脑胶质瘤患者生活质量变化状况，了解胶质瘤患者随时间推移的生活质量改变情况。

方法 回顾性分析本院近 5 年收治的 28 例功能区胶质瘤患者的相关资料，均行术中 B 超引导手术，对比手术切除率，术后神经功能缺损情况。患者均经病理学检查确诊为胶质瘤。在随访期间进行再次手术者排除在外。术前、术后 1、6 个月分别采用 EQ-5D 3L 指标值评估患者的生活质量。

结果 高级别胶质瘤（HGG）与低级别胶质瘤（LGG）患者相比，HGG 患者年龄更大，术前神经功能水平较低，运动能力、语言和认知障碍的发生率较高；肿瘤体积也较大。患者术后并发症、语言或运动障碍发生率无统计学差异。在日常活动、自我照顾和行走功能等方面比较，术后 1 个月时，HGG 和 LGG 患者与术前相比没有变化。在 HGG 患者中，疼痛恶化或改善较常见。在术后 6 个月时，HGG 患者恶化的比例增大。

结论 LGG 和 HGG 患者在术后 1-6 个月间的生活质量变化与自然病程发展规律基本一致，HGG 患者 6 个月时生活质量出现明显恶化。高级别胶质瘤、未全切除和术前并发症是脑胶质瘤患者生活质量不良发展的预测因子。



● 中 E3- 临床神经解剖学 ● Abstract

中 E3-129-0001

I 型神经纤维瘤病合并椎动脉动脉瘤及动静脉瘘病例汇报及文献回顾

周子璇 应奇 马鹏*

通过 1 例神经纤维瘤病合并椎动脉动脉瘤的诊疗经验，结合文献探讨其发病机制与临床特点及诊疗进展。

回顾分析 1 例 51 岁女性患者的临床表现、影像学特征（急诊 DSA 造影显示右侧椎动脉 V4 段动脉瘤，大小约 2.7×2.5×2.2 mm，V2-V3 段多处动静脉瘘，左侧椎动脉基底动脉开窗畸形）、治疗经过（经左侧椎动脉通路栓塞动脉瘤，术后行脑室外引流及对症支持），结合既往文献分析 NF 与脑血管畸形的形成关系，并进一步探讨诊疗决策。

文献回顾发现 NF1 合并椎动脉动脉瘤及动静脉瘘罕见，目前报道的合并病例仅 6 例，多为破裂动脉瘤。

NF 患者需警惕椎动脉血管病变，早期诊断与干预可改善预后。其发病机制可能与 NF1 基因突变导致的血管壁发育异常及血流动力学改变有关。

中 E3-129-0007

下丘脑室旁核调控焦虑的分子机制及网络药理学研究

曹欣娅 1 (734566909@qq.com) 熊柳林 2 遵义医科大学第三附属医院麻醉科 遵义 563000

下丘脑室旁核（PVN）在焦虑调控中的核心作用已被广泛报道，但其分子网络机制尚未系统阐明。本研究基于网络药理学方法，整合多维度生物信息学分析，旨在解析 PVN 调控焦虑的关键靶点及信号通路。通过 GeneCards 数据库分别以“Anxiety”和“Paraventricular Nucleus”为关键词检索相关靶点，筛选焦虑相关度评分≥4 的靶点 573 个和 PVN 相关靶点 384 个，通过 Venn 分析筛选出 112 个交集靶点。利用 STRING 数据库构建蛋白互作网络(PPI)，结合 Cytoscape 软件的 CytoHubba 插件（MCC 算法），筛选出 NPY、POMC、FOS、OXT、TAC1、VIP、CRH、AGT、TH、LEP 共 10 个核心靶点。基因本体（GO）富集分析显示，这些靶点主要参与神经递质调控(354 条 BP)和代谢过程(46 条 CC，74 条 MF)。KEGG 通路分析鉴定出 50 条显著通路，显示大部分基因主要富集在 GnRH 分泌、昼夜节律节律、酪氨酸代谢、GABA 能突触、神经活性配体-受体相互作用、安非他咪毒、5-羟色胺能突触、多巴胺能突触、人 T 细胞白血病病毒 1 型感染及 cAMP 信号通路。进一步构建的“情绪-部位-靶点-通路”多维网络模型揭示，PVN 通过 CRH-NPY-LEP 等核心靶点调控神经内分泌与突触可塑性，介导焦虑表型。本研究通过生物信息学分析明确了下丘脑室旁核在焦虑中的关键分子机制，为靶向 PVN 开发精准抗焦虑疗法提供了网络药理学基础。



● 中 E4-神经外科解剖学 ● Podium

中 E4-129-0001

接触性内镜在神经外科中的应用

邓学云 Xueyun Deng

四川省人民医院川东医院·达州市第一人民医院神经外科

目的 探讨接触性内镜在神经外科中的应用效果，评估其在微血管减压术、脑内血肿清除术、垂体瘤切除术和额叶海绵状血管瘤手术中的临床价值。

方法 回顾性分析 20 例应用接触性内镜辅助的神经外科手术病例，涵盖微血管减压术、脑内血肿清除术、垂体瘤切除术和额叶海绵状血管瘤切除术等。所有手术均在标准的神经外科手术流程下进行，术中使用接触性内镜进行视觉引导，并与传统手术方法进行对比分析。

结果 在 20 例手术中，接触性内镜显著提高了术中可视化水平，简化了术者操作难度，设备小巧轻便，更方便术者使用筷子技术完成复杂手术。接触性内镜精确显示了复杂结构和微小病变的位置。在微血管减压术中，内镜帮助精确识别压迫点并进行有效减压，提高手术安全性。在脑内血肿清除术中，内镜的应用使得血肿定位更加精确，清除更加彻底，减少了术后出血和感染的发生。在垂体瘤切除术中，术者更容易使用筷子技术切除垂体瘤。内镜提供了高清晰度的影像，增强了对肿瘤及周围结构的处理能力，患者术后恢复良好。额叶海绵状血管瘤切除术中，内镜的使用减少了开颅范围，显著降低了术后并发症和恢复时间。

结论 接触性内镜在神经外科手术中具有较高的应用价值。它能够提高术中可视化精度，降低神经内镜使用难度，改善手术效果，降低手术创伤和并发症的风险。随着技术的不断发展，接触性内镜在神经外科领域的应用前景广阔，未来可能成为微创神经外科手术的重要辅助工具。

● 中 E4-神经外科解剖学 ● Abstract

中 E4-129-0002

周围性面瘫个性化手术治疗效果分析

杨建华 1 申杰 2 潘俊吉 2 张春阳 2

1: 包头市第六医院; 2: 内蒙古科技大学包头医学院第一附属医院

周围性面瘫显著影响患者生活质量。本研究回顾性分析 19 例患者的临床资料，探讨不同手术方法的应用效果及面神经损伤至手术时间对恢复的影响。手术方法包括：中颅底入路面神经膝状神经节减压（3 例）、乳突入路面神经垂直段减压（8 例）、面神经-舌下神经重建（5 例）、面神经-咬肌神经重建（2 例）及腮腺肿瘤术中面神经断端吻合（1 例）。损伤至手术时间 1-3 年（中位 7 个月）。术后通过 House-Brackmann 分级、面神经电图及肌电图（EMG）评估功能恢复，随访记录并发症。结果显示，所有患者均顺利完成手术，无严重并发症。中颅底入路组 3 例患者功能显著改善（Ⅵ级→Ⅱ级），损伤至手术平均时间 2.5 月。乳突入路组 8 例中，4 例恢复至Ⅲ级，3 例Ⅱ级，1 例完全恢复，损伤至手术时间 1.5 个月。面神经-舌下神经重建组 5 例中，3 例Ⅲ级，2 例Ⅱ级，手术时间 6-10 个月。面神经-咬肌神经重建组 2 例，分别为Ⅲ级、Ⅳ级，手术时间分别为 8 个月和 36 个月。腮腺肿瘤吻合组 1 例（手术时间 1 个月）功能恢复至Ⅱ级，表情运动功能良好。结论表明，面瘫后尽早手术可提高疗效，与减少表情肌失神经支配时间相关。个性化手术显著改善面神经功能，需依据损伤部位和病情选择术式。中颅底、乳突、舌下神经、咬肌神经重建及腮腺肿瘤吻合均为有效方法，可恢复功能并提升生活质量。未来研究将优化手术方案以进一步提高疗效。



● 中 E6-整形美容解剖学 ● Podium

中 E6-129-0001

胸大肌解剖指导精细化隆乳的临床实践与效果分析

秦海燕 张连波 孙湄杨

单位：吉林大学中日联谊医院（吉林大学白求恩第三医院）

通信地址：吉林省长春市仙台大街 126 号

电话：13634406389

目的 明确胸大肌解剖特征对假体隆乳术的指导意义，构建基于解剖标志的精细化操作路径，改善假体植入的稳定性和美学表现。

方法 通过大体解剖分析胸大肌肌纤维走向及附着点特征。

创新性设计“三维导航剥离技术”：

术前规划：标记胸大肌筋膜层关键解剖边界及神经血管束；

术中操作：沿肌纤维走行钝性分离，保留胸大肌后间隙完整性；

腔隙控制：基于肌肉张力动态调节假体植入空间。

与传统术式进行临床效果对比评估。

结果 解剖导航组在术后并发症控制及美学效果方面呈现显著优势：

假体移位、血清肿等并发症发生率明显降低；

乳房在静态及动态下的形态自然度显著提升；

患者对术后触感及轮廓的满意度达较高水平。

结论 胸大肌解剖导向的精细化术式通过优化腔隙剥离路径和压力分布，为假体隆乳提供了更符合生物力学的解决方案。建议将解剖导航技术作为提升手术安全性和美学可预测性的重要策略。

关键词：胸大肌解剖；假体隆乳；三维导航

中 E6-129-0002

不同游离皮瓣修复在手指软组织缺损的美学效果及对手指功能恢复的影响

欧阳四民 赵景峰 冯光 林海阳 北京大学首钢医院 修复重建外科 北京 100144

本院对 2021 年 3 月~2023 年 3 月期间治疗的 296 例手指软组织损伤病例进行回顾性研究，将采用腕掌侧桡动脉掌浅支游离皮瓣修复的 136 例患者纳入对照组，采用跖趾腓侧游离皮瓣修复的 160 例

中 E6-129-0004

面部注射的分层解剖与美学设计

杨芷

随着微创美容技术的快速发展，面部注射填充已成为面部年轻化与轮廓塑形的重要手段。然而，注射技术的安全性和美学效果高度依赖于操作者对解剖层次的精准把控及个性化的美学设计。本次学术讲课将系统阐述面部注射相关的分层解剖结构、动态美学评估方法、材料选择与层次适配技术，并结合临床案例探讨并发症的预防与处理策略，旨在提升注射操作的精准性、安全性和自然美学效果。

本人将从两部分进行分享：



1. 分层解剖学基础与血管神经规避

面部注射的核心在于精准掌握皮肤、皮下脂肪、表浅肌肉腱膜系统（SMAS）、韧带支撑结构及骨膜层的三维解剖关系。本部分将结合断层解剖学、超声影像学及尸体解剖研究，详细解析面部各区域（如额部、颞部、眶周、中面部、鼻唇沟及下颌缘）的层次特点，重点探讨面部血管（如面动脉、滑车上动脉、眶下动脉）及神经（如面神经分支）的走行规律，并建立“高风险区注射安全路径”，以减少血管栓塞、组织坏死等严重并发症的发生。

2. 动态与静态美学评估体系

面部美学设计需综合考虑静态轮廓与动态表情的协调性。本部分将介绍基于黄金比例、光与影、面部容积分布及衰老变化（如脂肪垫移位、骨质吸收）的美学评估方法，并结合不同性别、年龄及种族的面部特征差异，提出个性化注射方案。

本授课结合医生的个人操作经验，整合了解剖学、生物力学及美学设计的多学科知识，旨在推动面部注射技术向精准化、标准化发展。未来，随着 3D 成像、人工智能辅助设计等技术的应用，个性化注射方案将进一步提升临床效果与患者满意度。

中 E6-129-0005

不同注射美容材料在眶周注射应用中的解剖学思考

张吉 南方医科大学珠江医院 整形美容中心 510515 zhnagji364@qq.com

目的 根据眶周区域注射美容材料的临床应用现状，结合眶周解剖学特征探讨技术优化策略。

方法 通过临床回顾性研究对 2018-2024 年我院整形外科眶周注射美容病例进行分析，并文献回顾近 5 年国内外眶周注射美容相关文献进行归纳整理，重点分析基于不同注射材料特性而选取不同解剖层次定位的注射技巧及注射并发症预防机制。结果：当前主流材料包括透明质酸（占比 62%）、胶原蛋白（18%）、再生材料（PLLA/PCL 等 15%）及复合制剂（5%）。材料选择需结合注射层次（皮下/ROOF 层/骨膜上）及解剖特征：①眉间区注射策略及并发症防治；②泪沟注射策略及与眼轮匝肌支持韧带及眶隔脂肪的动力学关系；③上睑凹陷填充材料选择及注射手法；④再生材料注射原则，注射剂量把握。结论：基于多层级解剖结构的动态容积补偿理念，建议建立以材料流变学特性与局部组织顺应性相匹配的个性化注射方案。

关键词：眼周注射；注射美容；眶周解剖学

中 E6-129-0006

不同部位、方向及深度的面部裂伤与面神经损伤的研究体会

刘振楠

新乡医学院第一附属医院
烧伤整形与医疗美容科

目的 探讨面部裂伤的不同部位、与面神经走行的不同方向（平行/斜行/垂直）及受伤深度（皮肤/肌层/骨膜层）三维因素与面神经损伤类型的相关性，达到面部裂伤后对面神经损伤的精准预判，进而在美容缝合中尽可能达到功能修复与美学效果的统一。

方法 方法本研究回顾性分析 2024 年 5 月至 2025 年 1 月期间在我科行面部外伤美容缝合的 185 例患者的临床资料。按三维特征分组：1.不同部位：颧颊区、额颞部、下颌部；2.不同方向：三维重建面神经走行，测量裂伤轴线与神经夹角（垂直组：60-90°；斜行组：15-60°；平行组：0-15°）；3.不同深度：记录损伤深度（皮肤/肌层/骨膜）。分析不同部位、方向、裂伤深度对面神经损伤的影响。



结果 1.面神经损伤的高危因素分析：靠近面神经主干的裂伤，神经损伤率显著升高（ $P<0.001$ ）；垂直面神经走行方向的裂伤，神经完全断裂风险较平行裂伤增加（ $P<0.001$ ）；深度达骨膜层的裂伤，神经损伤率显著高于未达骨膜层者（ $P<0.001$ ）。2.不同因素组合的损伤风险：高危组合（面神经主干区+垂直方向+深达骨膜）：神经完全断裂率 60.2%；低危组合（非主干区+平行方向+未达骨膜）：神经损伤率仅 0.7%。

结论 基于解剖基础，本研究证实靠近面神经主干、垂直其走行方向且深达骨膜的裂伤是面神经损伤的高危组合，其余情况损伤风险显著降低。有利于对患者进行美容缝合前综合性精准评估面神经损伤情况，进而在美容缝合中尽可能达到功能修复与美学效果的统一。

中 E6-129-0008

全腹壁整形术缩小腰围的案例分享

蒋萱 南方医科大学珠江医院 整形美容中心
广东省广州市海珠区工业大道中 253 号
gwanita@163.com

与西方相比，由于肥胖率较低，亚洲对腹部整形手术的需求较少。选择进行此手术的亚洲人大多是产后女性，而且她们中的大多数并不肥胖；她们腹部皮肤的松弛也不明显。相反，她们的主要担忧是腰围的增加。

尽管自然恢复通常在分娩一年后发生，但许多亚洲女性即使体重恢复到怀孕前的水平，腰围也会增加超过 20%。这种现象归因于怀孕和分娩导致的腹部壁肌肉和筋膜的松弛和拉伸。当腹部壁变得薄弱时，腹腔内容物倾向于向外突出，导致腰围显著增加，尤其是在饭后尤为明显。因此，手术干预这一问题的核心目标是折叠和恢复腹部肌肉和筋膜组织。

作者通过腹部肌肉的缝合使患者的腰围改善更加明显，缓解了背痛。

中 E6-129-0009

假体隆臀并发症的解剖学因素探讨

王国民
深圳博爱曙光医院

假体隆臀术是目前常见的整形手术之一，但由于臀部复杂的解剖结构，术后可能出现多种并发症。本文从解剖学角度探讨假体隆臀术相关并发症的发生机制，重点分析臀区血管、神经、肌肉及脂肪组织的解剖特点对手术安全性的影响。臀上动脉、臀下动脉及坐骨神经的走行位置可能增加术中出血和神经损伤的风险；肌肉层次（如臀大肌、臀中肌）的分离不当可能导致假体移位或包膜挛缩；而皮下脂肪的分布差异可能影响术后形态和假体稳定性。此外，手术入路（如肌肉下、筋膜下或皮下植入）的选择与并发症的发生密切相关。通过深入理解臀区解剖结构，术者可优化手术方案，减少血管神经损伤、感染、假体移位及不对称等并发症，从而提高手术安全性和患者满意度。

关键词：假体隆臀、并发症、解剖学因素、臀区血管、神经损伤、手术入路



中 E6-129-0010

隐蔽皮肤切口修复单侧微型唇裂的鼻部形态学观察

中国医学科学院整形外科医院 宋涛

背景 微型唇裂是唇裂最轻微的类型，上唇没有明显的缺陷。微型唇裂鼻畸形包括鼻孔缘扁平、鼻翼基部不对称和鼻中隔偏曲。采用隐形皮肤切口鼻底肌重建术治疗微型唇裂鼻畸形。

方法 回顾性分析 2020 年 5 月至 2022 年 10 月采用隐形皮肤切口鼻底肌重建术治疗的 21 例微型唇裂患者的手术效果。比较术前和术后 6 个月的鼻部形态计量学测量结果。从裂隙和非裂隙两侧获得比例值，并使用配对 t 检验分析来评估手术结果。

结果 术后 6 个月各项鼻部形态学指标与术前比较均有显著性差异 ($p < 0.05$)。术后鼻翼基部和鼻孔变窄，患侧侧唇高度增加。患侧鼻孔高度增加，鼻小柱偏差减轻。此外，术后裂隙与非裂隙面积的比值接近 1.0。

结论 单侧微型唇裂鼻畸形可通过隐蔽小切口进行修复。

中 E6-129-0011

面部层次解剖新视角

张明君
南方医院

背景 面部解剖因结构精细、层次复杂成为医学教学难点。本研究提出一种跨学科教学模式，通过融合人类进化生物学与工程设计原理，构建符合认知规律的分层教学体系。

方法 进化视角解构复杂性：从脊椎动物颅面进化历程切入，阐释面部肌肉、神经、血管的形态功能适应性。通过比较解剖学，揭示层次形成的生物学逻辑
工程仿生学类比教学：将面部层次类比“建筑工程”（骨骼→钢筋支架，筋膜→防水层，肌肉→电缆网络）。血管神经的“管路布线”与生物力学优化设计。

结果 通过此种方法的理解和授课，使复杂的面部解剖不在凌乱无序，变成一个错落有致，立体感强烈的画面，从皮肤界面到 SMAS 系统再到骨膜其实是进化的必然选择，血管神经的加入层次也是必然的。

结论 该模式可使学习效率大幅提升，有效降低认知负荷。让我们美容外科医生对解剖认识更加深刻和容易理解，对指导临床具有重要的意义。



中 E6-129-0012

面部年轻化关键解剖要点及临床应用

齐向东

单位：南方医科大学珠江医院

通信地址：广州市海珠区工业大道 253 号

邮箱电话：392123225@qq.com 02062782055

目的 面部衰老的过程伴随着面部所有组织包括骨骼、肌肉、韧带、筋膜结缔组织、脂肪及皮肤等的容积缺失及松弛导致的真性及假性下垂。根据不同年龄的老化改变，数字化评估求美者面部老化关键解剖要点；根据不同面部年轻化治疗方法修复老化、评估其效果。重点探讨应用三维重建软件定量评价 SMAS 层填充、支持韧带层面填充、SMAS 层提拉折叠固定、支持韧带层提拉折叠固定、射频治疗在面部年轻化中的应用效果，为面部年轻化提供关键解剖与临床治疗经验。

方法 选取 100 例面部皮肤松垂，眉下垂及眶颧沟、泪槽沟、颊中沟、鼻唇沟、“木偶纹”明显的患者。软件分析后，分为韧带深层填充注射组、传统浅层填充注射组、韧带深层提拉折叠固定组、韧带浅层提拉折叠固定组、光声电组，每组 20 例，填充注射组为透明质酸填充注射。治疗前后均对患者进行全面部三维扫描，应用 Mimics 13.0 软件对颧颊部横面弧（D-B-E）和冠状面弧（A-B-C）进行半径测量。

结果 韧带深层填充注射前后、传统浅层填充注射前后、韧带深层提拉折叠固定前后、韧带浅层提拉折叠固定前后、光声电治疗前后 D-B-E 弧和 A-B-C 弧半径均明显增加，治疗前后差异均有统计学意义。

结论 应用透明质酸注射填充韧带深层的提升效果优于传统浅层填充注射法，韧带深层提拉折叠固定的提升效果优于韧带浅层提拉折叠固定，韧带提拉效果优于透明质酸注射填充，另外，光声电治疗对紧致肌肤、减少皱纹，面部年轻化也有一定的临床疗效。

关键词：面部年轻化；临床；韧带；微创注射；内窥镜除皱；SMAS 折叠

中 E6-129-0013

基于乳房解剖基础上的自体脂肪移植层次探讨

刘成胜

北京京美医疗美容门诊

邮箱：13801102468@139.com

目的 探讨自体脂肪移植隆乳术后更好的效果、出现更少的并发症。

方法 2013 年 1 月至 2020 年 12 月，352 例女性患者（698 个乳房，6 例只做 1 个乳房），年龄 18~55 岁，平均年龄 33.34 ± 7.04 岁。在乳房解剖基础上进行脂肪颗粒乳房注射层次的细节把控，对乳房的皮下层、浅筋膜浅层、浅筋膜深层、肌膜层、肌肉层、肌肉下层脂肪颗粒精准注射填充，以尽可能使注射移植的脂肪颗粒成活，防止脂肪颗粒的堆积，避免出现脂肪坏死，从而减少脂肪包块等并发症的发生。

结果 术后无明显脂肪液化、感染、无可见及可触摸之结节或包块、脂肪栓塞等并发症，效果明显持久。患者随访 6 个月至 7 年，术后效果满意度。术后效果满意度：患者 84.9 %、手术医生 82.1 %。

结论 自体颗粒脂肪注射移植隆乳术是一种安全有效的软组织填充手术技术，自体脂肪注射在乳房解剖层次的精准细节把控，是脂肪移植隆乳成功的关键因素。

关键词：乳房解剖 自体脂肪移植 层次



中 E6-129-0014

颅面交通支的显微解剖学研究及临床应用进展

齐向东

单位：南方医科大学珠江医院

通信地址：广州市海珠区工业大道 253 号

邮箱电话：392123225@qq.com 02062782055

目的 颅面交通支作为头颈部血管网络的重要连接结构，对维持面部血供及修复重建手术的皮瓣设计具有关键意义。然而，其解剖变异性和功能分区的系统性研究仍存在不足。本研究旨在通过显微解剖学与三维影像学结合的方法，明确颅面交通支的走行规律、分支模式及供血范围，并探讨其在临床皮瓣移植中的优化应用策略。研究成果可直接指导颅颌面肿瘤术后重建、创伤修复及先天性畸形矫正手术方案设计，推动显微外科技术向更精细化、功能化方向发展。

方法 对 30 例成人新鲜头部标本进行分层显微解剖，结合 CT 血管三维重建技术，系统观测颞浅动脉、面动脉及眼动脉分支间的交通支分布特征。同时回顾分析 30 例基于交通支设计的穿支皮瓣修复颅颌面缺损的临床病例，评估皮瓣存活率、供区并发症及美学效果。

结果 解剖学发现：颅面部及颞区的动脉供应来自颈总动脉，颈外的分支颞浅动脉、面动脉、上颌动脉等，上颌动脉的分支为颞中动脉、颞深前动脉、颞深后动脉，静脉与动脉相伴随，这些分支与颈内动脉终末支眼动脉及颅内动脉亦有丰富的吻合支，互相交织成网；静脉回流由同名静脉收集于翼丛或下颌后静脉，最终注入上颌静脉。颞浅-眶上交通支出现率约 90%，面动脉-内眦动脉交通支形成功能性吻合网，为跨区域皮瓣提供解剖学基础。

临床验证：30 例患者中，约 90% 皮瓣完全存活，10% 远端部分坏死经保守治疗愈合。

结论 本研究解剖学数据为精准化、个体化颅面重建提供理论支持，临床实践证实其可显著提高修复效能。

关键词：颅面交通支；血管解剖；显微外科；颌面重建

中 E6-129-0015

鼻中隔软骨-耳软骨联合移植与鼻中隔软骨移植做鼻尖延伸移植在中国人鼻整形中鼻尖突出度的美学及稳定性比较的回顾性研究

Feven Birara, 杨晓, 齐向东

南方医科大学珠江医院

目的 （1）对比鼻中隔软骨-耳软骨联合移植与鼻中隔软骨移植这两种方法做鼻尖延伸移植在术后即刻以及长期的鼻尖突出度、鼻唇角、鼻长、鼻孔轴向夹角、鼻尖下小叶与鼻小柱比例差异；

（2）评估两组鼻中隔软骨移植面积大小的差异，关注两组软骨移植是否存在差异。

方法 接受鼻中隔软骨-耳软骨联合移植与鼻中隔软骨移植做鼻尖延伸移植的中国患者。将拥有术前，术中和术后 6 个月以上随访的照片记录，以评估手术效果的长期持久性。分组：鼻中隔软骨移植组：仅使用鼻中隔软骨做鼻中隔延伸移植。联合移植组：联合使用鼻中隔软骨和耳甲腔软骨做鼻中隔延伸移植。

结果 鼻中隔软骨移植组中隔软骨移植面积大小与鼻中隔软骨移植组中隔软骨移植面积大小有显著差异。两组在长期的鼻尖突出度、鼻唇角、鼻长、鼻孔轴向夹角、鼻尖下小叶与鼻小柱比例差异上没有统计学差异。联合移植组也能有效改善鼻尖突出度、鼻唇角、鼻长、鼻孔轴向夹角、鼻尖下小叶与鼻小柱比例。



结论 鼻中隔软骨-耳软骨联合移植做鼻尖延伸移植，与鼻中隔软骨移植做鼻尖延伸移植在鼻尖突出度的美学及稳定性有相同的效果。

● 中 E6-整形美容解剖学 ● Abstract

中 E6-129-0003

前锯肌筋膜在隆乳术及乳房重建手术中的意义与价值探索

姓名：孙湄杨

单位：广州艺星医疗美容医院

通信地址：广州市天河区天河北路中国市长大厦

电话：13304326657

目的 探讨前锯肌筋膜在维持胸大肌力学稳定性中的作用，及其对假体长期稳定性的影响，为优化胸大肌后间隙（双平面法）及筋膜下隆乳术/乳房重建手术提供解剖与临床经验。

方法 回顾性分析 2018-2023 年 100 例采用胸大肌-前锯肌筋膜复合体固定技术的隆乳与重建病例。通过术中对前锯肌筋膜完整性评估（分完全保留、部分修复、未保留三组），结合术后 1 年随访数据（三维影像测量、患者满意度问卷、Baker 分级），重点观察筋膜处理方式与假体稳定性、轮廓形态的相关性。

结果 前锯肌筋膜完整组胸大肌收缩所致假体动态畸形发生率降低降低，假体移位发生率减少，且术后 6 个月后包膜挛缩率（II 级及以上）显著下降。

结论 前锯肌筋膜作为胸大肌-假体复合体的“生物性吊带”，通过其与胸大肌筋膜的连续性纤维连接，形成三维力学锚定系统。术中系统性保留该筋膜结构可显著提升假体在呼吸运动及肌肉收缩中的稳定性，降低远期位移风险。

关键词：前锯肌筋膜；乳房重建；隆乳术；胸大肌

● 中 E7 机器人手术导航解剖学 ● Podium

中 E7-129-0001

Mazor 脊柱机器人辅助改良经皮椎体成形术治疗腰 椎骨质疏松性骨折的疗效分析

郭松

上海市第一人民医院

探讨 Mazor 脊柱机器人辅助改良经皮椎体成形术（percutaneous vertebroplasty, PVP）手术治疗腰椎骨质疏松性压缩骨折（osteoporotic vertebral compression fracture, OVCF）的疗效。

回顾性分析 2020 年 7 月~2020 年 12 月在本院接受 PVP 治疗的腰椎 OVCF 患者 50 例，其中 A 组（Mazor 脊柱机器人辅助改良腰椎 PVP 手术组）23 例，B 组（徒手椎弓根入路 PVP 手术组）27 例；记录两组手术时间、透视次数、辐射暴露剂量、住院时间、骨水泥弥散情况；测量治疗前、治疗后 3d、3 个月时的椎体高度恢复值、腰痛 VAS 评分、生活质量 ODI 评分。

A 组平均手术时间为 $40.61 \pm 3.85\text{min}$ ，明显大于 B 组（ $30.70 \pm 3.26\text{min}$ ），其中 A 组包含机器人配对与注册时间（TA1）为 $23.43 \pm 2.97\text{min}$ ，穿刺至切口关闭时间（TA2）为 $16.74 \pm 5.13\text{min}$ 。A 组术中平均透视次数为 6.96 ± 1.80 次，辐射暴露平均剂量为 $0.55 \pm 0.07\text{mSv}$ ，其中配对与注册透视次数为 2.12 ± 0.35 次，辐射暴露平均剂量为 $0.15 \pm 0.03\text{mSv}$ ；B 组术中平均透视次数为 17.70 ± 3.98 次，辐射暴露平均剂量为 $1.25 \pm 0.12\text{mSv}$ ；A 组术中平均透视次数及辐射暴露平均剂量明显



小于 B 组 ($P < 0.05$)。A 组骨水泥弥散形式全部属于 II 型, B 组骨水泥以单侧弥散为主, 仅有 14.87% (4/27) 属于 II 型弥散, 两组间差异显著 ($P < 0.05$)。两组术后 3d、3 个月腰痛 VAS 评分均较术前明显降低, 差异均有显著性意义 ($P < 0.05$), 组间比较两组术后 VAS 评分无差异 ($P > 0.05$); 两组术后 3d、3 个月随访时 ODI 评分均较术前明显降低, 术后各时间点随访与术前相比差异均有显著性意义 ($P < 0.05$), 组间比较两组术后 ODI 评分无差异 ($P > 0.05$)。

Mazor 脊柱机器人辅助改良入路经皮椎体成形术治疗腰椎骨质疏松性骨折安全、有效, 并可缩短术中穿刺手术时间、减少术中透视辐次数。

● 中 F -断层影像解剖学 ● Podium

中 F-129-0001

福尔马林致痛早期大鼠脑屏状核的可视化激活

张瑶瑶 临沂大学医学影像学院 临沂 276000 临沂大学化学化工学院 徐焱 盐城市肿瘤医院市放射科 盐城 224000 万法萍 徐州医科大学基础医学院解剖学教研室 徐州 221004 曲宗金 刘继国 临沂大学医学影像学院 临沂 276000 王德广 (deguangwang@xzhmu.edu.cn) 徐州医科大学基础医学院解剖学教研室 徐州 221004

屏状核 (CL) 是痛觉信息处理的重要脑区, 但在痛激活的早期的激活机制尚不明确。实验选用 20 只成年 SD 大鼠, 分为福尔马林致痛组与生理盐水对照组, 分别在后肢足底注射 5% 福尔马林溶液和生理盐水, 检测致痛 20min 后 c-Fos 在 CI 的表达; PET 扫描 (扫描中致痛)、重建 60s 图像并计算 CL 和后肢感觉代表区 (S1HL) 标准摄取相对值 (SUVR)。结果显示, 致痛组双侧屏状核 c-Fos 阳性细胞数显著高于致痛前, 但左右侧无差异; PET 成像显示 CI 和 S1HL 同步激活, 双侧 SUVR 显著升高, 但激活高峰时间滞后 S1HL 2~3min。研究首次结合 PET 与 c-Fos 技术可视化 CI 福尔马林致痛后 20min 痛觉响应, CI 和 S1HL 同步激活, 可能通过广泛纤维投射参与急性痛早期的调控, 为 CI 在急性痛调控中的重要作用提供了新证据。

中 F-129-0003

基于腹部增强 CT 定量评估南通地区健康人群胃周静脉正常内径范围

汪林 (tiramisu0916@outlook.com) 崔磊 南通大学第二附属医院 (南通市第一人民医院) 南通 226000

采用腹部增强 CT 提出适合不同性别、年龄段的胃周静脉内径的正常值参考范围。回顾性研究 640 例行腹部增强 CT 检查的南通市各年龄段健康人群分别测量胃网膜右静脉(Right gastroepiploic vein, RGV)、胃网膜左静脉(Left gastroepiploic vein, LGV)、胃冠状静脉(Gastri coronary vein, GCV)以及胃短静脉(Short gastric vein, SGV)的内径。男性 RGV、LGV、GCV、SGV 内径平均值分别为 $2.49 \pm 0.89\text{mm}$ 、 $2.50 \pm 0.91\text{mm}$ 、 $1.92 \pm 0.57\text{mm}$ 、 $0.87 \pm 0.67\text{mm}$, 女性 RGV、LGV、GCV、SGV 内径平均值分别为 $2.45 \pm 0.88\text{mm}$ 、 $2.47 \pm 0.89\text{mm}$ 、 $1.95 \pm 0.57\text{mm}$ 、 $0.93 \pm 0.66\text{mm}$; 同一受检者 RGV 与 LGV 的内径相近, SGV 显著小于其它胃周静脉; 以 18-30 岁、30-45 岁、46-60 岁、61-75 岁、 ≥ 76 岁为年龄段分组, 各年龄段 RGV、LGV、GCV、SGV 内径平均值分别为 $2.34 \pm 0.85\text{mm}$ 、 $2.44 \pm 0.90\text{mm}$ 、 $2.45 \pm 0.88\text{mm}$ 、 $2.54 \pm 0.85\text{mm}$ 、 $2.53 \pm 0.93\text{mm}$; $2.36 \pm 0.87\text{mm}$ 、 $2.47 \pm 0.95\text{mm}$ 、 $2.44 \pm 0.89\text{mm}$ 、 $2.56 \pm 0.90\text{mm}$ 、 $2.54 \pm 0.88\text{mm}$; $1.91 \pm 0.58\text{mm}$ 、 $1.98 \pm 0.58\text{mm}$ 、 $1.95 \pm 0.56\text{mm}$ 、 $1.92 \pm 0.60\text{mm}$ 、 $1.88 \pm 0.55\text{mm}$; $0.96 \pm 0.67\text{mm}$ 、 $0.82 \pm 0.65\text{mm}$ 、 $0.97 \pm 0.66\text{mm}$ 、 $0.89 \pm 0.66\text{mm}$ 、 $0.84 \pm 0.69\text{mm}$ 。基于腹部增强 CT 的胃周静脉内径正常值参考范围能够为临床诊断胰源性门静脉高压和个体化治疗提供客观依据。



中 F-129-0004

基于数字人高清晰断层与 MRI 的海马结构亚区分割及辨识系统建立

巩洁(3528056982@qq.com) 赵振美 闫帅 张忠和 山东数字人科技股份有限公司研发中心 济南 250000

海马结构是边缘系统的关键枢纽，由多个结构与功能不同的亚区组成的复杂异质性结构。现尚缺乏采用高清晰断层结合高场强 MRI 对海马结构各亚区进行精细分割和重建的研究及相应的辨识系统。本研究选取山东数字人科技股份有限公司铣切获得的层厚 0.1mm 的海马结构连续高清横、冠、矢数据 1200 张；同时获得与之相匹配的健康志愿者 3.0T 高分辨海马 MRI 数据。使用 Amira 软件将海马结构分割为十一个亚区：CA1、CA2、CA3、CA4、海马伞、前下托、下托、旁下托、副下托、齿状回、腔隙-分子层。将获得的 mask 数据再基于 C++ 的图像分割技术，建立基于数字人高清晰断层与 MRI 的海马结构亚区分割及辨识系统。该系统具备海马结构的解剖学与影像学的多模态及可视化功能，支持三维动态观察、多平面对比分析及多方位联动显示，精确呈现海马结构整体及其亚区的解剖学与影像学细节。支持用户进行海马结构亚区的解剖与影像实时联动、精准定位、对比观察，并进行交互式操作与自定义视图，以动态展示该区域在不同解剖平面及影像学模态下的形态学特征。本研究丰富了数字人高清晰断层数据集，提升了海马结构的精细辨识能力，可视为对海马结构研究方法与内容的细化与补充，为该区域的解剖学与影像学学习、科学研究等方面提供了基础。

中 F-129-0005

基于数字人高清腕部断层与 MRI 的辨识系统建立

李佳桐(1056122120@qq.com) 赵振美 张忠和 山东数字人科技股份有限公司 济南 250000 山东大学附属省立医院 医学影像科

腕部解剖结构复杂，其精细解剖结构的准确识别对腕部解剖及其病变的临床诊疗和医学教学至关重要，传统二维影像在辨识腕部结构时存在局限性，而三维影像技术能够提供更直观、精确的解剖信息。本项目选取山东数字人科技股份有限公司的辨识系统和志愿者 MRI 数据一例。本项目使用 Amira 软件对医学影像进行三维重建。通过基于阈值的分割算法半自动提取桡骨和尺骨下端，手舟骨、月骨等腕骨，并手动调整以提升精度。对于肌腱、脉管及神经等边界不清晰的组织，调整对比度和灰度后手动提取。为进一步优化，将 CT 与 MRI 数据导入 3D Slicer，利用多模态影像融合功能整合为三个正交视图，为 Amira 中的分割提供多视角参考，显著提高了分割的精确性和可靠性。且腕部断层与 MRI 的辨识系统采用实时联动技术，支持高精度的交互式学习体验。用户可通过旋转、缩放、平移等多维度操作，全方位观察腕部解剖结构，实现沉浸式学习。本系统具备分层解剖功能，能够逐层展示从皮肤表层到骨骼深层的解剖细节，并结合智能标注与注释功能，精准标识各结构的名称与功能。此项目进一步丰富了辨识系统腕部结构与功能信息，也为腕部解剖教学提供了全面、直观的数字教学资源。



中 F-129-0006

特发性脊柱侧弯患者胸廓及肋椎关节形态学研究

李 晗 (lihan9796@163.com) 闻锦旭 曹磊 吴文娟 韩殊曼 河北医科大学第三医院 石家庄 050051

作为青少年最常见的三维脊柱畸形，特发性脊柱侧弯（AIS）伴发的胸廓-肋椎关节重构机制尚未明确，本研究旨在探讨 AIS 患者胸廓及肋椎关节的形态学特征及发生机制。采用回顾性病例对照研究，纳入 48 例 AIS 患者（观察组）和 73 例健康对照者（对照组）。通过 CT 测量胸廓横径、前后径、扁平指数，肋椎关节参数（肋颈倾角、肋小头前凸距离及关节面长度），记录肋椎关节面形态（凹面型、凸面型、平面型）；基于 X 线测量 Cobb 角、胸椎后凸角（TK）及肋骨指数（RI）。统计分析采用独立样本 t 检验、配对 t 检验及 Pearson/Spearman 相关性分析。研究结果显示 AIS 组胸廓前后径较对照组缩小，AIS 患者凹侧胸廓前后径显著大于凸侧（ $P<0.01$ ）；肋椎关节形态重构表现为 AIS 组肋颈倾角较大，且凸侧更大，凹侧关节面长度较凸侧缩短（ $P<0.01$ ），关节面形态呈现侧别差异-凹侧关节面 60.4% 呈凹凸镶嵌型，凸侧 54.2% 为平面型；相关性分析显示 TK 与胸廓前后径呈正相关（ $r=0.581$ ），与扁平指数呈负相关（ $r=-0.692$ ）。研究表明 AIS 患者胸廓呈现“扁平-凹陷”重构：胸椎后凸减小导致胸廓矢状径缩短，凹侧肋骨通过增大倾角（代偿性旋转）及缩小关节面（力学负荷↑）适应脊柱侧弯，凸侧关节面平坦化提示应力分布改变。AIS 患者胸廓、肋骨及肋椎关节的形态改变可能与生物力学改变有关，不对称结构与不对称受力的恶性循环在脊柱侧弯的发生发展中起着重要作用。

● 中 F -断层影像解剖学 ● Abstract

中 F-129-0002

人工智能(AI)在肝细胞肝癌 TACE 诊疗中的应用进展

周展羽 1, 左立平 1, 安悦铭 1, 彭学文 1, 范金蕾 1, 刘恩宇 2, 于德新 1

1 山东大学齐鲁医院放射科, 山东济南, 250012

2 山东大学齐鲁医院肝胆外科, 山东济南, 250012

肝细胞癌（HCC）是位列世界第五、我国第二的恶性疾病，因其早期起病隐匿和缺乏明显症状，多数患者确诊时已无法手术切除，此时经动脉化疗栓塞术（TACE）对于改善患者预后和生活质量具有重要临床价值。随着 HCC 诊疗的数字化进程，人工智能（AI）在 TACE 的患者筛选、疗法选择、预后评估等方面均显示出重要作用，在肝癌的精准医疗方面发挥了重要作用。本篇综述总结了 AI 在接受 TACE 治疗的 HCC 患者诊疗全程的研究进展。



● 中 G- 功能解剖学 ● Podium

中 G-129-0001

主动活动促进健康的活性组织模型

承宜(liutcy@scnu.edu.cn) 华南师范大学体育科学学院 广州 510006

本文提出活性组织模型解释工作水平对健康的促进作用。每日的能量消耗分为食物热效应、主动活动和基础代谢，体成分可以分为骨骼肌、脂肪和其它，本文分别研究三种分量在总量的占比。每一项活动都有靶组织。主动活动是卡尼曼的系统 2 启动的活动，所增加的靶组织称为活性组织。无论是能量消耗，还是体成分，假定每个人的三个占比几何均值守恒，本文从理论上通过研究三个占比的变化讨论活性组织的健康效应。研究发现，1. 基础代谢占比就是健康标尺，基础代谢占比越低/高，健康水平越高/低。2. 工作水平越高，体力/脑力活动的主动活动占比越高/低，基础代谢占比越低。3. 主动活动分为脑力活动、普通体力活动和竞技体力活动，普通体力活动存在久坐和肥胖的副作用；脑力活动不存在久坐的副作用，肥胖的副作用也小于普通体力活动。4. 体力活动的活性组织为骨骼肌和神经回路，普通活动的主动活动占比增加引起基础代谢占比和食物热效应占比的下降，竞技活动的主动活动占比增加引起基础代谢占比的下降和食物热效应占比的增加。5. 不同物种脑质量和脂肪质量显著相关。脑力活动的活性组织是脂肪和神经回路，主动活动占比的降低引起基础代谢占比的下降和食物热效应占比的增加。因此，活性组织的增加促进健康水平的增加。

● 中 J- 智慧解剖学 ● Podium

中 J-129-0001

AI 赋能数字人 STEM-开启高效教学新模式

孙海燕(68045133@qq.com) 山东数字人科技股份有限公司 济南 250100

在深度学习架构革新与多模态融合技术的双重驱动下，叠加互联网超大规模数据集的指数级扩容，人工智能技术突破传统的应用范式，其赋能范围已从单一任务执行向医疗诊断、教育资源配置优化等方面纵深发展。本文将围绕“教、学、练、考”四大核心功能，阐述人工智能在医学教育中的融合应用。在 AI 技术赋能方面，系统通过增强检索（RAG）技术将解剖知识高效整合与精准匹配，结合大语言模型与多模态解剖数据库，提升教学资源的动态检索能力和知识关联性。在“教”的方面，AI 支持根据教师授课内容的智能推荐与个性化教案一键匹配生成；“学”，从“被动输入”到“主动探索”，基于 RAG 的智能问答，实时调取解剖图谱进行多模态跨学科的整合式学习；“练”，借助于 AI 人工智能，自动生成习题解析；虚拟现实结合力反馈技术，助力仿真实验练习；“考”，基于解剖学知识图谱与 RAG 技术，AI 自动分析知识点关联，实现主观题自动评分；STEM 系统通过 AI 技术的深度整合，在教学内容呈现、学生学习体验、教学评估等多方面实现了质的飞跃，极大提升了教学的效率与质量，未来，在 AI 的持续赋能下，STEM 系统将为医学教育智能化转型提供新范式。



中 J-129-0002

基于数字影像融合与虚拟应用技术，实现数字标本补充

孙雅真 (396102896@qq.com) 山东数字人科技股份有限公司研发中心 济南 250101

观察和研究大体标本是解剖学学习过程中不可或缺的环节。众所周知，大体标本资源紧缺，制作、保存和维护等技术门槛相对较高。为此，多地将大体标本扫描、重建为数字标本以供学生观察和学习。但大体标本质量参差不齐，部分标本制作也有一定的局限性。加之制作优质数字标本也需要较高的技术含量，需要拍摄及修复人员掌握相应的模型、图像处理技术和一定的解剖学知识。因此本文拟构建一个基于高清晰断层数据生成的数字标本模型，将所需结构整合后，仿照真实标本效果绘制贴图，制作成为数字标本，可达到将大体标本数字化后相同的效果。使用高清晰断层数据灵活组合制作标本，易于组合和制作出在大体标本上不易于解剖出的标本，且更便于制作出成套的逐层解剖标本。逐层解剖标本可更加系统的与局部解剖学教材相结合，便于教师授课和学生学习，帮助学生更扎实和系统的学习局部解剖学理论知识。由于其有较强的仿真效果，学生在动手解剖大体标本前也可参照此数字标本，初步了解深层次结构，使解剖操作更为熟练和准确。用本方法制作 3D 标本，节省了标本资源、维护大体标本产生的技术、资金等成本，避免了重复拍摄、生成和修复标本环节的工作。因其源于高清晰断层数据，所以完成后的虚拟标本结构形态准确。获取数字标本方式从此变得相对容易，便于批量投入制作，标本的设计、制作灵活，有较强的便利性和实用性。

中 J-129-0003

基于增强 RAG 技术在医学教学问答系统中应用

王成轩(pro_xuan@163.com) 山东数字人科技股份有限公司 山东省济南市高新区 271500

目标 随着人工智能和自然语言处理技术的进步，智能问答系统在医学教育中的应用变得尤为重要。本文旨在探讨基于检索增强生成（RAG）技术和大语言模型（LLM）的智能问答系统如何解决传统医学教学中资源分布不均、材料更新滞后以及师生互动不足的问题。

方法 通过结合检索与生成的混合架构——RAG 技术，从大规模知识库中提取相关文档片段，并利用 LLM 进行信息整合和答案生成。该系统特别强调了实时更新能力和对复杂医学知识点的精确理解。

结果 研究发现增强 RAG 技术能够显著提升医学教学质量，提供即时且准确的学习资源，支持个性化学习需求，同时作为教师的教学辅助工具，有助于提高教学质量和科学性。

结论 将 RAG 技术与 LLM 相结合构建的医学教学问答系统，不仅提高了教学资源的获取效率和准确性，还促进了自主学习能力的提升，为医学教育带来了深远影响。未来应进一步优化算法并探索多模态数据支持，以最大化其在医学领域的潜力。

关键词：增强 RAG 技术，医学教学，问答系统，大语言模型，知识库优化



中 J-129-0004

物理仿真下的解剖模拟

李凤英 (missleewow@163.com) 山东数字人科技股份有限公司 济南 250100

针对实物标本稀缺、成本高、保存难、学生实践机会少的问题以及现有虚拟仿真技术难以实时动态表现解剖操作层次与软组织形变的问题,本文提出基于位置动力学(PBD)算法构建解剖物理模拟的数字孪生环境。首先,选用高清数字人断层图像重建面网格和体网格模型,模型细节丰富、准确性高。物理模型采用 PBD 算法驱动体网格重构,即在线求解一系列约束函数实现组织形变、切割的物理响应。其次,系统基于 PBD 算法,支持模型拓扑改变,实现了解剖模拟常用器械操作,包括解剖镊夹持组织变形、解剖刀自由切割组织、解剖镊解剖剪配合皮肤剥离、解剖剪剪开肌肉、拉钩牵拉组织暴露深层视野。再次,系统采用基于物理渲染(PBR)方法,表现结构材质光泽、凹凸细节,并实时计算光线及阴影表现结构之间层次和前后关系。触觉交互上,通过外接力反馈设备,增加器械操作的触觉模拟,提高解剖过程仿真的真实性。最后,为保证系统交互的实时性,加入 GPU 并行运算,加速求解速度。系统以真实的高清人体横断层数据为基础,构建几何模型、物理模型,实现复杂人体软组织物理变形模拟,尤其是切割、剥离、剪断等常见解剖操作下组织的实时拓扑变形,在此基础上实现了触觉渲染和高保真的视觉渲染。系统有效解决了传统标本资源短缺与静态模型交互性不足的双重瓶颈,为解剖教学提供了安全、可重复且高仿真的训练平台。

中 J-129-0005

虚拟解剖手册赋能数字化解剖教学设计

王玥 (1227215542@qq.com) 山东数字人科技股份有限公司 济南 250101

局部解剖学研究人体各局部层次结构、器官形态、位置及毗邻关系,是临床医学尤其是外科学的重要基础课程。鉴于尸体标本稀缺及数字化教学手段升级,可通过虚拟解剖,观察、辨认并熟悉人体局部层次结构及器官位置毗邻关系,为实地尸体标本解剖奠定基础。虚拟解剖实验指导手册严格以教学大纲为基准,依据局部解剖操作步骤,对局部解剖过程进行了精准的虚拟还原。高清数字人虚拟解剖系统基于虚拟解剖技术的模拟解剖教学系统的设计与实施,构建了覆盖人体局部解剖区域的多模态虚拟仿真实验系统,其内置的虚拟解剖实验手册通过对面部浅层解剖以及腕前区和手掌的解剖等关键区域的详细解析,利用解剖台虚拟切割、层次解剖等工具操作为师生提供了直观且可重复的教学方式。虚拟解剖手册解剖操作实例配备了详尽的图文说明,使学生能够在虚拟环境中进行自主探索和实践,有助于巩固学习成果。虚拟解剖手册赋能数字化解剖的教学设计,打破了传统解剖教学的局限,提供了一种更为高效、环保且符合伦理要求的替代方案,有助于培养学生的空间想象能力和实践能力,还能够促进解剖学知识的普及与传播,为医学教育的发展贡献力量。虚拟解剖实验手册与高清数字人虚拟解剖系统的结合,为局部解剖学的教学带来了革命性的变革!



中 J-129-0008

3D 打印技术（膝关节半月板损伤精细仿真模拟训练器）在关节外科的辅助作用

李慧锦

(1571054625@qq.com) 山东数字人科技股份有限公司研发中心 济南 250101

目前公司通过对 3D 打印技术的实际应用，以模型建构为基础，结合山东数字人制作的膝关节半月板数据，从产品应用的角度入手，分析此例手术入路打印件的加入对该技术的掌握和应用。我司针对半月板问题，制作了一版膝关节半月板损伤 3D 打印数据，此类数据通过提取数字人体数据中的膝部数据集，构建膝部解剖结构的三维数字模型，以数据集中的体素作为模型的基础纹理贴图，经过外部与本公司医学专家的指导，从而获取数据，以构建膝关节半月板损伤的数字模型，还原了人体的颜色、纹理和手感，并且考虑可用于长期的模拟训练，因此设立了子母版模型以及可替换区域，可替换区域为可多次进行模拟操作的半月板数据。本例数据可以应用于医患沟通与医疗培训方向。3D 打印的 1:1 患病部位的真实尺寸模型，可以让患者及家属对病变部位有直观的认识，从触觉和视觉上为患者及其家属对复杂组织结构病变进行描述及展示病情及术中情况，有利于医患沟通。由于传统的膝关节教学模式，是在手术室观看手术操作，来学习手术实操，并且学习周期长、难度大、操作机会少、出错率高，因此此打印件的加入可精进传统培训形式，有效的降低了培训难度，增加了学生对于此类手术亲自操作的机会，避免了因不熟练而导致的手术失误，大幅度的提高了学习效率，从而提供个性化和精细化的医疗服务。

中 J-129-0009

高精度手部精细结构重建对解剖学的重要作用

李慧锦

(1571054625@qq.com) 山东数字人科技股份有限公司研发中心 济南 250101

高精度数字化手模型的原始数据用的是本公司的真实大体数据生成的高清断层数据，细微结构使用新鲜的标本进行细致解剖制作，再运用现有的模型修复技术，结合王增涛主任对人体标本的解剖，进行更加精细的修改。我司用高清断层数据生成的原始手部结构并不足以达到可以应用于临床医学培训的标准，某一神经、韧带的起止点或是贴图制作中某些纹理的细节等，会让王增涛主任做具体的指导。我司的技术人员，根据王增涛主任的指导，进行反复的修改，并在制作中及时沟通，以便提高修改的准确率，从而真实还原手上的结构；甚至直接去医学专家的解剖室，亲自上手解剖来观看脉管的走向，并结合书籍和网上找的一些图片参考来更加深入的了解手部结构，制作过程力求严谨。因为人的手部结构非常多，并且十分精细和繁杂，有的数据需要王增涛主任通过显微镜才能进行细致的解剖，从而看到完整的形态结构，并且有的数据需要用多个大体标本进行重复解剖，才能提取出一个完美的状态。这例手部标本制作出来，在一定程度上有利于医学生对真实结构的理解，有助于记忆，并且 3D 打印解剖教具直观反映三维结构，且具有易获得、易保存、便于推广的优点。从解剖学角度讲，手分为手指、手掌及手腕三个部份，由骨骼、肌肉和软组织组成，由于手部解剖结构精细，该数据可以提高对人体细微解剖结构的辨认能力，以及用于医患沟通。



中 J-129-0010

基于 3D 打印技术的心脏疾病类体系构建与产品研发

刘阳

(2317459615@qq.com) 山东数字人科技股份有限公司研发中心 济南 250101

近几年，我国心血管病人数逐年增加，很多患者需接受外科手术治疗。所以，选择有效的教学方式提升医学生对心脏外科疾病的正确认知情况，且促进其掌握心脏外科疾病临床诊断及治疗方式等非常关键。先心病，复杂心脏病等术前准备需要对心脏解剖结构准确评估。以往心外科医师主要通过超声和其他影像学文字描述了解心脏病变情况，即使通过 CT 容积再现或 3D 超声图像也很难将解剖信息完全传达给心外科医师。同时，一些解剖畸形本身就难以描述，需更为准确形象的表达方式。由此，我司结合 3D 打印技术进行了助力心胸外科学习的 3D 打印心脏产品研发。参考病例资料予以逆向建模，采取 3D 打印技术构建手术位置数字化实体模型，开展术前模拟，帮助心脏疾病的手术方案制定、手术操作过程模拟、手术治疗结果预估等。3D 打印 1:1 比例仿真模拟心脏模型，可使外科医师接触到完整的影像学数据，且并不需要额外的学习时间，可极大地提高外科医师术前对心脏解剖结构的认知。我司目前已研发制作 13 例数据，包括 2 例正常生理，7 例典型疾病，4 例先天性疾病。该 3D 打印心脏可用于心脏解剖的副本，对于练习复杂的心脏手术大有裨益。随着技术发展，3D 打印在心血管诊疗以及在瓣膜疾病的评估和治疗中也发挥更多的作用，包括临床训练、医学教育等。

中 J-129-0011

3D 打印与多模态 AI 融合驱动的解剖学教育革新

李晓童 (row119@126.com) 马爱荣 沃雁 上海交通大学医学院解剖学与生理学系 上海市 200025 上海交通大学基础医学院人体构造课程组

解剖学作为医学教育的基石课程，长期面临传统教学模式僵化、资源匮乏等难题。本研究通过上海交通大学医学院 60 名临床医学本科生的随机对照实验，验证学生参与 3D 打印模型制作的教学效果。实验组（55 人）结合 3D 扫描、建模及打印技术，自主完成骨骼模型制作；对照组（55 人）采用传统 2D 图谱教学。结果显示，实验组笔试（ 69.60 ± 6.64 vs. 65.16 ± 8.77 ）、标本辨识（ 16.73 ± 2.23 vs. 15.67 ± 2.30 ）及总成绩（ 86.18 ± 8.13 vs. 80.80 ± 10.44 ）显著优于对照组（ $P < 0.05$ ）。90% 以上学生认为参与 3D 打印强化了空间认知与跨学科实践能力。研究团队同步建成自主知识产权的“裸眼 3D 层次教学系统”与“多模态智能导师”平台，推动 AI 与医学教育深度融合。在 AI 与数字化融合趋势下，亟需建立人工智能辅助教学国家标准，为解剖学注入“AI”新动能。

关键词：动手实践 3D 打印，骨学教学，裸眼 3D 分层教学系统，多模态 AI 导师



● 中 J- 智慧解剖学 ● Abstract

中 J-129-0006

智慧解剖学教学实验室的建设及管理

刘真 李蕴峰 李昊 田广平 王震 李振中 (wzhen@sdu.edu.cn) 山东大学基础医学院人体解剖与神经生物学系 济南 250012

智慧解剖学是利用数字化技术、信息化技术和人工智能等各种现代技术手段研究、展示及应用人体解剖学的新兴交叉学科。利用智慧解剖学实验室开展解剖学教学有利于开辟解剖学教学研究的新领域，改变人体解剖学原有的表达方式，改变人体解剖学的教学模式，重新评价和认识人体解剖学与其他学科之间的关系。现阶段，每个实验室的面积一般为 90-120 平米，过小不宜于各种仪器设备的安装和标本模型的陈列，过大不宜于课堂教学的控制。每个实验室配备 8-10 个全自动内、外通风系统的冷冻冷藏解剖实验台，4-8 台数字人解剖系统（每台数字人解剖系统内不仅配备了数字人解剖系统，而且还配备了微课课件、实地解剖操作指导系统），1 台标本示教系统，8-10 台手术无影灯，每个实验室还配备了实验室及仪器设备控制系统。还有根据进行实际需要的各个系统的瓶装标本、示教标本和模型。本校已经按照此标准建立了 6 个智慧解剖学实验室，这些新型设备的配备将原有的不利于学习的解剖学实验室环境条件，改变为环境优雅的学习环境条件，至今已经开展了 1339 名本科生的系统解剖学教学和 1200 名本科生的局部解剖学教学。采用智慧化管理的模式，授课前、授课中、授课后和日常的实验室的管理极为方便。授课前技术人员可采用远程控制实现实验室的开启，教师可采用一键上、下课系统开启或关闭电脑主机和 LED 屏；授课中教师和学生可根据实际需要，随时调取所需的学习资源，大大提高了“教”与“学”的效率。

中 J-129-0007

智慧解剖学时代实体标本与数字资源相结合的实验室管理

震 刘真 李振中 (wzhen@sdu.edu.cn) 山东大学基础医学院人体解剖与神经生物学系 济南 250012

智慧解剖学教学实验室的应用是解剖学教学模式向智慧化转型的一个重要标志和必经途径。为了探索智慧解剖学实验室管理的新模式，以适应智慧解剖学教学模式的顺利进行，本研究提出了实体标本与相应的数字资源相结合的实验室管理模式。本研究采取的策略是：（1）按系统分类准备的人体标本与相应的数字资源相结合，以适宜于系统解剖学的教学；（2）以显示人体各局部的代表性标本、显示难以解剖和辨认的解剖结构的局部标本与数字资源相结合，以适宜于局部解剖学的教学；（3）以人体典型代表性断面的标本与相应的数字资源相结合，以适宜于断层影像解剖学的教学；（4）以注重相关手术入路和手术操作密切相关的标本与数字资源相结合，以适宜于临床应用解剖学的教学；（5）智慧解剖实验室内的瓶装陈列标本制作成数字化的三维全方位展示的动画图像，学生每个标本的二维码，即可获取此标本三维全方位展示的动画图像，可在手机屏幕上以随意角度和在任何方位展示和观看，以获取标本所要展示的详细信息。真正实现实体标本与数字化信息完全匹配的统一的模式，这是每一个真实标本与其数字化标本相结合的实际应用，所提供的大量的标本信息，有利于学生迅速地做到理论联系实际。无论智慧化的管理模式多么先进，实体标本在解剖学教学过程中仍然具有无可替代的地位。因此，在智慧解剖学时代采用实体标本与数字资源相结合的实验室管理模式，才是对解剖学教学更加有力的支持。



● 中 K- 脑网络组学 ● Podium

中 E3-129-0006

基于网络药理学与多组学整合分析的杏仁核调控焦虑分子机制研究

张静 (876664874@qq.com) 熊柳林 遵义医科大学第三附属医院麻醉科 遵义 563000

焦虑与杏仁核的关联机制是神经药理学领域的研究焦点，但其分子机制尚未完全阐明。本研究整合网络药理学与生物信息学技术，系统解析杏仁核调控焦虑的多靶点通路。通过 GeneCards 数据库筛选获得 8,693 个焦虑相关靶点和 2,279 个杏仁核相关靶点，Venn 分析鉴定出 173 个关键交集基因。基于 STRING 数据库构建蛋白质互作网络，结合 Cytoscape 的 CytoHubba 插件筛选出 BDNF、NPY、CRH 等 10 个核心靶点，其网络拓扑特性显示 BDNF、NPY、CRH 构成调控网络中枢。GO 富集分析显示，靶点显著参与胚胎发育调控、突触前膜功能及 G 蛋白偶联受体活性。KEGG 通路分析鉴定出 85 条通路，其中甲状腺激素通路（14 个基因）通过钙稳态调节神经元活性，Th17 分化通路（11 个基因）提示神经免疫交互机制，色氨酸代谢通路（5 个基因）揭示 5-羟色胺合成关键作用。我们通过创新性构建“情绪-杏仁核-靶点-通路”四维模型，阐明多靶点级联调控机制：BDNF/NPY/CRH 核心轴通过 cAMP 信号转导和免疫调节双重通路影响杏仁核功能。本研究为焦虑障碍提供了新型生物标志物组合及靶向治疗策略，进一步推动了神经药理学研究从单一靶点向网络调控范式的转化。

中 K-129-0003

基于纤维束测量的对比学习精神分裂症亚型识别

吴霞(wuxia2020@ia.ac.cn) 初从颖 樊令仲 中国科学院自动化研究所脑网络组研究中心 北京 100190

精神分裂症（SZ）是具有显著异质性的失连接精神疾病，临床表现的异质性提示存在具有独特神经生物学关联和临床轨迹的不同亚型。纤维束测量通过定量分析白质纤维束，是阐明 SZ 失连接假说的重要手段。在个体水平提取疾病相关特征对于精细理解疾病机制和开发靶向干预措施至关重要。对比学习提供了一种从背景特征中分离疾病特异性特征的方法，可强化异质性探索并实现亚型分层。本研究旨在识别 SZ 特异性特征并分析其临床与结构异质性，从而深化对该疾病的病理理解并指导临床预后治疗。本研究采用多中心大规模数据集，利用弥散磁共振成像数据进行纤维追踪和测量分析。设计对比变分自编码器解缠背景特征（如采集中心等）和 SZ 特异性特征，进一步使用特异性特征进行亚型划分。比较亚型间 PANSS 评分和白质纤维束差异。结果显示，对比学习有效解缠了 SZ 特异性特征和背景特征。SZ 划分为两个分布均衡、特征有效解缠的亚型，亚型间发病年龄存在差异。两亚型 PANSS 情感症状维度存在显著差异（ $t=3.12$, $p<0.01$ ），且在联络、连合和投射纤维束中都存在显著差异，尤其是上纵束、小脑脚、丘脑和纹状体，主要差异集中位于双侧额颞区域，小脑脚差异较小。对比学习实现了疾病特异性特征与背景特征的解缠，支持了疾病亚型划分。亚型间在情感症状和白质结构上存在显著差异，纤维测量揭示了不同的失连接模式。



中 K-129-0005

绘制早期大脑成熟地图：新生儿皮层连接转变的解剖学基础

李德莹(lideying2020@ia.ac.cn) 初从颖 樊令仲 中国科学院自动化研究所 北京 100190

了解大脑连通性的早期发展对于揭示大脑成熟的机制至关重要。在本研究中，我们利用来自 242 名足龄新生儿的弥散磁共振成像数据，绘制了新生儿皮层连接拓扑模式的发育轨迹。我们通过梯度映射技术量化了大脑皮层区域间连接的变化，并识别了沿前后轴、背腹轴和内外轴的三种不同的脑结构连接拓扑模式。在 40 孕周左右时，背腹轴和内外轴的脑结构连接拓扑模式发生了一个关键的翻转。这种翻转在对丘脑皮层投射纤维束进行虚拟损伤后消失，突显了丘脑皮层投射纤维束的重要作用。纵向分析显示，早产儿的结构连接模式发育延迟，未能表现出预期的翻转。该研究有助于阐明塑造新生儿脑组织的拓扑原则，并强调了丘脑连接对早期脑部发育的影响。我们的研究成果揭示了早期阶段脑部发育的解剖基础，为皮层层次结构的形成提供了重要见解，并强调了丘脑连接对发育轨迹的影响。这些发现对理解典型的人脑生长以及神经发育障碍的发病机制至关重要。

中 K-129-0007

基于结构 MRI 的恒河猴大脑表面自动重建流程

韦亚辉(weiyahui2023@ia.ac.cn) 王海艳 程禄祺 蒋田仔 初从颖 樊令仲 中国科学院自动化研究所 北京 100190

恒河猴因其与人类的进化关系密切，长期以来被视为神经科学研究中的重要模式动物。基于结构磁共振成像（MRI）数据构建恒河猴的大脑表面，对于多模态 MRI 数据的分析具有基础性意义，不仅有助于提取与脑表面相关的指标，还可实现其他模态数据向表面的映射，从而提升可视化与分析效果。然而，现有的大脑表面重建方法主要针对人脑设计，直接应用于恒河猴时往往需要大量人工干预，且重建效果不佳。为解决上述问题，本研究对大脑表面重建流程的多个关键步骤进行了针对性优化，结合先进的恒河猴脑组织分割工具、专属模板及高精度脑图谱，构建了适用于恒河猴的表面重建流程。此外为了减小组织内偏置场，提高组织间对比度，基于深度学习先验提出了基于组织的偏置场矫正和对比度增强方法。最终我们从鲁棒性和精确度的角度对比了现有的几种猕猴皮层重建工具和我们工具重建的皮层，展示了该流程不仅具有良好的用户友好性，且在不同质量的数据集上均表现出较高的重建性能。

中 K-129-0009

单细胞转录组学揭示非综合征性唇腭裂胎儿颞上平面的氧化磷酸化和氧化应激

方长乐 (fangchangle@163.com) 王秋琳 肖秋霞 熊柳林 遵义市第一人民医院（遵义医科大学第三附属医院麻醉科）遵义，563000

非综合征性唇腭裂（Non-syndromic cleft lip and palate, NSCLP）是一种常见的出生缺陷，可导致颅面形态和功能异常。为了探讨 NSCLP 胎儿是否存在脑发育异常，我们对孕 17 ~ 23 周的 3 例 NSCLP 胎儿和 3 例正常胎儿进行了颞上平面的单核 RNA 测序（single-nucleus RNA sequencing, snRNA-seq）。采用实时荧光定量 PCR（Rt-qPCR）和免疫荧光进一步验证测序数据中鉴定的表型。经过降维聚类，我们得到了 7 种主要的细胞类型。细胞比例显示兴奋性神经元、抑制性神经元和星形胶质细胞差异显著。我们进一步发现，在 NSCLP 胎儿中，氧化磷酸化（OXPHOS）和氧化应激水平异常升高。进一步的研究发现，一个特殊的抑制性神经元亚群 InN6 与 OXPHOS 的改变和氧化应激密切相关，这可能导致 NSCLP 的脑发育异常。最后，免疫荧光和 Rt-qPCR 结果证实了



NSCLP 胎儿大脑中 OXPHOS 和氧化应激的异常增加。综上所述，本研究首次提供了 NSCLP 胎儿 STP 的单细胞图谱，揭示了胎儿大脑中 OXPHOS 和氧化应激的增加。这些发现为 NSCLP 的脑病理机制提供了新的见解。

关键词：非综合征型唇腭裂；氧化磷酸化；氧化应激；单核 RNA 测序

中 K-129-0010

焦虑与腹侧被盖区关联的分子机制分析

郑羿 1 (544393753@qq.com) 熊柳林 2 遵义市第一人民医院（遵义医科大学第三附属医院）麻醉科 遵义 563000

腹侧被盖区在焦虑的发生与调控中发挥重要作用，但其分子机制尚不完全明确。本研究通过生物信息学方法筛选焦虑与腹侧被盖区的关键靶点并解析其潜在通路。基于 GeneCards 数据库分别检索“Anxiety”和“Ventral tegmental area”相关靶点，筛选后获得 318 个焦虑和 306 个腹侧被盖区的相关靶点，通过 Venn 分析筛选出 98 个交集靶点。利用 STRING 数据库构建蛋白互作网络（PPI），结合 Cytoscape 软件的 CytoHubba 插件，采用 MCC 算法筛选出 BDNF、CRH、DRD2、CRHR1、SLC6A3、TAC1、NPY、SLC6A4、TH、HTR1A 共 10 个核心靶点。GO 富集分析显示，这些基因在多巴胺生物合成、突触传递、腺苷酸环化酶抑制信号、系统性动脉血压调控及生长激素分泌调控等生物过程中具有重要作用，主要定位于突触后膜、NMDA 受体复合物、GABA-A 受体复合物、轴突及核周区域，分子功能涉及 GABA 门控氯离子通道活性、多巴胺受体活性等。KEGG 通路分析富集到 34 条通路，相关基因主要涉及多巴胺能突触、长时程增强作用、昼夜节律同步、cAMP 信号通路、激素信号通路、神经活性配体-受体相互作用、吗啡成瘾、GABA 能突触等。我们构建“症状-部位-关键靶点-KEGG 通路”网络图，直观呈现腹侧被盖区调控焦虑的潜在机制。本研究为后续机制验证及干预策略开发提供了理论依据。

中 K-129-0011

抑郁导致大脑海马病变的潜在靶点及机制分析

杨义辉 (47730237@qq.com) 熊柳林 遵义医科大学第三附属医院麻醉科 遵义 563000

抑郁症严重影响人的身心健康，抑郁导致的大脑海马病变是当前卫生领域的研究热点，其潜在的分子机制尚不明确。本研究采用生物信息学方法系统分析抑郁导致海马病变的分子机制，通过 GeneCards 数据库分别检索“depression”、“hippocampus”关键词，筛选出 11904 个与抑郁相关的靶点和 10802 个与海马相关的潜在靶点，Venn 分析出共同交集的基因集靶点 90 个，采用 STRING 数据库蛋白质互作网络分析结合 Cytoscape 拓扑学方法筛选出 10 个核心调控靶点，分析结果显示这些靶点主要参与神经递质调控（302 条 BP）和代谢过程（84 条 CC, 83 条 MF）。KEGG 通路分析鉴定出 44 条显著通路，显示大部分基因富集在钙离子、cAMP、激素等信号通路，以及 5-羟色胺能突触、胆碱能突触、突触囊泡循环及相应的神经活性配体-受体相互作用部位。我们通过构建“症状-部位-关键靶点-KEGG 通路”网络图，呈现抑郁导致大脑海马病变最为相关的分子机制。本研究通过多维度生物信息学分析，揭示了抑郁导致大脑海马病变相关联的潜在分子靶点和通路，为深入理解抑郁引起的大脑海马异常机制提供了理论依据，也为未来相关干预策略提供参考。



● 中 K- 脑网络组学 ● Abstract

中 K-129-0001

弓状束：狨猴和人类的趋同演化

王珂璠(wangyufan2021@ia.ac.cn) 程禄祺 李德莹 陆玉恒 蒋田仔 初从颖 樊令仲 中国科学院自动化研究所 北京 100190

狨猴以其发声能力很强而著称，它与人类有着共同的解剖和功能特征，为阐明不同连接特征的系统发育起源及其在演化过程中的转变提供了独特的机会。尽管狨猴与人类发声特征的相似性已有报道，但狨猴是否具有弓状束同源结构尚不清楚。在这项研究中，我们重建了狨猴的弓状束，建立了与其他灵长类动物（包括猕猴、黑猩猩和人类）的同源性，并使用神经元示踪和超高分辨率弥散磁共振成像数据集证实了狨猴中弓状束同源结构的存在。进一步地，我们使用连接指纹图方法，比较了这些物种的皮层连接模式，发现狨猴的弓状束在腹侧前额叶皮层的连接与人类的相似性超过了猕猴。我们将不同物种的脑配准到同一空间后做定量分析验证了这一结论。最后，在探索弓状束对物种特异性发声的作用中，我们发现狨猴和人类发声交流的激活模式与弓状束的连接有关。总的来说，我们的研究表明，在狨猴演化早期出现的背侧通路已经与人类趋同演化，尽管它们与人类的亲缘关系非常遥远。

中 K-129-0002

基于机器学习算法绘制人类小脑个体化功能网络图谱

王凯凯(kkwang07@126.com) 王亚平 樊令仲 中国科学院自动化研究所脑网络组研究中心 北京 100190

本研究旨在应用新型机器学习技术，即非负矩阵分解(NMF)绘制个体化的小脑功能图谱，以探究不同个体间小脑功能网络的拓扑差异及其与认知行为的潜在联系。本研究采用 NMF 技术对个体静息态脑功能数据进行处理，获得反映个体特异性的非负小脑功能网络及其对应的非负时间序列。结果发现 NMF 方法成功地在个体水平上绘制了 17 个具有显著个体异质性的小脑功能网络，建立了这些网络的拓扑模式与认知行为之间的预测模型，揭示了个体间小脑功能网络的多样性。本研究验证了 NMF 方法获取个体特定小脑功能网络的有效性，并发现个体间小脑功能网络的显著差异。这些发现为神经精神疾病的精准诊断和治疗提供了新的视角，并为未来个性化神经调控治疗方案的制定提供了科学依据。

中 K-129-0006

追踪神经发育过程中局部脑活动的复杂度下降现象

梁皓格(ddknight0215@gmail.com) 初从颖 樊令仲 中国科学院自动化研究所 北京 100190

神经发育过程中大脑局部活动的动态模式尚未被充分探索。本研究从发育过程中局部脑活动的复杂度下降事件频次入手，对神经发育过程中局部动态性的变化进行研究。使用人类连接组计划发育队列(HCP-D)的 625 名 8-21 岁参与者的 fMRI 数据，本研究发现随大脑成熟，复杂性下降频率呈显著降低趋势。进一步使用 GAM 模型对脑区平均复杂度下降频次($\bar{f}_{\text{drop}}$)进行发育建模分析，我们发现 $\bar{f}_{\text{drop}}$ 的年龄效应受到区域异速生长指数的约束，并且其发育模式与主功能梯度相似并逐渐靠近主功能梯度。研究揭示了局部动态特性的结构约束与功能效应，发现局部动态特性的发育推动了全局功能组织的渐进式分化，为解析大脑功能组织发育的生物学机制提供新视角。



中 K-129-0008

运动与睡眠关联的分子机制研究

姚瑶 (282993652@qq.com) 熊柳林 昆明医科大学神经科学研究院 昆明 650000 遵义市第一人民医院临床睡眠医学中心

运动与睡眠之间的关系一直是健康科学领域的研究热点，但其分子机制尚未完全阐明。本研究采用生物信息学方法系统分析运动调节睡眠的分子网络机制。通过 GeneCards 数据库筛选获得 471 个睡眠相关靶点和 930 个运动相关靶点，Venn 分析鉴定出 102 个关键交集基因。STRING 数据库蛋白质互作网络分析结合 Cytoscape 拓扑学方法筛选出 10 个核心调控靶点，包括 INS、TNF、ALB、IL1B、IL6、IGF1、IL10、IFNG、IL1A 和 TLR4。GO 功能富集分析显示这些靶点主要参与神经递质调控（373 条 BP）和代谢过程（63 条 CC，48 条 MF）。KEGG 通路分析鉴定出 80 条显著通路，其中昼夜节律调节和神经递质信号转导通路尤为关键。通过构建“行为-部位-靶点-通路”多维网络模型，系统阐释了运动改善睡眠的分子机制。本研究通过多维度生物信息学分析，揭示了运动与睡眠关联的潜在分子靶点和通路，为深入理解运动对睡眠的调控机制提供了理论依据，也为未来相关干预策略的开发奠定了基础。

● 中 L-人脑库建设与应用 ● Podium

中 L-129-0001

Transcriptomic and functional genomic insights reveal WNT3 as a critical modulator of human speech processing

Zixian Wang¹, Yanxi Chen², Gaoyu Zu², Yongqi Feng³, Menghan Zhang⁴, Wensheng Li², Gong-Hong Wei^{1,5}, Linya You^{2,6}.

¹MOE Key Laboratory of Metabolism and Molecular Medicine and Department of Biochemistry and Molecular Biology of School of Basic Medical Sciences & Fudan University Shanghai Cancer Center, Shanghai Medical College of Fudan University, Shanghai 200032, China

²Department of Human Anatomy & Histoembryology, School of Basic Medical Sciences, Fudan University, Shanghai 200032, China

³Human Phenome Institute, Fudan University, Shanghai 200438, China

⁴Research Institute of Intelligent Complex Systems and Institute of Modern Languages and Linguistics, Fudan University, Shanghai 200437, China

⁵State Key Laboratory of Common Mechanism Research for Major Diseases, Suzhou Institute of Systems Medicine, Chinese Academy of Medical Sciences & Peking Union Medical College, Suzhou 215123, China

⁶Key Laboratory of Medical Imaging Computing and Computer Assisted Intervention of Shanghai, Shanghai 200032, China

Corresponding email: lyyou@fudan.edu.cn (L.Y.).

Language is a hallmark of human cognition, yet its molecular underpinnings remains poorly understood due to limited animal models and technical constraints. In this study, we conducted a comprehensive transcriptomic profiling of 125 samples from 13 speech processing-related Brodmann areas (BAs) across both hemispheres in five human postmortem brains. Our analysis revealed a differential gene expression landscape, confirming left hemisphere dominance while uncovering unexpected higher expression in specific right hemisphere regions, including BA45 (part of Broca's area), BA3/1/2 (part of ventral sensory-motor cortex), and BA37. Integrative analyses combining genome-wide association study of speech processing-related disorders, differentially expressed genes, and human brain cis-expression quantitative trait loci data pinpointed the rs62060948-MYC-WNT3 axis as a key regulator of speech processing, with WNT3 showing a significantly higher expression in the right BA44 compared to the left. Functional studies



and behavioral tests in mice demonstrated that Wnt3 overexpression in the left auditory cortex induced speech processing-like abnormalities, including altered ultrasonic vocalization and diminished social novelty, linked to impaired myelination and downregulation of Jun and Opalin. These findings establish Wnt3 as a critical regulator of neuronal processes underlying speech processing and hemispheric lateralization, offering novel insights into the molecular basis of language.

Keywords: human speech processing-related regions, transcriptomics, genome-wide genetic studies, WNT3, hemispheric lateralization, ultrasonic vocalization, myelination.

中 L-129-0002

两种银染方法在人脑组织病理评估中的应用

句文怡 徐园园 付颖 王雪 余亮 吴薇 钱晓菁 仇文颖 (qiuwy73@126.com) 中国医学科学院基础医学研究所人体解剖与组织胚胎学系 国家发育和功能人脑组织资源库 北京 100005

应用改良的 Bielschowsky (Garvey) 银染法和 Gallyas-Braak 银染法对人脑组织石蜡切片进行染色并比较二者染色异同。二者都是利用银离子与神经纤维、突起或异常蛋白沉积物的亲和性,经还原后显色。Garvey 银染可以不用复染,同时显示 A β 沉积造成的斑块(包括弥散斑与核心斑)与神经纤维缠结(NFT),但对胶质细胞显示欠佳。Gallyas 银染染色过程中利用过碘酸抑制正常脑组织的嗜银性,背景更浅,因此较容易观察到神经炎斑(neuritic plaque, NP)和 NFT,但对弥散斑通常不显示。经与磷酸化 Tau 蛋白(pTau)免疫组织化学对比,发现 Gallyas 银染同时也可以显示胶质细胞中 pTau 和嗜银颗粒病中 pTau 沉积扩张的轴突末端。两种银染方法各有利弊,有目的地选择适合的方法有助于准确的病理评估。

中 L-129-0003

人脑微动脉形态学特征的数学模型构建

袁圆(yuanyy2960@163.com) 赵越 王素 王晓晨 中南大学湘雅基础医学院人解系 长沙 410000

脑微血管的形态结构对大脑的正常血供至关重要。有研究发现,大脑存在一种弯曲形态的微血管,且这些微血管大多为微动脉。然而,这些研究通常仅限于二维平面观察。本研究旨在基于组织透明化的基础上从三维立体角度探索此类微血管的具体形态及脑区分布,并且结合数学建模来探讨不同脑区是否存在差异。我们采用组织透明技术结合免疫荧光染色、迂曲指数测量、数学建模及血流动力学分析等方法,研究了成年人脑尸脑与胎脑中不同脑区的微血管形态与血流动力学特征。研究表明,此类弯曲微血管呈现波浪状形态,且这种弯曲是生理性的,在成人中央前回、颞叶及扣带回脑区和胎脑中央前后回之间的脑区都存在,且主要为微动脉;在成年脑丘脑和岛叶脑区未观察到此类波浪状微动脉。波浪状微动脉主要分布于皮质区域,皮质下区域较为罕见。数学建模显示,成年脑中央前回与颞叶的波浪状微动脉形态相似,扣带回的波浪状微动脉与胎脑中央前后回之间脑区的特征相近。流体动力学分析发现,弯曲微动脉与直管相比,流动特性有显著差异,弯管的压降和能量损耗更高。此类微动脉的区域分布和流动特性为大脑血流调节及氧气供应提供了新的视角。



中 L-129-0004

基于脑库脑淀粉样病理改变的分析

崔祖旗 叶梦瑶 周艺 米世雄 马敏 杨倩 王明 王施懿 余琪涵 崔慧先 杜鹃 (dujuan@hebmh.edu.cn) 河北医科大学人体解剖学教研室, 人脑组织库 河北医科大学基础医学院 石家庄 050017

分析河北医科大学人脑组织库内病理诊断为脑淀粉样血管病样本的基本情况及其病理特征, 为相关疾病的研究提供参考依据。通过 β -淀粉样蛋白免疫组化染色、刚果红染色和偏振光观察诊断脑淀粉样血管病样本, 统计样本的性别、年龄和载脂蛋白 E 基因型等基本资料, 分析脑淀粉样血管病病理分型分级、阿尔兹海默病相关病理改变评分、共病等病理信息。截止到 2024 年 10 月, 河北医科大学人脑组织库内病理诊断有脑淀粉样血管病样本 20 例, 男女比例 3:1, 平均年龄 80.90 ± 8.08 岁; 涉及 3 种载脂蛋白 E 亚型、5 种载脂蛋白 E 基因型 ($\epsilon 2/\epsilon 3$ 、 $\epsilon 2/\epsilon 4$ 、 $\epsilon 3/\epsilon 3$ 、 $\epsilon 3/\epsilon 4$ 、 $\epsilon 4/\epsilon 4$); 病理分型涵盖 2 种, 其中 1 型 6 例, 2 型 14 例; 病理分级涵盖 3 级。脑淀粉样血管病严重程度分级和亚型分类与阿尔兹海默病样病理改变程度相关, 尤其是 1 型样本与阿尔兹海默病高度重合; 脑淀粉样血管病样本与其他退行性疾病可同时存在且共病率高。基于脑库收集的高龄样本中脑淀粉样血管病发生率较高, 与阿尔兹海默病和边缘系统为主的年龄相关性的 p-TDP 43 脑病常为共病; 为样本的进一步科研共享提供了较为详细的病理诊断依据。

中 L-129-0005

精神分裂症 21 例大脑神经病理学分析

竺可青
浙江大学医学院

目的 探讨精神分裂症大脑的神经病理学改变。本研究采用常规病理方法和免疫组织化学, 与对照组相比分析 21 例精神分裂症尸检病例的神经退行性疾病病理学改变。重点关注阿尔兹海默病的病理状况, 以及 TDP-43 病理和原发性年龄相关性 tau 病的状态。精神分裂症队列中 6 例表现为阿尔兹海默病病变的“低-中度”水平, 13 例被判定为原发性年龄相关性 tau 病, 在 8 例病例中杏仁核和或海马区存在 TDP-43 沉积。精神分裂症患者和年龄匹配的对照者之间, 阿尔兹海默病病理程度没有显著差异。精神分裂症病例的临床痴呆症状不能由其病理改变解释。载脂蛋白 E (ApoE) 状态, 精神分裂症患者与对照组无明显差别。与健康对照组相比, 精神分裂症患者的阿尔兹海默病等神经变性疾病相关神经病理学并未增加, 在精神分裂症患者中观察到的严重认知障碍不是基于阿尔兹海默病中发生的病理改变。

中 L-129-0006

人脑组织库免疫组化实验流程的优化

吴娟利 (wujuanli008@zju.edu.cn) 方正 胡雨婷 刘翠云 沈逸 包爱民 浙江大学国家健康和疾病人脑组织资源库 杭州 310058

针对人脑组织库 (简称脑库) 所收集到的人脑组织样本做出神经病理诊断是脑库建设的“灵魂”, 它依赖于一系列标准化病理染色实验结果。为了实现国内各脑库之间人脑组织样本资源的共享合作研究, 并与国际脑库的神经病理诊断结果有效接轨, 建立标准化的病理染色实验流程至关重要。人脑组织在固定、脱水、透明、浸蜡以及包埋等处理过程中使用了多种化学试剂, 它们会封闭组织内抗原而导致相应抗原的免疫组化结果难以呈现正常阳性, 本研究针对脑库常规的神经退行性疾病的病理标志物, 即过度磷酸化 Tau 蛋白 (p-Tau)、磷酸化 TDP43 蛋白 (p-TDP43)、 α 突触核蛋白 (α -synuclein) 和 β 淀粉样蛋白 ($A\beta$) 的免疫组化染色流程进行了优化实验, 包括抗原修复步骤、



抗体浓度及克隆号等。采用热修复进行抗原修复，针对修复液的酸碱性（ $\text{pH}=6.0$ 或者 $\text{pH}=9.0$ ）；针对添加 80% 甲酸再修复及其修复时间（10 min 或者 15 min）；调整 p-TDP43 的工作浓度以及不同克隆号 $\text{A}\beta$ 抗体的染色效果比对等，建立了 4 种抗体的分别优化后实验流程。采用这些优化的流程对来自荷兰人脑库（NBB）的样本进行染色，同时采用 NBB 染色流程对浙大国家脑库的样本进行免疫组化染色。结果表明：针对上述 4 种抗体在人脑组织样本的免疫组化实验流程获得理想结果；并可以获得与 NBB 相同的染色结果和诊断结果。本研究为中国脑库的神经病理染色及诊断质控体系建设提供了有力的技术支撑。

中 L-129-0007

河北医科大学脑库宣传体系建设的实践与探索

杨倩（1074120282@qq.com） 马敏 米世雄 杜鹃 崔慧先 河北医科大学人体解剖学教研室 石家庄 050017

为科学普及脑库建设的意义和有效推进脑样本收集的进度，河北医科大学脑库积极构建了全面且多元化的宣传体系。设计专属 logo，以简洁直观的视觉形象标识彰显脑库的专业特质与使命，提升辨识度；建设独立网站，分设脑库概况、新闻资讯、研究成果、样本信息、宣传视频等板块，实现信息的公开透明和及时更新；制作宣传手册，起到“名片”的效果，便于民众快捷了解和联系脑库；设置宣传墙，展示脑库建设历程、科研成果、样本收集流程等内容，利于实地讲解和参观；规划宣传视频，以更加灵活立体的影像资料方式讲述脑库的故事；走进大中小学校和社区，面向广大市民进行脑科学和生命科学的科普讲座。在此基础上，积极筹备申请河北省科普示范教育基地和科普相关人文社科课题。宣传工作作为脑库与公众、科研界沟通的桥梁，不仅能提高社会对脑库研究的认知与支持，也为脑库吸引更多科研资源与合作机会，对推动脑库长期可持续发展、加速神经科学领域研究进程具有关键意义。



●中 M1-神经生物学● Podium

中 M1-129-0001

制作海马结构教学模型体会

穆瑞民

北京协和医学院

在神经解剖学教学中有很多知识难点学生很难理解掌握，人类海马结构很小但它的位置和结构很重要，其功能也很强大，它包括有记忆、空间认知、情绪调节、学习和感知觉信息的处理等，内含很多重要的神经细胞和多种走行的神经纤维，这些结构均浓缩在狭小的海马结构内，同学很难理解掌握。为提高教学质量，以简明、直观和三维立体模式使学生理解掌握海马结构，我们设计制作一款海马结构教学模型，该模型特点：

- 1、采用透明有机玻璃板热成型构架了海马结构的水平、矢状、冠状三维立体构筑，展示了海马结构细胞组成及神经纤维的位置毗邻关系，其外观形象透明，使内部结构精准鲜明一目了然。
- 2、采用可熔性胶棒经热熔后冷却塑制的各种神经细胞及其突起，形态逼真、相互连结、位置精准，精确展现海马结构的形态和位置关系，具有三维立体显示特色。
- 3、采用不同颜色网线表现海马结构神经纤维联系，可以清晰识别不同纤维的位置、走行、来源和归宿。
- 4、本模型外观设计新颖，形象逼真地展现了海马结构的组成及进出的神经纤维，透明有机玻璃构架的外形映衬下其内部结构一览无遗，给人以清新、漂亮、光鲜之感，留下难忘的印象，很适合学生实验教学、临床医生的培训及科普宣传使用。

中 M1-129-0002

己糖激酶 2 调节创伤后应激障碍中星形胶质细胞-神经元丝氨酸穿梭和机体葡萄糖代谢

冷历歌

厦门大学

创伤后应激障碍(PTSD)患者经常与糖尿病共病，并相互加剧疾病的发展。然而，其具体机制尚不清楚。在这里，我们发现创伤后应激障碍模型小鼠表现出血糖水平的增高。单核转录组学(snRNA)测序显示，高血糖的创伤后应激障碍模型小鼠杏仁核中的星形胶质细胞显著衰老，这是由己糖激酶 2(HK2)的下调引起的。接下来，我们构建了星形胶质细胞 HK2 缺失小鼠，其也表现出应激表型和 T2D 样表型。星形胶质细胞中的 HK2 缺乏会通过破坏“星形胶质细胞-神经元-丝氨酸穿梭”来减少星形胶质细胞 L-丝氨酸的合成和神经元的 D-丝氨酸的供应。杏仁核神经元中 D-丝氨酸水平的降低会损害神经元功能，进而导致交感神经和副交感神经不平衡和影响其向胰腺的投射，导致外周血糖水平的升高。通过补充 L-丝氨酸或达沙替尼/槲皮素(DQ)以消除衰老细胞均可以缓解创伤后应激障碍样神经行为，也可以缓解外周高血糖。因此我们的研究表明，星形胶质细胞 HK2 在创伤后应激障碍中介导恐惧记忆消退和外周葡萄糖代谢。



中 M1-129-0003

Disfunction of dorsal raphe nucleus-hippocampus serotonergic-HTR3 transmission results in anxiety phenotype of Neuroplastin 65- deficient mice.

Cheng Jie; Chen Ling; Zheng Yani; Zhang Lei; Yuan Qionglan
同济大学

Anxiety disorders are the most common psychiatric condition, but the etiology of anxiety disorders remains largely unclear. Our previous studies have shown that neuroplastin 65 deficiency (NP65^{-/-}) mice exhibit abnormal social and mental behaviors and decreased expression of tryptophan hydroxylase 2 (TPH2) protein. However, whether a causal relationship between TPH2 reduction and anxiety disorder exists needs to be determined. In present study, we found that replenishment of TPH2 in dorsal raphe nucleus (DRN) enhanced 5-HT level in the hippocampus and alleviated anxiety-like behaviors. In addition, injection of AAV-NP65 in DRN significantly increased TPH2 expression in DRN and hippocampus, and reduced anxiety-like behaviors. Acute administration of exogenous 5-HT in hippocampus decreased anxiety-like behaviors in NP65^{-/-} mice. Moreover, replenishment of TPH2 in DRN partly repaired the impairment of long-term potentiation (LTP) maintenance in hippocampus of NP65^{-/-} mice; HTR3 agonist SR57227A mitigated anxiety-like behaviors in NP65^{-/-} mice. Finally, we found that loss of NP65 lowered transcription factors Lmx1b expression in postnatal stage and replenishment of NP65 in DRN reversed the decrease in Lmx1b expression of NP65^{-/-} mice. Together, our findings reveal that NP65 deficiency induces anxiety phenotype by downregulating DRN-hippocampus serotonergic-HTR3 transmission. These studies provide a novel and insightful view about NP65 function, suggesting an attractive potential target for treatment of anxiety disorders.

中 M1-129-0004

小鼠岛叶向丘脑中央内侧核投射通路参与痛信息传递与调控的机制研究

任肖, 张明明, 李云庆
空军军医大学人体解剖与组织胚胎学教研室

作为大脑中关键的信息整合中心, 已被证实是疼痛信号传递和整合的重要核团。IC 与丘脑存在广泛纤维联系, 但其特异性投射至丘脑中央内侧核 (CM) 核团的神经通路在痛觉-情感共病中的功能意义尚未明确。本研究通过建立小鼠神经病理性痛模型, 综合运用神经形态学、钙成像、电生理、光/化学遗传学、行为学等方法, 验证小鼠 IC-CM 通路的结构基础, 并阐明 IC-CM 投射通路参与痛信息的特异性神经元类型, 进而揭示 IC-CM 投射通路在痛信息传递和调节中发挥的作用。免疫荧光组织化学染色结果显示 SNI 模型诱导的神经病理性痛能够激活深层 IC 和吻侧 CM 内神经元, 且主要为兴奋性神经元; 神经束路追踪结合免疫荧光染色结果显示主要为深层 IC^{VGluT2} 神经元向 CM^{CaMKII} 神经元发出投射参与痛信息的传递; 光纤成像和电生理结果显示 IC-CM 投射通路在痛刺激下兴奋性增强, 进一步表明该通路参与痛信息的传递; 光/化学遗传学结果显示激活 IC^{VGluT2}-CM 投射通路能够降低正常小鼠机械和热痛阈值并诱发小鼠产生焦虑样行为, 而抑制该通路能够缓解神经病理性痛小鼠的机械痛敏、热痛敏及其相关的焦虑样行为。本研究旨在探索小鼠 IC-CM 投射通路参与痛信息调控的神经机制, 为研究中枢内源性疼痛调控系统和疼痛机制的进一步阐明提供实验依据。



中 M1-129-0009

靶向抑制 NAT10 改善慢性应激和脂多糖所致小鼠抑郁样行为

杨靖雯,王萌,徐杨,曹文字

南华大学

抑郁症严重影响患者生活质量，但其治疗仍存在一些不足之处，深入揭示抑郁症的发病机制并寻找新的靶点意义重大。NAT10 参与应激与免疫调控，但其在抑郁中的作用尚不清楚。在本研究中，我们采用脂多糖（LPS）及慢性束缚应激（CRS）两种抑郁模型观察 NAT10 在模型小鼠脑内的改变，并结合病毒工具和药理学阻断 NAT10，探讨其在抑郁中的作用。Western blot 和免疫组织化学的结果表明，CRS 与 LPS 模型小鼠海马 NAT10 的表达均显著上调；尽管各组小鼠在旷场实验中活动度无显著差异，但是我们发现 CRS 与 LPS 模型小鼠在糖水偏好实验中糖水偏好百分比显著降低，悬尾实验与被迫游泳实验中不动时间显著增加，敲低海马 NAT10 改善模型小鼠的抑郁样行为；全身给予 NAT10 抑制剂 Remodelin 也能够改善 LPS 模型小鼠的抑郁样行为，表现为糖水偏好百分比增加，悬尾实验与被迫游泳实验中不动时间显著降低；并且，Remodelin 干预抑制 LPS 模型小鼠海马小胶质细胞的活化，但不影响外周炎症因子的表达。以上结果表明靶向抑制 NAT10 很可能是治疗抑郁的新靶点。

中 M1-129-0010

揭秘神经-免疫的交互作用在骨癌痛的双相机制

王长明

南京中医药大学

骨癌痛是一种严重影响患者生活质量的顽固性疼痛，其背后的神经免疫机制尚未完全阐明。本研究聚焦于疼痛感知中的关键神经肽 P 物质（Substance P, SP），深入探讨其在骨癌痛神经-免疫相互作用中的调控机制。通过整合行为学与生理学方法，研究发现背根神经节（Dorsal Root Ganglion, DRG）神经元通过胞吐作用释放的 SP 是启动骨癌痛的关键因素，其释放量在骨癌痛模型第 14 天达到峰值，并与小鼠的疼痛行为显著相关。同时，实验观察到巨噬细胞向 DRGs 和坐骨神经的浸润，其中 I 型巨噬细胞的数量在骨癌痛小鼠中显著增加。进一步机制研究表明，巨噬细胞的缺失可显著缓解骨癌痛症状，而阻断 SP-NK1R 通路不仅能减少巨噬细胞浸润，还可有效减轻骨癌痛。此外，在骨癌痛晚期阶段，DRGs 通过释放趋化因子 CCL3 和 CCL2 招募巨噬细胞。基于这些发现，本研究提出了骨癌痛进展的两阶段模型：早期阶段由 SP 的释放发起骨癌痛并诱导巨噬细胞浸润，晚期阶段则由趋化因子介导巨噬细胞募集。本研究首次揭示了 SP 介导的神经-免疫相互作用在骨癌痛中的关键调控机制，明确了 SP-NK1R 通路和巨噬细胞浸润作为骨癌痛治疗的重要靶点，为开发阶段特异性的治疗策略提供了新的理论依据和潜在方向，有望为改善骨癌痛患者的生活质量带来突破性进展。



中 M1-129-0011

VTA-CL-mPFC 神经通路在甲基苯丙胺奖赏效应中的作用机制

范宇,赵子恒,何钰红,关晓伟

南京中医药大学

药物相关线索能够触发记忆检索并驱动觅药行为，这一过程构成了戒毒和预防复吸的主要挑战。然而，调控药物记忆检索的神经通路尚未被完全阐明。本研究采用甲基苯丙胺（METH）诱导的条件性位置偏爱（CPP）小鼠模型，结合神经示踪、化学遗传学、光遗传学、膜片钳记录及光纤钙成像等技术，探讨屏状核（CL）及其相关通路在 METH 奖赏相关记忆检索中的作用。研究发现，CL 内表达多巴胺 D1 型受体（D1R）的谷氨酸能神经元（CL^{Glu}）接受来自腹侧被盖区（VTA）的多巴胺能投射，并向内侧前额叶皮层（mPFC）发送兴奋性输出，从而构成调控 METH 相关记忆存储与检索的关键神经通路。抑制 VTA-CL-mPFC 通路可显著削弱 METH CPP 记忆的检索能力。此外，VTA-CL-mPFC 通路中的部分神经元表现出较高的电生理兴奋性和复杂的树突分支结构，提示其可能参与 METH CPP 相关记忆的存储和检索。综上，本研究揭示了一条由 CL^{Glu} 介导的、此前未被充分认识的中脑-皮层通路可调控 METH CPP 相关记忆的检索。通过阐明 VTA-CL-mPFC 通路在药物相关记忆处理中的作用机制，加深了对成瘾物质奖赏效应的脑环路和分子机制的理解，并为防控成瘾风险提供了新的干预靶标和思路。

中 M1-129-0014

海马神经元周围基质网在甲基苯丙胺诱导的小鼠成瘾相关行为中的作用

姚嘉燊,崔艳慧,李芳,李昌琪

中南大学

甲基苯丙胺（MA）俗称“冰毒”，已成为我国滥用最广泛的毒品。海马作为学习、记忆和情感调节的关键脑区，分为背侧和腹侧海马，其中背侧海马主要与空间记忆和认知功能相关，腹侧海马则参与调节情绪反应和动机行为，两者均在药物成瘾中发挥重要作用。神经元周围基质网（PNNs）是一种特殊的细胞外基质，在学习和记忆等过程中起重要调控作用，其在 MA 成瘾中的作用及机制仍不清楚。本研究采用条件性位置偏爱（CPP）小鼠模型，探讨小鼠海马 PNNs 在 MA 成瘾行为中的作用。结果发现，与盐水组相比，MA 组小鼠在 CPP 形成后，腹侧海马 CA1（vCA1）PNNs 和 PV 的表达明显增加。在条件化训练前给予 ChABC 消融背侧海马 CA1 的 PNNs 对小鼠 CPP 形成没有影响，而消融 vCA1 的 PNNs 可以显著抑制 MA 诱导的 CPP 形成并减少该脑区 PV 和即早基因 Egr1 的表达。化学遗传学抑制 vCA1 中的 PV 神经元，也显著抑制 MA 诱导的 CPP 形成。本研究表明，vCA1 中的 PNNs 通过影响 PV 神经元在 MA 诱导的成瘾相关行为中发挥重要作用，消融 vCA1 中的 PNNs 或抑制 PV 活性均能有效改善 MA 诱导的成瘾行为，这为 MA 成瘾的防治研究提供了新的思路。



中 M1-129-0018

天麻素通过促进 Alkbh5 核转位及 Gclm 的 m6A 去甲基化减轻缺血性脑卒中铁死亡

石金沙,杨舒涵,张幸霖,皋雨青,窦欣,郑惠馨,王朝,郭涛,肖蓉,李娟娟
昆明医科大学

探究天麻素 (Gastrodin, GAS) 减轻缺血性脑卒中 (Ischemic stroke, IS) 后小胶质细胞铁死亡的作用机制。体内构建大脑中动脉栓塞 (MCAO) 模型以及体外小胶质细胞氧糖剥夺 (OGD) 模型。通过 Western blot、RT-qPCR 和免疫荧光检测 GAS 干预后小胶质细胞铁死亡相关指标 (线粒体膜电位、 Fe^{2+} 以及脂质过氧化产物 MDA 和 4HNE) 及铁死亡相关蛋白 (Acsl4、Ptgs2、Sat1 和 Gpx4) 的表达变化, 并通过网络药理学、分子对接以及免疫共沉淀技术探讨其具体的分子机制。结果显示: GAS 能降低 Acsl4、Ptgs2、Sat1 的表达, 促进 Gpx4 表达, 并且降低 Fe^{2+} 、MDA 和 4HNE 的表达水平, 恢复线粒体膜电位。进一步研究发现, GAS 可与磷脂酰肌醇-3-激酶 (PI3K) 相结合, 并通过磷酸化的 Akt 诱导 AlkB 同源蛋白 5 (Alkbh5) 的丝氨酸/苏氨酸磷酸化及其核转位, 降低谷氨酸-半胱氨酸连接酶调节亚基 (Gclm) 的 N6-甲基腺苷 (m^6A) 甲基化水平, 从而提高 Gclm 表达并促进 GSH 合成, 最终抑制 IS 中的铁死亡。综上结果表明, GAS 通过 PI3K/Akt/Alkbh5/Gclm 轴抑制缺血性脑卒中后小胶质细胞的铁死亡。该研究为 GAS 在 IS 中的治疗作用提供了新的实验依据。

中 M1-129-0019

Nrf2 调控的 Gm26550 在小鼠学习记忆中的作用及机制研究

王宏方 左冬悦 苏兆文
河北医科大学人体解剖学教研室

核因子 E2 相关因子 2 (nuclear factor erythroid-2-related factor 2, Nrf2) 在学习记忆障碍中发挥重要作用。前期研究发现 Nrf2 与非编码 RNA 之间存在复杂的调控网络, 但其作用机制不清。本研究利用全转录组基因芯片及生物信息学分析、分子生物学、形态学、电生理学和行为学实验, 发现 Nrf2 基因敲除小鼠海马脑区中 Gm26550 表达显著下调, 过表达 Gm26550 可显著改善小鼠学习记忆障碍。进一步采用 FISH 和双荧光素酶报告基因、RNA pull down、RIP、放线菌素 D 等实验方法, 证实 Gm26550 通过双重分子机制调控 IGF1 表达, 进而提高海马神经元突触可塑性: 一方面作为 miR-26a-5p 的分子海绵发挥吸附作用, 解除其对 IGF1 的抑制作用; 另一方面竞争性结合 KHSRP 蛋白的 KH3/KH4 结构域, 抑制 KHSRP 介导的 IGF1 mRNA 降解。研究结果表明, 海马 Nrf2 在转录水平上调 Gm26550 的表达, Gm26550 通过上述双重机制促进 IGF1 表达, 进而增强海马神经元突触可塑性并改善学习记忆障碍。本研究揭示了 Nrf2 通过 Gm26550 调控学习记忆障碍的新机制, 为学习记忆障碍的预防和治疗提供了潜在的分子靶点。



中 M1-129-0022

FMRP 通过 β -catenin 调控 NrCAM 对海马突触蛋白 PSD95 和树突棘以及孤独症样行为的影响

王钊,陈欢,牟宸羽,乔丹,王畅,张紫璇,李得贤,崔程冉,王梦怡,崔慧先,李莎
河北医科大学

脆性 X 智力低下蛋白 (FMRP) 和 β -catenin 对树突发育和神经行为调控起到重要作用。神经细胞粘附分子 (NrCAM) 与突触形成和重塑密切相关。FMRP 是否通过 β -catenin 调控 NrCAM 影响海马树突发育和神经行为,目前尚不清楚。本研究探讨 β -catenin 是否介导 FMRP 调控 NrCAM 对突触蛋白 PSD95 和树突棘以及孤独症样行为的影响。1. 通过转录组学测序、qRT-PCR 和免疫印迹的方法,检测 Fmr1 基因敲除对小鼠海马基因表达的影响。结果显示, β -catenin 是 Fmr1 KO 小鼠海马树突异常发育的关键差异基因。2. (1) 通过 RIP 实验检测 HT22 细胞 FMRP 与 β -catenin 的结合情况,通过 qRT-PCR、免疫印迹和免疫荧光染色检测敲降 Fmr1 对 β -catenin、NrCAM 和 PSD95 mRNA 和蛋白表达水平的影响。结果显示,FMRP 与 β -catenin mRNA 直接结合;敲降 Fmr1 引起 β -catenin、NrCAM 和 PSD95 mRNA 和蛋白水平升高,促进 β -catenin 核易位。(2) 激活 β -catenin 或敲降 β -catenin,通过 qRT-PCR 和免疫印迹检测 HT22 细胞 NrCAM 和 PSD95 mRNA 和蛋白表达水平。结果显示,干预 β -catenin 可以影响 HT22 细胞 NrCAM 和 PSD95 的表达,且趋势与 β -catenin 保持一致。(3) 同时敲降 Fmr1 和 Nrcam,通过免疫印迹检测 HT22 细胞 PSD95 蛋白表达水平。结果显示,同时敲降 Fmr1 和 Nrcam 引起 PSD95 蛋白水平降低。通过 Co-IP 和 Duolink PLA 实验检测敲降 Fmr1 对 NrCAM 和 PSD95 蛋白相互作用的影响。结果显示,NrCAM 和 PSD95 之间存在相互作用,而敲降 Fmr1 显著增加了这种相互作用。3. 通过 qRT-PCR、免疫印迹、Golgi 染色和神经行为学实验,观察敲降 β -catenin 对 Fmr1 KO 小鼠海马 NrCAM、PSD95 和树突棘以及孤独症样行为的影响。结果显示,Fmr1 KO 小鼠海马 NrCAM 和 PSD95 mRNA 及蛋白表达水平增加,树突棘密度升高,成熟度和复杂性降低,出现孤独症样行为,而敲降 β -catenin 缓解了 Fmr1 KO 小鼠的上述异常表型。

●中 M1-神经生物学●Poster

中 M1-129-0012

从解剖微环境视角剖析孤独症谱系障碍患者短链脂肪酸代谢紊乱：一项荟萃分析

杨朝名 侯晓晖
南京中医药大学

孤独症谱系障碍 (ASD) 的神经发育异常机制与肠道菌群代谢产物间的相互作用尚未阐明,短链脂肪酸 (SCFAs) 作为菌群-肠-脑轴的关键信号分子,其病理生理意义存在广泛争议。本研究从解剖学视角解析 ASD 患者 SCFAs 谱特征,为寻找潜在诊断标志物及干预靶点提供依据。本研究遵循 PRISMA 指南构建框架 (PROSPERO 注册号: CRD42024515666),系统检索 PubMed/EMBASE 等 5 大数据库至 2024 年 12 月,纳入 16 项研究 (n=987),采用随机效应模型计算标准化均数差,通过亚组分析样本来源 (粪便/血浆)、年龄分层 (学龄前/学龄期) 等与解剖生理密切相关的协变量影响。核心发现: ASD 患者存在特异性 SCFAs 谱改变,戊酸 (SMD=0.76,95%CI:0.23-1.29, p=0.005) 与己酸 (SMD=0.60,95%CI:0.05-1.16, p=0.03) 在 ASD 组粪便中特异性升高,其分子结构 (5-6 碳支链) 可能影响肠黏膜通透性与血脑屏障穿透效率。



粪便样本效应量显著高于血浆 ($Q=4.32$, $p=0.04$)，提示远端结肠菌群代谢异常可能是主要解剖来源。发育阶段的解剖关联：2-6 岁组 SCFAs 差异最显著 ($\beta=0.34$, $p=0.02$)，与肠道神经系统髓鞘化关键期存在时间吻合。气相色谱-质谱检测到更显著的短链脂肪酸差异 ($p=0.03$)，揭示不同检测技术对肠道解剖微环境代谢产物的捕获灵敏度差异。本研究首次通过大样本荟萃分析证实 ASD 患者存在特异性短链脂肪酸代谢紊乱，为理解肠-脑轴物质交换的解剖学基础提供代谢组学证据，揭示特定 SCFAs 可能作为肠道解剖微环境改变的生物标志物。

中 M1-129-0017

神经营养因子 Nrn1 对长时程增强（LTP）的作用研究

胡钰敏, 黄青芸, 程雪, 谭国鹤, 刘媛媛
广西医科大学

学习记忆是大脑最重要的高级功能之一，其机制研究一直是神经科学领域的热点课题。其中，突触长时程增强（Long-term potentiation, LTP）被认为是研究学习记忆的神经基础和理想的模型。相关研究表明，神经营养因子 Nrn1 能促进神经元轴突和树突的生长和分支，但目前 Nrn1 在长时程增强（LTP）中的作用尚未得到探索。首先，我们在大鼠 PP-DG 通路使用高频电刺激诱导产生 LTP，观察不同时间点的 Nrn1 mRNA 的表达变化，结果显示 Nrn1 mRNA 在 30min 后出现上调，6h 达到峰值，这说明 Nrn1 会响应 LTP 发生表达变化。我们进一步使用在神经系统中特异性敲除 Nrn1 的条件性基因敲除小鼠进行在体 LTP 实验，结果显示，同窝对照小鼠相比条件性敲除小鼠的兴奋性突触后电位（EPSP）和群峰电位（PS）增长率均降低，这说明脑内敲除 Nrn1 后海马 LTP 的诱导与维持受到损害。我们在小鼠海马 DG 区注射外源性 Nrn1 蛋白，增加海马 DG 区的 Nrn1 蛋白含量，结果显示，EPSP 和 PS 幅值均增强，说明 Nrn1 可以诱导 LTP 的产生和维持。这些结果证明 Nrn1 对 LTP 有重要的潜在作用，这有助于我们更进一步了解 LTP 的分子调控机制，并为理解学习记忆现象提供了新的科学线索。

●中 M1-神经生物学● Abstract

中 M1-129-0006

TAF15 下调有助于运动改善老年小鼠空间工作记忆相关的认知功能

何云, 闫梦婷, 黄廷杰, 许本柯, 陈运才
长江大学

适度有氧训练可延缓和阻止老年机体的记忆快速衰退。小鼠“跑转笼训练”对海马相关空间记忆功能的益处已被证实，但“跑转笼训练”对前额叶皮层（the prelimbic cortex, PrL）相关的空间工作记忆报道罕见。本项目探讨了“跑转笼训练”对 PrL 相关空间工作记忆的影响，并观察到 TAF15（TATA-binding protein-associated factor 2N）表达下调有助于运动改善老年小鼠空间工作记忆相关的认知功能。16 月龄的 C57BL/6J 雄性小鼠被用于“跑转笼训练”建立运动动物模型，该训练持续 5 个月（每天运动 1 小时，每周运动 5 天）。待老年小鼠达 22 月龄采用行为学、形态学及分子生物学方法检测小鼠空间记忆能力、树突棘密度、TAF15 表达等。另一部分小鼠采用病毒注射方法调高 PrL 区 TAF15 表达，观察运动训练对树突棘和工作记忆的影响。研究结果显示上述运动策略改善了老年小鼠的空间工作记忆能力，同时增加了树突棘的密度，并降低了 PrL 区 TAF15 的



表达。具体而言，运动防止了因年龄因素引起的顶端树突分支上纤细型和蘑菇型树突棘的选择性丢失。此外，TAF15 表达的增加对树突棘不利。课题组观察到运动训练会降低 TAF15 在 PrL 中的表达，从而保护 PrL 锥体细胞上的树突棘，并改善运动老年小鼠的工作记忆。当通过病毒方法在 PrL 中过表达 TAF15 时，运动训练对树突棘和工作记忆的益处就会消失。上述数据表明，适度的有氧运动训练可能会下调 TAF15 在 PrL 中的表达，从而有利于树突棘的生长。

中 M1-129-0007

运动对 3xTg-AD 雄性小鼠海马 CA1 神经元树突棘和 A β 淀粉样蛋白的影响

许本柯, 黄廷杰, 闫梦婷, 何云, 陈运才
长江大学医学部

记忆力减退是阿尔茨海默病（Alzheimer's disease, AD）的主要症状。针对 AD 患者记忆衰退，目前尚未找到成功的药物治疗，因此如长周期的有氧运动训练等非药物干预措施来延缓和改善记忆衰退备受欢迎。本课题基于 3xTg-AD 雄性小鼠建立运动动物模型（5 个月的“跑转笼训练”，每天 1 小时，每周 5 天），并探讨运动对海马依赖性空间记忆的影响及其内在机制。3xTg-AD 转基因小鼠和非转基因小鼠运动训练后随即进行空间记忆测试。行为测试后，对背侧海马 CA1 区的神经元树突棘、突触和兴奋性突触蛋白以及 A β 淀粉样蛋白进行分析。实验结果显示运动改善了 3xTg-AD 小鼠海马依赖的空间记忆。“跑转笼训练”同时防止了 3xTg-AD 小鼠 CA1 锥体细胞上的纤细型和蘑菇型树突棘丢失，而运动对非转基因小鼠的影响仅限于纤细型树突棘。在突触分子水平，运动对树突棘的影响伴随着突触数量的增加和兴奋突触蛋白表达的上调。值得注意的是，运动减少了细胞内 APP 的表达和细胞外 A β 蛋白（包括 A β ₁₋₄₀ 和 A β ₁₋₄₂）的积累。上述数据表明，长周期的有氧运动可通过减缓淀粉样蛋白病理变化和防止突触丢失来改善临床前注意力缺失症患者的记忆功能。

关键词：树突棘、突触、淀粉样蛋白、记忆、AD、运动训练

中 M1-129-0008

运动改善 3XTg-AD 和衰老小鼠海马依赖的空间记忆能力

黄廷杰, 闫梦婷, 何云, 许本柯
长江大学医学部

运动可改善机体的认知功能，但具体机制尚不清楚。以往运动与认知相关的研究多集中在青年和成年动物模型，对于老年动物，特别是 AD 模型动物的研究非常有限。本研究基于 3XTg-AD（6 月龄）和老年小鼠（16 月龄）以 5 次/周，1 小时/次的频率建立“跑转笼训练”动物模型，该运动持续 5-6 个月。运动结束后检测小鼠海马相关空间记忆能力，包括新物体识别、新位置识别和水迷宫实验。小鼠行为学实验结束后，灌注取脑并分为左、右两半，一部分的背侧海马用于提取蛋白，供 A β 、Tau、CRF 和 CRFR1 的生化分析，另一部分半脑进行免疫组化和免疫荧光分析。此外，将部分脑组织用于高尔基浸渍实验，并结合体视学定量分析运动对相关蛋白以及树突棘数目的变化。研究结果表明，运动组 AD 和衰老小鼠的记忆能力显著高于对照组；运动组小鼠的海马 CA1 区神经元树突棘密度在始层、辐射层及分子层在不同程度高于对照组，各层具有显著差异；兴奋性突触蛋白 PSD95 和 GLUR1 的表达上，运动组小鼠在辐射层显著高于对照组。此外，运动组 3XTg-AD 小鼠海马 CA1 区 A β 淀粉酶的水平较同龄对照组显著降低，例如 A β ₁₋₄₀ 和 A β ₁₋₄₂。综上，“跑转笼训练”延缓甚至阻止了“年龄”因素所致的兴奋性突触蛋白低表达、树突棘丢失以及 AD 的病理性沉积，进而减缓衰老相关的认知记忆。



中 M1-129-0013

早年生活负性应激损害前边缘皮层依赖的工作记忆机制研究

闫梦婷,黄廷杰,何云,许本柯,陈运才

长江大学医学部

早年生活负性应激与个体成年后认知功能障碍密切相关,工作记忆受损尤为显著,其中前边缘皮层(PrL)神经元突触可塑性受损发挥重要作用,具体机制尚不清楚。本项目通过改变幼鼠饲养环境(P2-P9)建立早年生活负性应激模型,待小鼠3月龄(P120)采用行为学、形态学和分子生物学方法研究CRF-CRFR1-RhoA通路激活并损害PrL神经元突触可塑性。奖励性T迷宫测试显示ELA小鼠较正常小鼠工作记忆受损显著。高尔基浸渍及免疫荧光结果显示,ELA组小鼠PrL锥体细胞树突棘密度降低,特别是在II-III层和V-VI层的特定树突段上,包括纤细型和蘑菇型树突棘。免疫组化和WB结果显示,ELA组小鼠PSD-95标记的突触后斑点减少,而突触前蛋白Syn的表达未受影响。综上,早年生活的负性应激降低兴奋性突触蛋白PSD-95表达,损害PrL神经元树突棘密度,最终导致机体工作记忆受损,其机制可能与CRF-CRFR1-RhoA通路被激活密切相关。

中 M1-129-0020

Pitolisant对酒精成瘾相关行为的影响及机制研究

付依昕,陈炳青,曹国馨,韩小娇,刘天豪,付饶

中山大学医学院

Pitolisant作为首款上市的H3R反向激动剂/拮抗剂,因有效提升脑内HA水平用作治疗发作性睡病,而Pitolisant对酒精成瘾相关行为影响的研究存在空白。本研究采用腹腔注射酒精、双瓶选择饮酒、慢性间歇性饮酒等模型,发现Pitolisant系统性给药压制酒精的行为敏化、镇静效应与奖赏效应,同时降低饮酒量、酒精偏好并缓解戒断期间的负性情绪状态。Pitolisant经侧脑室给药,从17个脑区中筛选出6个同时响应慢性酒精暴露与Pitolisant治疗的脑区。随后选取LHb进行局部脑区联合给药(Veh+Pitolisant、Triprolidine+Pitolisant、Cimetidine+Pitolisant)与单独给药(Pitolisant、Triprolidine、Cimetidine)分别调控HA相关受体(H1R、H2R、H3R)。LHb给药Pitolisant可以降低复吸饮酒量与酒精偏好,并缓解戒断期间焦虑样行为;Cimetidine预先拮抗LHb H2R将阻断Pitolisant的降低饮酒与抗焦虑功能;另外,Cimetidine可使对照组小鼠出现焦虑样行为,而Triprolidine具有降低饮酒的功能。以上结果表明,Pitolisant可能通过多个脑区影响酒精相关行为。Pitolisant提升的HA可能透过LHb H2R行使降低饮酒与抗焦虑功能,而H1R单独参与饮酒行为的调控。



中 M1-129-0021

酒精戒断致负性情绪表达伴随 RMTg 至 DRN 环路功能亢进

陈炳青, 卢凯新, 丁汝璇, 付依昕, 韩小娇, 刘天豪, 孙诗竹, 唐颖, 付饶

中山大学医学院

酒精成瘾是慢性反复发作性脑病常与焦虑和抑郁共病发生, 与脑内五羟色胺 (5-HT) 系统密切相关。我们最近报道大鼠吻内侧被盖核 (Rostromedial tegmental nucleus, RMTg) 异常兴奋驱动酒精戒断所致负性情绪表达。鉴于慢性饮酒个体脑内 5-HT 水平变化及 (Dorsal raphe nucleus, DRN) 核团富含 5-HT 能神经元, 且接受 RMTg 抑制性神经递质投射。我们检测 GABARMTg-5-HTDRN 环路是否参与酒精依赖所致脑内 5-HT 水平缺乏及负性情绪表达。研究选用雄性 C57BL/6 以慢性间歇性酒精熏蒸结合自主饮酒范式诱导小鼠酒精依赖模型, 并进行外周血酒精浓度检测; 戒断 24-48h 以串联行为学组检测小鼠躯体戒断、焦虑、抑郁样行为表征; 采用脑立体定位显微注射-环路示踪-病理学技术检测 RMTg-DRN 神经元活性。结果提示酒精熏蒸过程中小鼠血液酒精浓度升至约 150mg/dl; 与正常小鼠相比, 酒精依赖小鼠机械痛阈值显著下降; 焦虑、抑郁样行为评分、饮酒水平显著上升; RMTg 区域 DRN 投射神经元 cFos 表达显著增加。综上, 被动酒精蒸气暴露可成功诱导稳定酒精依赖小鼠模型。RMTg-DRN 环路可能是导致酒精依赖致负性情绪表达和脑内 5-HT 水平下调的关键环路。

中 M1-129-0023

TET1 通过调节 microRNA-30b/Nav1.6 参与奥沙利铂诱导的神经病理性疼痛

赵森, 张晶晶, 张萌雅, 杨庆庆, 李志晓, 任秀花, 苏松雪, 司天恩, 李建敏, 武晖蕊, 陈诗乐, 臧卫东, 曹靖

郑州大学

化疗引起的神经病理性疼痛严重影响患者的生活质量, 为临床治疗带来了巨大挑战。我们之前研究表明, 大鼠背根神经节(dorsal root ganglia, DRG)中 microRNA-30b (miR-30b)通过调控 Nav1.6 参与奥沙利铂(oxaliplatin, OXA)诱导的神经病理性疼痛。此外, 10-11 易位甲基胞嘧啶双加氧酶 1(ten-eleven translocation methylcytosine dioxygenase 1, TET1)通过改变基因表达在疼痛的产生中起关键作用。我们通过在 C57 鼠中腹腔注射 OXA 建立神经病理性疼痛模型, 并检测 DRG 中 TET1 和 Nav1.6 蛋白。使用慢病毒和 Tet1^{flx/flx} 小鼠, 调节 TET1 并评估小鼠疼痛行为、DRG 神经元兴奋性、Nav1.6 电流、miR-30b-5p 和 Mir30b 启动子区域去甲基化水平。使用染色质免疫沉淀法来确定 Mir30b 启动子上的 TET1 结合位点。鞘内注射 miR30b agomir (或 antagomir), 评估其对 Nav1.6 表达和小鼠疼痛的影响。结果显示, OXA 降低了 TET1 和 miR-30b-5p, 增加 Nav1.6 电流、DRG 神经元兴奋性。TET1 敲减可以导致类似变化, 相反 TET1 过表达逆转了这些影响。TET1 还靶向并增强了 Mir30b 启动子(-1103bp 至-1079bp)的去甲基化, 从而增加 miR30b 的表达, 而 miR-30b antagomir 可以逆转过表达 TET1 的影响, 上调 Nav1.6 蛋白表达。我们认为 OXA 导致 DRG 中的 TET1 降低, miR-30b 减少, 上调 Nav1.6 及其电流, 诱发动作电位并导致疼痛。我们假设 TET1 通过调节 Mir30b 启动子的去甲基化来介导这一过程。



中 M1-129-0024

脚桥被盖核胆碱能神经元差异性调控慢性疼痛及相关负性情绪的环路机制

张士强,杨艺豪,张晶晶,曹靖,臧卫东
郑州大学

慢性疼痛常伴随负性情绪，二者相互影响且形成机制不完全一致，这大幅增加了临床上的治疗难度。越来越多的证据表明，中枢神经系统的胆碱能核团可能是缓解炎症性疼痛、偏头痛和神经病理性疼痛等慢性疼痛的潜在靶点，但也有研究表明胆碱能核团的激活可加剧负性情绪，这种功能异质性的原因目前尚无定论。本实验以坐骨神经慢性压迫性损伤模型（Chronic constriction injury model, CCI）作为慢性疼痛模型，结合转基因小鼠，利用病毒示踪、化学遗传学、光遗传学、药理学和免疫荧光染色等技术，发现脚桥被盖核（pedunculopontine tegmental nucleus, PPTg）胆碱能神经元差异性调控小鼠疼痛和焦虑样行为。慢性疼痛模型下，投射到腹外侧导水管周围灰质（ventrolateral periaqueductal gray, vlPAG）的 PPTg 胆碱能神经元活动降低，激活 PPTg-vlPAG 胆碱能通路可缓解疼痛但不影响焦虑样行为；投射到中央杏仁核（central amygdala, CeA）的 PPTg 胆碱能神经元活动增加，抑制 PPTg^{ChAT}-CeA 胆碱能通路可减少焦虑样行为但不影响疼痛，该通路的促焦虑效果由 CeA 中的烟碱型乙酰胆碱受体介导。这些发现可为慢性疼痛共病情绪障碍患者的治疗提供新的思路和科学依据。

●中 M2 神经损伤和再生● Podium

中 M2-129-0004

经颅光遗传刺激通过激活 JAK/STAT 通路促进 CST 再生修复脊髓损伤的实验研究

马媛媛,陈虹瑛,位庆帅,兰月,曾湘,曾园山.
广州市第一人民医院/华南理工大学附属二院

脊髓损伤（spinal cord injury, SCI）后皮质脊髓束（corticospinal tract, CST）轴突的再生是重建神经元连接以恢复自主运动功能的关键因素。然而，由于有效的干预措施有限，仍然具有挑战性。本研究采用改良的经颅光遗传学技术刺激大脑皮层神经元促进全横断转基因鼠 CST 轴突再生到脊髓损伤部位，并探讨其潜在的分子机制。我们构建了一种新型的光遗传 LED 装置（发明专利，CN201910103715.2）刺激 ChR2-YFP 转基因小鼠的大脑运动皮层，观察完全性脊髓损伤部位 CST 轴突的再生情况。还利用该 LED 装置用于体外转基因小鼠大脑皮层切片的刺激，观察其神经突的生长情况。结果显示，经颅光遗传刺激后，ChR2-YFP 转基因小鼠双侧大脑运动皮质锥体神经元被激活，表达及早基因 c-fos，并观察到 CST 轴突再生到脊髓损伤部位，且瘫痪后肢运动功能部分改善。蛋白质组学分析显示，大脑运动皮层中 JAK2/STAT3 通路被显著激活，我们在体外验证了 LED 蓝光照射可促进转基因小鼠脑切片神经突的生长，且用 JAK2/STAT3 抑制剂 FLLL31 治疗可显著抑制神经突生长。这说明改良的经颅光遗传技术能广泛刺激 ChR2-YFP 转基因小鼠的双侧大脑运动皮质并促进 CST 轴突再生，其机制可能跟 JAK2/STAT3 通路激活增加运动皮质锥体神经元的兴奋性有关，本研究为通过神经调控技术提高皮层电活动促进脊髓损伤修复提供理论依据。



中 M2-129-0005

环状 RNA DENND1B 通过跨细胞调节轴增强血脑屏障通透性引发阿尔茨海默病认知障碍

程智

天津师范大学

环状 RNA (circRNA) 是非编码 RNA 的一种特殊形式, 由前体 mRNA 外显子和内含子的反向剪接而产生。circRNA 在哺乳动物大脑神经元中富集, 并在阿尔茨海默病 (AD) 中发生异常表达。目前对大脑中与 AD 直接相关的关键 circRNA 的特征和功能知之甚少。我们研究发现海马中表达的 circDENND1B 是一种与 AD 相关的新型 circRNA, 并阐明了其在认知障碍中的作用。该 circRNA 富集于海马神经元, 在 AD 转基因模型小鼠和 AD 患者中显著上调, 神经元敲降 circDENND1B 可显著改善 AD 相关的认知功能障碍。此外, 我们发现 miR-17-5p 是 circDENND1B 调节的血脑屏障通透性的重要下游介质, 其靶点还包括星形胶质细胞中的 lncRNA KCNQ1OT1 和内皮细胞中的 Vegf。总之, 我们证明 circDENND1B 水平在 AD 患者中升高, 并提供证据表明 circDENND1B/lncRNA KCNQ1OT1/miR-17-5p/VegfA 跨细胞调控轴可能作为 AD 的一种新的生物标志物, 为 AD 的诊断和神经保护策略的制定提供了新见解。

中 M2-129-0006

ISRIB 在链脲佐菌素所致小鼠糖尿病认知障碍中的作用

Tang pingping, Wang jiale, Niu lei, Li suyun

衡阳大学医学院临床解剖与生殖医学应用研究所

糖尿病并发的认知功能障碍严重影响患者生活质量, 其机制与脑内突触丢失密切相关, 寻找防止突触丢失的药物治疗靶点具有重要的临床意义。ISRIB 是提高认知功能的新型小分子化合物, 但其在糖尿病认知障碍中的作用鲜有报道。在本研究中, 我们采用链脲佐菌素 (STZ) 诱导糖尿病认知功能障碍模型, 观察了 ISRIB 对模型小鼠认知行为的影响并探讨其潜在机制。尽管 ISRIB 对模型小鼠焦虑和抑郁样行为无显著影响, 但 ISRIB 显著改善了模型小鼠在新旧位置实验、Y 迷宫和三箱社交实验中的认知障碍, 表现为新位置识别指数, 新臂停留时间显著增加; ISRIB 的确阻断了内侧前额叶皮质内质网应激通路的激活, 并且上调了模型小鼠突触蛋白的表达; 然而, 我们发现 ISRIB 处理未改善模型小鼠的血糖紊乱。因此, 我们的研究结果提示 ISRIB 可以作为改善糖尿病认知功能障碍潜在药物。

中 M2-129-0007

外源性功能线粒体移植对新生鼠缺血缺氧性脑损伤的保护作用

宋林娜

郑州大学基础医学院人体解剖与组织胚胎学

缺氧缺血性脑病是一种严重的因新生儿大脑缺氧和血流受限引起的中枢神经系统损伤性疾病, 预后差并伴随着严重的神经功能障碍, 其涉及多种机制, 可导致不同程度细胞死亡途径的激活。既往研究表明, 线粒体功能障碍是这些不同损伤反应的中心。已有研究证实, 自体来源的线粒体移植可显著保护心脏免受缺血再灌注损伤, 但在中枢神经系统中的研究依然有限。因此, 本研究拟在新生鼠缺氧缺血性脑损伤 (Hypoxic ischemic encephalopathy, HIE) 模型中探讨外源性线粒体移植对新生鼠脑损伤的潜在治疗作用, 并阐明相关机制。本实验采用 C57BL/6J 小鼠雄鼠 30 只, 雌鼠 15 只,



合笼繁育以获得新生小鼠，选用 9 日龄小鼠行单侧颈总动脉结扎构建 HIE 模型。同时，选取同日龄小鼠从肝脏中快速分离出高度纯化、活的且具有完整结构、功能的线粒体，Mito Tracker 染色验证活性。采用立体定位技术将线粒体移植入 HIE 小鼠脑损伤部位，结果显示，外源性功线粒体的移植可以显著挽救线粒体功能，降低脑损伤后氧化应激，改善神经元死亡，减轻新生鼠脑实质的损伤，缓解小鼠行为功能异常。这些发现表明，线粒体移植有望作为一种治疗新生儿缺血缺氧性脑病的方法。

中 M2-129-0008

ADSC-EVs 对谷氨酸刺激下视网膜节细胞钙离子失衡的调控

段天婧,罗爱祥,于海洋,李敏,黄菊芳
中南大学

钙离子稳态失衡是神经元退行性疾病的核心病理过程，临床常用的钙离子通道阻滞剂因为对正常钙离子信号的干扰副作用明显。前期研究发现脂肪间充质干细胞来源细胞外囊泡（ADSCs-EVs）可通过调节 PKCA/GluA2 磷酸化水平，有效抑制谷氨酸刺激下 AMPA 受体的钙离子渗透，从而改善视网膜神经节细胞（RGCs）凋亡。鉴于 ADSCs-EVs 成分复杂性限制其临床应用，本研究旨在发现其中调控 RGCs 钙稳态的关键小分子遗传物质及其作用机制。我们以 Sprague Dawley（SD）大鼠和大鼠视网膜神经元前体（R28）细胞为实验对象，通过小 RNA 测序筛选出 ADSC-EVs 中关键的 miR-23a-5p，并在体内和体外的谷氨酸损伤模型中验证其功能。实验运用 angomir/antagomir 调控技术，结合 Fluo4 AM 钙成像、视网膜电图 pHNR 分析、视觉行为学评估及分子生物学检测等多模态方法。结果表明，miR-23a-5p 通过靶向抑制 PLCD1 表达下调 GluA2/PKCA 磷酸化水平及细胞膜 GluA2 表达，显著减轻谷氨酸诱导的 RGCs 和 R28 细胞钙离子失衡。这些发现为开发基于 ADSCs-EVs 关键成分的神经保护策略提供了新的分子靶点和理论依据。

中 M2-129-0013

米诺环素调节小胶质细胞极化改善三叉神经痛大鼠的认知功能障碍

李君洁 (lijunjie20212021@163.com) 米晓娟 刘娟 宁夏医科大学基础医学院 银川 750004 宁夏医科大学总医院

三叉神经痛（TN）相关认知障碍是患者生活质量下降的常见原因，与神经炎症密切相关。尽管米诺环素已被证明具有抗炎、镇痛和神经保护功能，但其在治疗 TN 相关认知障碍中的作用仍未报道。在本研究中，我们使用体内 TN 模型和体外原代小胶质细胞神经炎症模型来研究米诺环素对 TN 大鼠认知功能和小胶质细胞极化的潜在影响。我们的结果表明，米诺环素治疗通过减轻 TN 大鼠海马神经元损伤和增强突触可塑性来减轻认知缺陷。此外，体内外实验都证明米诺环素使活化的小胶质细胞极化为 M2 表型，导致促炎因子（包括肿瘤坏死因子- α 和白细胞介素-1）减少，以及抗炎因子（如白细胞介素-4 和白细胞介素-10）增加，从而减弱神经炎症。我们进一步发现 TLR4/MyD88/NF- κ B 途径参与小胶质细胞从促炎（M1）到抗炎（M2）的转变。综上所述，米诺环素可能部分通过 TLR4/MyD88/NF- κ B 途径介导小胶质细胞极化过程，促进神经元存活并恢复突触可塑性，从而改善 TN 相关的认知障碍。



中 M2-129-0015

A1 型星形胶质细胞 ACSL1-CPT1A 脂代谢通路功能障碍在缺血再灌注诱导的视网膜神经元脂毒性损伤中的作用

廖峻乐 覃良师 陈旦
中南大学

探究视网膜缺血再灌注损伤条件下 A1 型极化星形胶质细胞发挥脂毒性损伤视网膜神经元的机制。

1) 采用肿瘤坏死因子 α (tumor necrosis factor α , TNF- α)、白介素 1 α (Interleukin-1 α , IL-1 α) 和补体 1q (Component 1q, C1q) 诱导星形胶质细胞 A1 型极化, 并结合 R28 细胞氧糖剥夺/恢复 (oxygen and glucose deprivation/recovery, OGD/R) 模型; 采用急性高眼压 (acute intraocular hypertension, AIH) 诱导视网膜的缺血再灌注 SD 大鼠模型。2) 转录组学测序检测星形胶质细胞 A1 型极化后差异基因表达情况。3) 采用免疫荧光实验检测 GFAP、C3、CPT1A 的蛋白表达情况; 采用 TUNEL 染色评估细胞凋亡情况。4) 采用蛋白质印记法 (western blot, WB) 检测 GFAP、C3、ACSL1、CPT1A、Bax 和 Bcl-2 的蛋白表达量。5) 采用荧光定量聚合酶链式反应 (QRT-PCR) 从转录水平检测 TNF- α 、IL-1 β 、iNOS、BDNF、C3 和 ACSL1、CPT1A 的表达情况。6) 采用 LC/MS 技术检测星形胶质细胞培养基内长链饱和游离脂肪酸 (free fatty acids, FFAs) 的相对含量。RI/R 损伤后 12h 时, 视网膜星形胶质细胞向 A1 表型极化达到峰值, 与正常组相比, A1 型星形胶质细胞内 ACSL1 基因表达显著上调, CPT1A 基因表达显著下调, 使得大量长链饱和 FFAs 堆积, 通过 CPT1A 过表达质粒的干预从而增强胶质细胞线粒体内长链饱和脂肪酸的代谢可显著改善神经元凋亡。在 RI/R 损伤前期, 视网膜星形胶质细胞向 A1 表型极化, 可通过干预 ACSL1-CPT1A 通路增强长链饱和脂肪酸的代谢挽救视网膜神经元死亡。

中 M2-129-0017

基于内源神经干细胞募集和神经刺激调控脊髓再生修复和功能重建的研究

徐静, 孙嘉伟, 林煜健, 赖碧琴
中山大学中山医学院

为了解决脊髓损伤处内源性干细胞不足, 且恶劣微环境难以支持内源干细胞增殖和分化, 导致脊髓自我修复能力低下的根本难题。我们制备了一种缓释 DNA aptamer (Apt) 19S (Apt19S) 的去细胞视神经 (DON) 支架 (DON-A), 探索其移植到大鼠全横断脊髓损伤处通过缓释 Apt19S 高效地募集损伤激活的内源性干细胞, 并在 DON 所营造的中枢神经发育微环境中, 促进脊髓原位神经再生和血运重建的机制。在募集内源干细胞的同时采用神经刺激兴奋损伤脊髓头、尾两端的神经环路, 揭示其防止神经退变、促进内源干细胞重建神经通路的效果和机制。结果显示, DON-A 可以稳定持久地缓释 Apt19S。首次证实, Apt19S 可作为配体与神经干细胞 (NSCs) 和间充质干细胞 (MSCs) 表达的碱性磷酸酶 (ALPL) 受体特异性结合, 在脊髓损伤微环境中可同时实现对这 2 种干细胞的特异性高效募集。更重要的是, DON 为募集的干细胞提供了中枢神经发育微环境, 在损伤早期支持内源性 NSCs 和 MSCs 增殖, 形成类似于新生大鼠脊髓的发育微环境; 继而促进 NSCs 向神经元分化和促进 MSCs 向血管内皮细胞分化, 快速启动了脊髓的原位神经再生和血运重建。结果还显示, 经颅磁刺激能够促进皮质脊髓束 (CST) 再生到损伤区, 而骶尾神经电刺激能够激活腰段脊髓 CPG 神经环路和促进上行的降钙素基因相关肽 (CGRP) 能神经纤维与新生神经元形成突触连接。结果证实内源干细胞募集联合头尾两端的神经刺激能够促成损伤处形成内源性神经元中继器, 大鼠的运动能力和脊髓电生理传导功能得以提升。基于募集内源干细胞解决脊髓损伤无



法自我修复问题的研究和基于脊髓头尾两端神经刺激协同重建神经功能的研究具有易于临床应用转化的重要价值。

中 M2-129-0018

不同解剖部位周围神经损伤代谢异质性的近红外二区成像研究

邵珂萌,彭羽,李惠珠,小仓心吾,杨雨,王月明,陈俊,沃雁
上海交通大学医学院

周围神经损伤（PNI）类型多样且病因复杂多变，给社会和个人带来了极大的负担。以往的研究主要集中在坐骨神经，对其他周围神经的研究不足，缺乏不同解剖部位神经损伤后代谢差异的系统性研究。本研究利用近红外二区活体成像技术，将硫化铅量子点（QDs）分别注射到面神经、臂丛神经和坐骨神经损伤的大鼠模型中，实时监测不同周围神经损伤后 14 天内 QDs 的时空代谢变化。成像结果显示，QDs 在面神经中的停留时间最短，仅为 2 到 3 天，而在臂丛神经中能够停留 5 天，坐骨神经代谢 QDs 的时间最长，可达 14 天。本研究通过利用近红外二区成像技术对神经内 QDs 代谢进行长时程活体动态观察，揭示了不同解剖部位周围神经损伤后代谢的异质性。这一发现为临床上针对不同解剖部位周围神经损伤的精准化修复治疗提供了重要依据。

中 M2-129-0019

基于干细胞的工程化细胞外囊泡联合神经酸递送系统治疗脊髓损伤的再生策略研究

沈瑶,范勇,杨雪松,王广
暨南大学

脊髓损伤(SCI)是一种常见的中枢神经系统创伤，可导致损伤部位以下的运动和感觉功能丧失。目前临床可用的治疗方法非常有限，且修复效果不佳。因此寻找促进自体神经元中继重建的方法被认为是一种有前途的 SCI 非侵入性和免疫相容性治疗策略。干细胞来源的工程化细胞外囊泡与外泌体具有相似的性质，其内含丰富的 miRNAs 在细胞间通讯中起着关键作用，在 SCI 中能够发挥神经发生、神经营养、抗凋亡和抗炎等作用。同时基于 SCI 增强内在神经发生能力和重建不利微环境的先进操控方法，我们关注到天然小分子化合物神经酸在髓鞘保护性再生及改善细胞微环境中的独特作用。因此本研究利用脐带间充质干细胞构建工程化细胞外囊泡联合神经酸的载药递送系统开展 SCI 的再生修复研究。通过一系列行为学功能检测、组织原位分析、体外细胞效应分析，结果显示该治疗策略能够显著改善 SCI 小鼠的运动功能，促进神经元中继的再生重建。本研究将为 SCI 的再生修复治疗提供一种非活细胞治疗的免疫相容性再生策略。



●中 M2-神经损伤与再生 ● Poster

中 M2-129-0011

sEH 参与调节 APP/PS1 小鼠听力损伤的机制研究

曹碧青,郭祥葛,王旭萌,张展翅,任乾
河北医科大学

阿尔兹海默症(Alzheimer's disease)是代表性的神经退行性疾病。众多研究发现,AD 的发病与听力损伤关系密切,APP/PS1 突变可能会诱发听力损伤的发生。前期的研究发现,可溶性环氧化物水解酶(Soluble epoxide hydrolase)可以有效改善AD模型小鼠脑中APP蛋白的异常表达和 β 淀粉样蛋白的聚集。因此,sEH可能在AD导致的听力障碍中也发挥着重要调节作用。本研究发现,与野生C57BL小鼠相比,APP/PS1小鼠在3月龄时听力脑干反应检测出现全频段的听力损失,而在给与sEH抑制剂TPPU干预后听力损失得到有效抑制。其次,通过Western blot以及免疫荧光染色等发现APP/PS1小鼠内耳螺旋神经节以及听觉皮层中sEH蛋白表达异常升高,神经元数量显著减少,细胞凋亡显著增加,并且sEH蛋白的异常表达与螺旋神经节细胞的凋亡发生存在显著的相关性。同时还发现,在给与sEH抑制剂干预后可以有效抑制小鼠内耳螺旋神经节和听觉皮层神经元的凋亡。研究结果表明,APP/PS1的突变可以诱发小鼠螺旋神经节以及听觉皮层中神经元的数量的减少和凋亡的发生,进而导致小鼠出现听力损伤。而sEH可能在其中发挥着重要调节作用,其抑制剂在改善认知功能障碍的同时可以有效抑制听力损伤的发生。

中 M2-129-0028

通过fMRI分析结合VBM和DTI研究侧脑室嗅丛细胞移植对大鼠缺血性脑梗塞的治疗效果

秦皓玥,李靖,王廷华,熊柳林
遵义医科大学第三附属医院(遵义市第一人民医院)

本研究旨在通过功能性磁共振成像(fMRI)结合体素形态测量法(VBM)和弥散张量成像(DTI)技术,监测嗅鞘细胞移植对大鼠缺血性脑梗死的治疗效果。实验中,12只SD大鼠被随机分为假手术组(Sham组)、对照组(脑内注射生理盐水)和嗅鞘细胞移植组(OEC组)。通过建立脑梗死模型后,分别在28天后对各组进行fMRI分析,构建脑部三维立体图,评估嗅鞘细胞移植对脑损伤的修复作用。结果显示,与对照组相比,OEC组大鼠脑组织的缺血侧信号强度降低,右初级运动皮质和右次级运动皮质的灰质体积显著增加($P<0.01$),而深部脑区(如右海马、右间脑)的灰质体积显著减少($P<0.01$)。研究结论表明,嗅鞘细胞移植能够促进脑梗死大鼠损伤区域的神经组织修复和再生,但对远端皮质灰质损伤的修复效果有限。这一发现为嗅鞘细胞在脑损伤治疗中的应用提供了重要参考。



●中 M2-神经损伤和再生● Abstract

中 M2-129-0001

YTHDF1-TLR4-NF- κ B 信号轴对糖尿病合并脊髓损伤后免疫炎症的调控作用及机制研究

官镇洁,于雨晴,苍叙同,王莹,李文媛
牡丹江医学院

N6-甲基腺苷 (m6A) 作为 RNA 表观遗传修饰的重要形式,其识别蛋白 YTHDF1 已被证实参与多种神经系统疾病的病理调控,但其在 2 型糖尿病 (T2DM) 合并脊髓损伤(spinal cord injury, SCI)中尚无相关报道。本研究旨在阐明 YTHDF1-TLR4-NF- κ B 信号通路在糖尿病合并 SCI 免疫微环境调控中的作用机制,并探索其作为潜在治疗靶点的临床价值。本研究采用高脂饮食联合链脲佐菌素 (STZ) 诱导建立 SD 大鼠 2 型糖尿病 (T2DM) 模型,通过改良 NYU 法构建 SCI 模型。实验分为 5 组:假手术组 (Sham)、糖尿病组 (T2DM)、脊髓损伤组 (SCI)、糖尿病合并脊髓损伤 (T2DM +SCI)、YTHDF1 干预组 (T2DM +SCI+AAV-YTHDF1)、NF- κ B 抑制剂组 (T2DM +SCI+AAV-YTHDF1+BAY11-7082)。通过立体定位技术于损伤前 72 小时进行脊髓内微量注射,分别递送 AAV-YTHDF1 及 BAY11-7082。行为学结果显示,与对照组比较,YTHDF1 干预组 BBB 评分显著增高 ($P<0.05$)、HE 染色病变面积显著降低 ($P<0.05$);尼氏染色前角运动神经元显著增加 ($P<0.05$);Western blot 法显示 YTHDF1、TLR4、NF- κ B 表达显著增高 ($P<0.05$)、炎症介质 (IL-6、IL-1 β 、TNF- α) 和凋亡相关因子 (Caspase-1、Caspase-3) 表达显著降低 ($P<0.05$)。而 NF- κ B 抑制剂抑制 YTHDF1 的上述调控作用。生物信息学分析结合实验验证揭示,YTHDF1 通过靶向调控 TLR4/NF- κ B 信号通路参与免疫炎症反应。荧光原位杂交 (FISH) 显示 YTHDF1 主要定位于细胞核。双荧光素报告基因实验、染色质免疫共沉淀 (ChIP) 以及 RNA pull-down 结果证实,YTHDF1 通过正向调控 TLR4-NF- κ B 信号通路介导免疫炎症微环境的形成。本研究首次揭示了糖尿病通过 m6A 依赖性机制加剧 SCI 病理进程的分子机制,证实了 YTHDF1-TLR4-NF- κ B 信号轴在糖尿病合并脊髓损伤免疫炎症调控中的关键作用,为开发表观遗传-免疫调节联合治疗策略提供了新的分子靶点和实验依据。

中 M2-129-0002

FXR1 在糖尿病脊髓损伤大鼠模型轴突再生的作用和调控机制

孟鑫鑫,申颖颖,郭芷含,李文媛,王莹
牡丹江医学院

本研究旨在探讨 FXR1 调控 POU6F1-JNK 信号轴在高血糖合并脊髓损伤中的轴突再生调控机制。研究采用高脂饮食联合链脲佐菌素诱导建立糖尿病脊髓损伤 (DM+SCI) 大鼠模型,并结合晚期糖基化终产物 (AGEs) 与过氧化氢 (H_2O_2) 构建神经元损伤模型 (DM+ H_2O_2)。在体外实验中,通过 AAV 病毒介导的基因转染技术构建 FXR1 过表达体系 (OE-FXR1),实验分组包括对照组、损伤模型组、空载体组及干预组。研究通过 ChIP-seq 与 RNA pull-down 联合分析,证实 FXR1 可直接结合 POU6F1 mRNA 并调控其表观遗传修饰。功能实验结果表明,与损伤组相比,OE-FXR1 组细胞增殖率显著增加 ($P<0.01$),Transwell 迁移能力显著增强 ($P<0.01$),细胞凋亡率显著降低 (TUNEL 染色与流式细胞术检测, $P<0.01$)。分子机制研究发现,FXR1 过表达显著上调 POU6F1 蛋白表达水平,并显著增强 JNK 磷酸化水平 ($P<0.01$)。在体内实验中,通过 BBB 评分、斜板试验及足迹分析等行为学检测,证实 OE-FXR1 干预显著改善运动功能。组织病理学观察显示,损伤区域面积显著减少,髓鞘保留率显著提高 ($P<0.01$),尼氏体密度显著增加 ($P<0.01$)。免



疫荧光检测进一步显示，5-HT+轴突密度显著升高（ $P<0.01$ ）。本研究创新性地阐明了 FXR1-POU6F1-JNK 信号轴在高糖合并脊髓损伤微环境中的调控机制，揭示了 FXR1 作为潜在治疗靶点的分子作用网络。研究结果为糖尿病合并脊髓损伤的治疗提供了新的理论依据和分子靶点。

中 M2-129-0003

LncRNA OIP5-AS1/miR-153-3p/KLF7 信号通路对周围神经损伤施万细胞的调控机制研究

辛广智;孟祥云;宋润琦;李文媛;王莹
牡丹江医学院

周围神经损伤（Peripheral nerve injury, PNI）是由机械性创伤、代谢性炎症或手术源性损伤导致的轴突连续性中断。损伤后施万细胞（Schwann cells, SCs）通过表型转换，分泌神经营养因子并形成 Büngner 带，为轴突再生提供微环境支持。课题组前期研究表明，转录因子 KLF7 作为轴突促生长因子可通过激活下游靶基因 NGF 促进 SC 的再生潜能，然而，调控 KLF7 时空表达的上游信号网络仍存在关键空白。本研究旨在阐明 LncRNA OIP5-AS1 通过竞争性结合 miR-153-3p 解除其对 KLF7 的转录抑制，进而激活 SCs 再生能力的分子机制。H₂O₂诱导的氧化损伤模型中，Annexin V/PI 双染显示 SCs 凋亡率呈剂量依赖性增加（ $P<0.01$ ）。同时 qRT-PCR 结果显示 SCs 的 OIP5-AS1、KLF7 表达显著上调，miR-153-3p 水平下降（ $P<0.01$ ）。采用 AAV2 血清型构建重组病毒 AAV-OIP5-AS1 过表达/敲低、miR-153-3p 过表达/抑制转染病毒，发现敲低 OIP5-AS1 或过表达 miR-153-3p 显著抑制 SCs 增殖（MTT 及 EdU 阳性率显著下降， $P<0.01$ ）及 JAK/STAT3 通路磷酸化水平（p-STAT3/STAT3 比值降低， $P<0.01$ ）。Ago2-RIP 实验显示 OIP5-AS1 在 miR-153-3p 过表达组富集显著增高，突变结合位点后富集消失；双荧光素酶报告系统验证 miR-153-3p 通过 KLF7 3'UTR 结合位点实现转录抑制。在坐骨神经挤压模型中，与 NC 组比较，OIP5-AS1 过表达 SFI 在术后 4 周显著增高，免疫荧光显示 NF 标记轴突再生数量及 KLF7 蛋白表达均显著增高。上述作用被 miR-153-3p 共转染部分逆转。本研究首次揭示 OIP5-AS1 通过抑制 miR-153-3p 上调 KLF7 表达从而激活 SC 轴突再生能力，为开发基于 RNA 干扰的神经修复策略提供了新靶点。

中 M2-129-0009

3,6'-二芥子酰基蔗糖（DISS）调控 Kalirin7-BDNF 通路治疗抑郁小鼠的机制研究

陈泰霖,周艳平,韦淑萍,夏猛,何国珍,黎明星
广西中医药大学

本研究基于 CUMS 抑郁小鼠模型，探讨远志活性成分 DISS 通过 OFC-mPFC-NAc 神经环路 Kalirin7/BDNF 通路发挥抗抑郁作用的机制。行为学检测结果显示 DISS（50-200 mg/kg）剂量依赖性地改善 CUMS 小鼠抑郁样行为：强迫游泳不动时间缩短 27-42%（ $P<0.01$ ），糖水偏好率提升 35-58%（ $P<0.01$ ），旷场直立次数增加 1.8-2.5 倍（ $P<0.05$ ），并显著逆转体质量下降趋势。血清检测结果显示 DISS 能显著降低皮质酮水平（降低 42-55%， $P<0.01$ ），其中低剂量组（50 mg/kg）可上调 BDNF 含量达正常组水平（ $P<0.01$ ）。Western Blot 结果表明 DISS 通过特异性调控边缘系统关键脑区蛋白表达：低中剂量组显著提升 OFC、mPFC 及 NAc 的 Kalirin7（分别增加 1.7/2.1/2.3 倍）和 BDNF（分别增加 1.5/1.8/2.0 倍）表达（ $P<0.01$ ），而高剂量组仅对 mPFC 和 NAc 有显著作用。值得注意的是，DISS 低剂量组在行为学改善和分子调控效果上与文拉法辛组



(3 mg/kg) 无统计学差异 ($P>0.05$)。本研究首次揭示 DISS 通过协同调控 Kalirin7/BDNF 通路恢复边缘系统神经可塑性, 其作用靶点呈现脑区特异性剂量效应, 为开发植物源抗抑郁药物提供了新的作用靶点和理论依据。

中 M2-129-0010

海藻酸锌原位自组装水凝胶用于改善脊髓损伤微环境和促进神经再生

王超 张卫光

北京大学医学部基础医学院人体解剖与组织胚胎学系

水凝胶被广泛用于促进脊髓损伤后的组织再生, 既往研究表明锌离子在抗炎、神经再生方面具有一定作用。本研究报道了一种由动态锌离子与海藻酸盐原位自组装交联的海藻酸盐网络, 搭载 NT3 组成的蛋白水凝胶。本实验应用 T9 全横断 SCI 小鼠, 分为 sham、SCI、Alg-Zn 和 Alg-NT3 四组。体外实验中, 分离培养原代 NSCs 细胞, 通过活/死细胞染色检验水凝胶体系的生物安全性, 通过 IF 检测水凝胶对体系对 NSCs 细胞分化的影响。体内实验中, 将水凝胶植入 T9 全横断 SCI 小鼠体内, 对小鼠心、肝等主要脏器 HE 染色评估对重要器官的生物毒性, 同时采用 qPCR、WB 等检测炎症因子表达情况, 同时通过进行转录组测序; 60 天取材时通过采用 IF 染色明确神经再生、轴突延伸情况。最后, 我们构建了同时具有神经保护与促进组织再生修复的 Alg-Zn@NT3 水凝胶体系, 显著降低了损伤区的炎症反应, 改善了微环境。同时利用水凝胶体系长效释放神经营养因子, 促进神经分化、再生与成熟, 最终促进 SCI 损伤后运动功能恢复。

中 M2-129-0014

SKP-SC-EVs 通过促进施万细胞功能修复糖尿病周围神经病变的研究

喻妙梅, 周佳艺, 宋刘畅, 于洋, 丁斐

中南大学

糖尿病周围神经病变 (DPN) 是糖尿病的主要慢性并发症, 目前尚缺乏有效治疗手段。本课题组前期研究表明, 皮肤源性前体细胞分化的施万细胞来源的胞外囊泡 (SKP-SC-EVs) 可显著促进周围神经缺损后再生, 但其在代谢性 DPN 中的作用尚未明确。本研究通过体外高糖诱导的 SCs 损伤模型, 发现 SKP-SC-EVs 能够显著提升 SCs 的活力 (CCK-8 检测)、增殖 (EdU 染色) 和迁移能力 (划痕实验)。在 STZ 诱导的大鼠 DPN 模型中, SKP-SC-EVs 对血糖和体重无显著影响, 其治疗显著改善了大鼠感觉功能 (机械痛阈和热痛敏测试) 和运动功能 (平衡木实验)。电生理检测显示 SKP-SC-EVs 组大鼠神经传导速度显著提高; 激光多普勒血流成像显示后肢血流灌注量明显增加。组织学分析表明, SKP-SC-EVs 治疗后坐骨神经髓鞘厚度增加 (电镜)、有髓纤维密度提升 (免疫荧光), 并有效延缓靶肌萎缩。本研究首次系统证实 SKP-SC-EVs 可通过增强 SCs 功能、改善神经血供及促进髓鞘再生, 从而缓解 DPN 进展, 为临床治疗提供了新策略。本研究已通过苏州大学伦理委员会审查。



中 M2-129-0016

神经肌肉接头对周围神经损伤修复作用的研究进展

王月明,邵珂萌,小仓心吾,沃雁

上海交通大学医学院

周围神经损伤（PNI）导致的运动功能障碍与神经肌肉接头（NMJ）的完整性密切相关。失神经支配后 NMJ 的退化是功能恢复的主要障碍，因此靶向 NMJ 的修复策略至关重要。本文总结近年来以 NMJ 为靶点的 PNI 修复研究进展，并探讨脑机接口（BCI）技术的潜在应用价值。PNI 后 NMJ 的修复涉及多个层面。维持 NMJ 结构稳定是核心，包括促进突触前膜再生（如利用 CXCL12α、外泌体）与维持突触后膜乙酰胆碱受体（AChR）聚集（如应用 PGDHi、电刺激）。终末雪旺细胞（SC）的功能状态，包括其迁移（Ctgf 调控）与表型（Gpr126 影响），对神经再支配成功与否起决定性作用。此外，优化 NMJ 再生微环境，如调控局部炎症（巨噬细胞参与）和利用细胞因子（Vegf-A、BDNF）改善再生条件，亦是关键修复途径。新兴的脑机接口（BCI）技术为此领域提供了新视角。BCI 不仅能解码神经信号以解析 NMJ 机制，更有潜力通过神经调控（如模拟信号传递、靶向刺激）延缓 NMJ 退变，促进功能重塑。结合忆阻器芯片、聚焦超声、光声刺激等技术进展，BCI 有望为 NMJ 修复提供更高效、安全的干预方案。综上所述，多维度靶向 NMJ（结构、SC、微环境）是 PNI 修复的前沿方向。

中 M2-129-0020

miRNA-592 调控 H₂O₂ 诱导的星形胶质细胞氧化应激的机制研究

朱益伟,李恒希,曹 艳,蒋鸿雁,罗心园,张乐誉,杨 莉,李 坪

昆明医科大学

本研究旨在探究 miRNA-592 在 H₂O₂ 诱导的星形胶质细胞氧化应激中的调控作用及其分子机制。通过构建 miR-592 模拟物及其抑制剂的报告基因载体，转染至星形胶质细胞（AST）中，设置 Control 组、H₂O₂ 组、H₂O₂+miR-592 mimic 组、H₂O₂+miR-592 mimic NC 组、H₂O₂+miR-592 Inhibitor 和 H₂O₂+miR-592 Inhibitor NC 组，采用 CCK-8 和 DCFH-DA 荧光探针分别检测细胞活性和活性氧（ROS）水平，通过 ELISA、Western Blot 和 RT-qPCR 检测氧化应激相关指标及 Keap1-Nrf2 通路相关分子的表达变化。实验结果显示，400 μM H₂O₂ 处理 24 h 可成功诱导 AST 氧化应激模型，并显著下调 miR-592 表达水平（P < 0.05）。miR-592 过表达时，星形胶质细胞标志物 GFAP 的表达量显著降低（P < 0.05），而 miR-592 抑制时则显著上调 GFAP 表达水平（P < 0.05）。ELISA 检测结果显示，miR-592 mimic 组的超氧化物歧化酶（SOD）、谷胱甘肽（GSH）水平均显著升高，而丙二醛（MDA）和 ROS 水平降低（P < 0.05）；miR-592 抑制剂干预显著逆转上述变化。RT-qPCR 和 Western Blot 结果表明，miR-592 过表达可显著下调 Keap1 的 mRNA 及其胞质蛋白（C-Keap1）的表达水平，同时上调 Nrf2 及其下游靶基因 NQO1 的转录水平，以及核 Nrf2（N-Nrf2）和 NQO1 蛋白表达，该效应可被 miR-592 抑制剂有效逆转。由此可见，miRNA-592 可抑制 H₂O₂ 诱导的星形胶质细胞氧化应激水平，且该抑制作用与 Keap1-Nrf2 通路密切相关。



中 M2-129-0021

大麻二酚调控线粒体自噬改善乌头碱急性中毒致 中枢神经损伤的机制研究

罗心园,曹艳,蒋鸿雁,李恒希,李静林,黄永杰,吴海鹰,李坪
昆明医科大学

昆明医科大学第一附属医院急诊科 乌头碱急性中毒可导致严重中枢神经损伤,其病理机制涉及线粒体功能障碍与自噬调控。本研究旨在探讨大麻二酚(CBD)通过调控线粒体自噬对乌头碱中毒致中枢神经损伤的改善作用及分子机制。实验采用SD大鼠建立乌头碱急性中毒模型,随机分为对照组、中毒组及CBD干预组。通过行为学评估、电镜观察线粒体形态、Western blot检测自噬相关蛋白(LC3-II、P62、Parkin)及线粒体功能标志物(ATP、ROS),结合免疫荧光染色分析神经元存活与凋亡。结果显示,乌头碱急性中毒导致大鼠运动协调性显著下降,海马区神经元凋亡增加,线粒体肿胀破裂,ATP水平降低且ROS蓄积,同时自噬流受阻(P62积累,LC3-II/LC3-I比值下降)。CBD干预后,大鼠神经功能损伤明显改善,出现结构破坏的线粒体减少,ATP合成提升,ROS水平降低,自噬活性增强(Parkin表达上调,P62降解,LC3-II/LC3-I比值升高),神经元凋亡减少。以上结果表明CBD可能通过激活Parkin依赖的线粒体自噬途径,清除受损线粒体,缓解氧化应激,从而改善乌头碱中毒所致中枢神经损伤。

中 M2-129-0022

大麻二酚对创伤性脑损伤后嗅球损伤的改善作用

杨楠 杨雨鹭 蒋鸿雁 李恒希 曹艳 罗心园 尹爱平 蹇德毅 李之好 吴海鹰 李坪

昆明医科大学第一附属医院急诊医学科 创伤性脑损伤常导致认知、运动和感觉功能障碍,其中嗅觉功能障碍严重影响患者的生存质量。本研究将36只成年雄性SD大鼠随机分为sham组、TBI组和TBI + CBD组(n=12)。利用改良Feeney自由落体法建立大鼠TBI模型,通过改良神经功能缺损(mNSS)评分评估大鼠神经功能损伤。采用HE染色和尼氏染色观察嗅球组织学形态变化,运用Western blot检测神经再生标志物(DCX)、突触可塑性相关蛋白(PSD-95)以及TNF- α 、IL-1 β 的表达变化。并通过埋藏食物小球实验及蔗糖偏好实验观察TBI后对嗅球的损伤情况。结果显示,TBI组的mNSS评分显著升高(**P<0.01),而CBD干预组的mNSS评分有所降低(*P<0.05)。HE染色结果显示,TBI组的嗅球神经元出现胞体水肿、空泡改变,出现凝固性坏死;CBD干预组嗅球神经元损伤减轻。尼氏染色结果显示,TBI组嗅球神经元坏死增加(*P<0.05),而CBD干预后神经元坏死数量降低(*P<0.05)。Western blot结果表明,TBI组DCX、PSD-95蛋白表达减少(*P<0.05),IL-1 β 、TNF- α 表达量显著增强(*P<0.05),CBD干预后,DCX、PSD-95蛋白表达增加(*P<0.05),IL-1 β 、TNF- α 表达量显著降低(*P<0.05)。证实了CBD可能通过抑制炎症反应,从而减轻TBI大鼠的嗅球损伤,发挥神经保护作用。综上所述,CBD具有改善TBI后嗅球的损伤,缓解脑损伤继发的嗅觉障碍,有望为TBI后嗅觉功能障碍的临床治疗带来新的策略。



中 M2-129-0023

多肽 OM-LV20 通过 FPR2/PI3K/AKT 通路减轻 TBI 诱导的小鼠神经炎症发挥神经保护作用的研究

习杨彦彬，章意坚，刘丽娜，王丹，严国纪，叶臣君，李珊珊
昆明医科大学

目前临床上针对创伤性脑损伤(traumatic brain injury, TBI) 的高效靶点治疗药物仍有待开发。因肽类具强效性、特异性和稳定性使其成为药物发掘的宝贵资源。课题组前期研究发现云贵高原特产绿臭蛙皮肤分泌物中的小分子多肽 OM-LV20 具有较好的血脑屏障通透性，在 TBI 等多种神经损伤动物模型中表现出良好的促神经修复作用；4D-DIA 蛋白组学、免疫荧光染色揭示多肽干预后影响了 TBI 后损伤脑区小胶质细胞中甲酰肽受体 2 (Formyl Peptide Receptor 2, FRP2) 的水平。在此基础上，我们拟探索 OM-LV20 是否通过影响小胶质细胞 FRP2 介导的神经炎症相关通路在 TBI 诱导损伤小鼠模型中发挥保护作用。应用行为学测试我们发现多肽 OM-LV20 干预显著改善了 TBI 小鼠运动能力、空间记忆能力和焦虑抑郁样行为，减轻小鼠社交行为缺陷；蛋白组学、Western blot、组织切片病理染色结果证实，OM-LV20 干预缓解了 TBI 诱导的小鼠神经炎症，减轻了小鼠损伤脑区的组织病理损伤，逆转了 TBI 后损伤脑区 FPR2 的表达，并激活了 PI3K/AKT 通路；分子对接模拟结果显示，OM-LV20 与 FPR2 有很大可能结合，微热泳实验进一步验证了双方的相互作用。在体外，构建 BV2 细胞划痕损伤模拟 TBI 模型。根据分子对接模拟结果构建 OM-LV20 与 FPR2 互作位点突变序列肽 OM-LV20-Mut，通过 CCK8 实验评估 OM-LV20 或 OM-LV20-Mut 干预对 BV2 细胞划痕损伤模型细胞增殖、活力的影响，发现 OM-LV20 处理后细胞增殖、活力有所恢复，而 OM-LV20-Mut 干预后未能达到与 OM-LV20 同样的细胞挽救作用，提示 OM-LV20 可能通过与小胶质细胞的 FPR2 互作调控激活 PI3K/AKT、缓解 TBI 引发的神经炎症、促进小鼠神经损伤修复。本研究为 TBI 临床药物开发提供新机制和新靶点参考。

中 M 2-129-0024

3D Gel 支架负载 ADSCs/Exo 修复脊髓损伤的实验研究

龙慧
海南医科大学

海口 570100 探讨 3D Gel 支架负载 ADSCs/Exo 对脊髓损伤后修复的作用。构建 3D Gel 支架与 ADSCs 和 Exo 的复合体：流式细胞术鉴定 ADSCs；超高速离心法提取 Exo，TEM、NTA 和 WB 鉴定 Exo；制备 3D Gel 支架，SEM、万能材料试验机、流变仪对支架进行表征检测；BCA 法检测 Exo 在支架上的缓释效果，并观察其在支架上的分布，同时观察 ADSCs 在支架上的存活率。构建脊髓半横切模型，将 Gel/ADSCs/Exo 植入脊髓损伤处，BBB 评分、斜板实验和足迹评估脊髓损伤后的运动功能恢复情况；MRI 检测脊髓的连续性；神经肌电图检测患肢运动和感觉功能；脊髓取材后进行 HE 染色，评估脊髓的修复情况；q-PCR、免疫荧光和 WB 观察脊髓损伤处神经元的修复情况、小胶质细胞极化影响和炎症指标的改变。LPS 诱导的 BV2 体外炎症模型：q-PCR、WB 和免疫荧光实验评估 ADSCs/Exo 对 BV2 细胞极化的影响及其对炎症因子的调控作用；WB 评估 ADSCs/Exo 对 cGAS-STING 信号通路蛋白的影响。Exo 为凹盘状结构，平均粒径为 164 nm，Exo 表达 TSG101，Exo 分布在 3D Gel 支架中，并能缓慢释放，ADSCs 在支架上能存活并增殖。在体实验中，与 SCI 组相比，移植 ADSCs/Exo 组的 BBB 评分更高，斜板倾斜角更高，足迹可见脚掌行走，MRI 显示脊髓断端连续完整，运动诱发电位波峰更高，潜伏期缩短，躯体感觉诱发电位更高，白质内的空泡面积减少，神经元数量增多，cGAS、STING、p-IRF3 蛋白表达降低。离体研究发现 ADSCs/Exo 干预的 BV2 细胞炎症因子 IL-1 β ，TNF- α 降低，IL-10 增高，cGAS、STING、



p-IRF3 蛋白表达降低。3D Gel 支架负载 ADSCs/Exo 能促进脊髓损伤后神经再生和功能恢复，并减轻炎症反应。

中 M2-129-0025

VDAC2 介导的 BCL2 线粒体凋亡途径影响神经元钙信号调控远隔缺血后适应脑保护的作用机制研究

赵文玉，马微，赵庆娥，李力燕
昆明医科大学神经科学研究院

缺血性脑卒中是全球致残致死的主要原因之一，血管再通诱发的 I/R 损伤及神经细胞凋亡是 IS 治疗和预后的关键因素。远隔缺血后适应（RIPostC）具有脑保护作用，前期通过蛋白组测序发现 VDAC2 通过 Bcl2 介导的线粒体凋亡通路参与 RIPostC 脑保护作用，但机制尚未阐明。本研究分体外/体内两部分：体外采用 VDAC2 基因过表达结合钙信号动态监测，解析线粒体功能及 VDAC2-Bcl2 凋亡轴对钙超载的调控机制；体内通过行为学评估、活体钙成像及线粒体凋亡通路分析，阐明 VDAC2 介导的线粒体凋亡在 RIPostC 减轻 I/R 损伤中的作用。实验结果显示 RIPostC 较 I/R 组脑梗死面积减少，神经功能评分及大鼠运动探索能力得到改善；线粒体空泡化和线粒体嵴断裂减轻，线粒体功能改善（ATP 含量升高、ROS、Ca²⁺含量下降，稳定 mPTP 开放）；VDAC2 下调，Bcl2 上调，Bax、Caspase3 和 Cyto-C 表达下调。希望本研究可进一步阐明 RIPostC 的脑保护机制及为 RIPostC 转化应用研究提供新思路 and 实验基础。

中 M2-129-0026

新生儿缺血缺氧性脑损伤后 Pea15a 对神经的保护作用

甘宗晋 王廷华 熊柳林
遵义医科大学

缺氧缺血性脑病（HIE）是儿童长期神经系统后遗症和脑瘫的重要病因，可能导致脑室周围白质软化或发育迟缓，并可能引起远期神经功能障碍。目前缺乏特异性治疗方法，探索新的治疗策略有重要临床意义。本实验采用慢病毒转染体外培养的 SH-SY5Y 细胞研究 Pea15a 基因过表达的影响。观察细胞的绿色荧光表达、细胞活力，结果显示各组细胞均表达较强的荧光，慢病毒感染效率均达 70% 以上。细胞生长状态良好，形态均一，呈梭形条纹状。与对照组相比，1d、3d、5d 时 Pea15a 过表达组细胞数量显著增加，差异具有统计学意义（ $P < 0.05$ ）。而 CCK-8 结果则表明：Pea15a 过表达组细胞活力增强，差异具有统计学意义（ $P < 0.05$ ）。体内实验中，通过构建 HIE 动物模型，将 Pea15a 过表达的重组慢病毒载体注入侧脑室观察其对神经功能的影响。结果表明，Pea15a 过表达组的 NSS 评分相较于对照组有所恢复。脑组织的 HE 染色和尼氏染色结果显示，相较于对照组，Pea15a 过表达组在 HIE 后留存的神经元数量更多，差异具有统计学意义（ $P < 0.05$ ）。本研究揭示了 Pea15a 过表达通过神经元保护促进 HIE 损伤新生大鼠的行为功能恢复，为神经保护基因治理提供了实验依据。



中 M2-129-0027

转录组学结合网络药理学揭示 LPS 脓毒血症脑损伤新机制

林庚,刘雅博,苏敬阳,张婕,高青华
中国医科大学

脓毒血症（脓毒症 Sepsis）是指由感染引发的全身性炎症反应综合征（SIRS）并导致器官功能障碍的严重临床综合征。脓毒血症相关脑损伤（Sepsis-Associated Encephalopathy, SAE）是指脓毒症引发的急性脑功能障碍，属于全身性感染导致的非直接感染性中枢神经系统损害，它是脓毒症引发的全身炎症反应、代谢紊乱和微循环障碍间接导致。本研究通过对小鼠 LPS 腹腔注射构建脓毒血症模型，并将脑组织进行转录组测序，同时结合网络药理学方法，揭示 LPS 作用机制并进行探讨。首先，对脓毒血症脑组织测序的结果进行差异基因分析，将得到的差异基因进行 go-kegg 富集分析；再用网络药理学方法得到 LPS 和脑损伤共同的靶基因，并进行 go-kegg 富集分析，最后进行综合分析。综合以上结果我们发现，脓毒血症脑损伤的机制主要为以下通路：TNF signaling pathway, Phagosome, IL-17 signaling pathway, AGE-RAGE signaling pathway in diabetic complications.

中 M2-129-0029

褪黑素通过调控铁蛋白自噬对慢性吗啡成瘾小鼠多巴胺神经元保护作用的研究

殷露玮,谭庆围,苗雨生,陈文武
昆明医科大学

褪黑素（Melatonin, MT）是一种主要由松果体分泌的对人体发挥多种调节作用的激素，MT 的内源性抗氧化作用以及螯合特性可以有效缓解金属蓄积引起的细胞毒性。本实验设置空白对照组、吗啡成瘾组、褪黑素干预组，对吗啡成瘾组小鼠腹腔注射盐酸吗啡，使其产生药物成瘾性，褪黑素干预组小鼠进行腹腔注射盐酸吗啡同时进行褪黑素灌胃，空白组注射等剂量生理盐水。采用条件位置偏好与戒断症状评分量化吗啡诱导的成瘾行为特征；利用免疫荧光染色观察多巴胺神经元活性；Western Blot 检测吗啡成瘾组、褪黑素干预组中核受体共激活因子（NCOA4）依赖铁转运相关蛋白：铁转运蛋白 1（FPN1）、二价金属离子转运体（DMT1）、转铁蛋白受体（TFR），用试剂盒检测多巴胺神经元细胞内谷胱甘肽（GSH）、丙二醛（MDA）的含量；透射电镜观察神经元超微结构；通过基因沉默技术干预自噬通路验证机制。结果显示：在 MT 处理后 FPN1、DMT1、TFR 蛋白表达量回落，细胞内 GSH、MDA 在 MT 治疗后也得到缓解，脂质过氧化水平回落。褪黑素有效保护多巴胺神经元，并特异性恢复铁蛋白自噬水平；褪黑素通过激活 NCOA4 介导的选择性自噬途径维持铁稳态的平衡。本研究为了解褪黑素通过调控铁蛋白自噬影响吗啡成瘾小鼠多巴胺神经元保护作用提供了有用的实验依据。



中 M2-129-0030

大鼠坐骨神经损伤后 P2X7 蛋白在背根神经节的表达变化及其在神经再生中的作用

焦玲玲 张全鹏
海南医科大学

周围神经损伤后，神经元感知 ATP 信号激活卫星胶质细胞（SGCs）表面的嘌呤能受体 P2X7 调控下游通路。背根神经节（DRG）与 SGCs 中 P2X7 表达的时空模式及其促再生作用尚不清楚。为明确大鼠坐骨神经损伤后 P2X7 蛋白在 DRG 中动态表达及其在神经再生中的作用，本研究通过大鼠坐骨神经挤压模型，免疫荧光双标和 Western Blotting 检测 P2X7 的动态表达以及利用 P2X7 特异性抑制剂 BBG 以及 P2X7 选择性激动剂 BzATP 检测 P2X7 对神经元的再生作用。免疫荧光双标结果表明 P2X7 在 DRG 神经元和 SGCs 中均有表达。Western Blotting 结果显示 DRG 中 P2X7 在 6h、12h 和 1d 显著上调，1d 达到峰值后减少。体外培养的 DRG 神经元进行 P2X7 拮抗剂 BBG 处理后发现神经元数目显著增加，但神经元突起长度明显下降；而使用激动剂后细胞数目无差异，基本未见神经元突起。这些结果表明，周围神经损伤后 P2X7 经历先上调再恢复至原有水平的过程，在 DRG 神经元中激活其表达会引起神经元的损伤，抑制神经突起的生长，这提示 P2X7 可能作为检测神经损伤的潜在靶点。

中 M2-129-0031

GeIMA-HAMA 水凝胶包裹人脐带间充质干细胞促进脊髓损伤功能修复与机制初探

姜基理，鲁颖，王廷华
昆明医科大学神经科学研究院

本研究旨在通过使用复合光敏水凝胶 GeIMA-HAMA 包裹人脐带间充质干细胞（hUC-MSCs）后移植到脊髓损伤处，为脊髓损伤治疗提供新策略。将 SD 大鼠分为假手术组（Sham 组）、脊髓损伤组（T 组）、GeIMA-HAMA 复合水凝胶治疗组（G 组）和 GeIMA-HAMA 复合水凝胶联合 hUC-MSCs 治疗组（GM 组）。在人脐带组织中提取原代 hUC-MSCs 并进行培养和鉴定，对材料的特性进行检测。对 hUC-MSCs 和复合水凝胶进行 3D 培养，行活死染色及 CCK8 检测。在术前 1 天，手术第一天 1 天以及术后 12 周每周进行一次 BBB（Basso, Beattie, and Bresnahan Locomotor Rating Scale）评分。在第 12 周行后肢肌电图、运动诱发电位及感觉诱发电位，使用 HE、尼氏染色观察脊髓损伤结构变化，应用免疫荧光染色观察神经元、星形胶质细胞、小胶质细胞的变化情况；通过单细胞测序对各组脊髓损伤部位进行分析。结果发现 hUC-MSCs 可在 GeIMA-HAMA 中生长。BBB 评分和电生理提示运动指标好转。单细胞测序发现 GM 治疗组可导致活化小胶质细胞 B 及炎症星形胶质细胞的表达量下调。尼氏染色和 HE 染色提示联合治疗组大鼠脊髓炎症反应减轻，神经元增多。免疫荧光染色提示治疗组 NeuN、GAP43、MBP、NF、Tuj1 表达量升高，CD68、Iba1、GFAP 的表达量降低。本研究发现 GeIMA-HAMA 水凝胶包裹 hUC-MSCs 移植可促进大鼠后肢功能的恢复，减少炎症星形胶质细胞和活化小胶质细胞 B 的表达并对脊髓损伤后神经元起到明显的保护作用，促进神经元之间连接的重建与传导。



中 M2-129-0032

Targeting NLRP12 to Modulate PANoptosis During Cerebral Ischemia/Reperfusion Injury

Junhua Hu, Lingling Li, Xiaoyi Dun, Jinqiu Li, Qinfen Wu, and Gulibaha Maimaitili

中国人民解放军联勤保障部队第九九〇医院

Objective during recovery, which severely impacts outcomes. This study fills an important gap by investigating PANoptosis—a unique form of programmed cell death that combines pyroptosis, apoptosis, and necroptosis—and examining its regulation by NLRP12 in Cerebral ischemia-reperfusion injury (CIRI) so as to provide potential new therapeutic targets to mitigate brain injury.

Methods This study employed in vitro oxygen-glucose deprivation/reoxygenation (OGD/R) on SH-SY5Y neural cells and in vivo middle cerebral artery occlusion/reperfusion (MCAO/R) models in C57BL/6 mice to simulate CIRI. Sample sizes and intervention durations were optimized for detecting ischemic and reperfusion phase responses, including PANoptosis markers.

Results PANoptosis was observed in both OGD/R and MCAO/R models, as indicated by increased markers associated with pyroptosis (NLRP3, GSDMD, IL-18, IL-1 β), apoptosis (Caspase-3, Caspase-9, BAX), and necroptosis (phosphorylated RIPK3, MLKL). Morphological analyses through Hoechst, TUNEL, and PI staining confirmed significant cell death, showing widespread apoptosis, necrosis, and membrane damage in OGD/R-treated SH-SY5Y cells and MCAO/R mouse brain tissues. Notably, inhibition of NLRP12 led to a marked reduction in PANoptosis markers across all pathways. Western blot analysis showed decreased expression of pyroptotic, apoptotic, and necroptotic proteins in NLRP12-inhibited samples, resulting in significantly lower cell death rates. These findings suggest that NLRP12 is essential for PANoptosis activation in CIRI, acting as a potential control point for reducing neural damage.

Conclusion NLRP12's plays critical role in CIRI-induced PANoptosis, positioning it as a promising therapeutic target in stroke management. In the future, targeting NLRP12 could prevent PANoptosis-driven cell death, offering a valuable neuroprotective approach to improve IS outcomes.

●中 M3-神经胶质● Podium

中 M3-129-0002

胆碱转运体调控少突胶质细胞分化和髓鞘形成的作用机制

刘明晨, 于彬, 雷琦敬, 梅峰

陆军军医大学

少突胶质细胞 (OL) 的髓鞘化对于出生后及成年大脑的神经功能至关重要, 驱动少突胶质前体细胞 (OPC) 快速合成髓鞘膜的机制尚不明晰。胆碱作为脂质代谢和膜合成的必需营养素, 通过胆碱转运蛋白 (ChTs) 被细胞摄取。借助单细胞测序和 RNAscope 技术, 我们鉴定出 SLC44A1 和 SLC44A5 为在少突胶质细胞谱系细胞中特异性表达的主要 ChTs。我们构建了在少突胶质细胞中特异性敲除 (cKO) SLC44A1 或 SLC44A5 的小鼠模型。两种 cKO 模型在新生小鼠大脑及纯化的 OPC 培养物中均表现出 OL 分化及髓鞘化受损。值得注意的是, SLC44A1 cKO 小鼠至成年仍持续存在髓鞘形成不足的情况, 而 SLC44A5 cKO 小鼠则无此现象, 这可能归因于少突胶质细胞中 SLC44A5 表达随年龄增长而减少。对体内髓鞘段及纯化的 OPC 培养物在纳米纤维上的评估显示, SLC44A1 或 SLC44A5 的缺失显著降低了每个 OL 的总髓鞘长度。代谢组学分析表明, 这两种转运蛋白对于脂质合成 (如关键的膜脂质溶血磷脂酰乙醇胺 (LPE_P)) 至关重要。成年 SLC44A1 cKO 小鼠表现出认知缺陷和焦虑样行为, 将胆碱转运受损与神经功能缺陷建立了关联。总之, 我



们的研究表明 SLC44A1 和 SLC44A5 通过为髓鞘形成期间的脂质代谢提供支持来保障脑白质的完整性，突显了它们作为脱髓鞘疾病治疗靶点的潜在价值。

中 M3-129-0006

脱髓鞘触发的适应性髓鞘形成促进髓鞘修复和功能恢复

刘志禹 王斐 梅峰

陆军军医大学组织胚胎学教研室

适应性髓鞘形成是一种重要的大脑可塑性类型，可用于调节大脑功能。脱髓鞘损伤会触发病变区域自发的髓鞘再生过程。然而，脱髓鞘损伤后非病变区域的适应性髓鞘形成及其功能意义仍知之甚少。通过细胞谱系特异性标记和追踪，我们发现溶血卵磷脂诱导的脱髓鞘损伤显著增加了非病变区域的髓鞘形成，而未改变原有的髓鞘。值得注意的是，在髓鞘再生之前，许多新的髓鞘和少突胶质细胞已在非病变区域形成。我们假设非病变区域的适应性髓鞘形成可能有助于损伤后的髓鞘修复和功能恢复。为了验证这一可能性，我们构建了 ENPP6-CreErt 谱系小鼠来标记新形成的少突胶质细胞，而不是少突胶质前体细胞或原有的少突胶质细胞。清除非病变区域中产生的 ENPP6 阳性新生髓鞘抑制了损伤区域的髓鞘再生。在损伤区髓鞘再生前使用促进髓鞘形成的药物氯马斯汀治疗，增强了非损伤区域的髓鞘形成。促髓鞘形成策略显著促进了损伤处的髓鞘再生。为了证明其功能意义，我们在实验性自身免疫性脑炎（EAE）小鼠中，在疾病发作前进行了促髓鞘形成治疗，结果导致发病延迟和功能缺陷减少。这些结果共同表明，非损伤区域中的适应性髓鞘生成可以促进脱髓鞘损伤后的髓鞘再生和功能恢复，为临床上早期干预促进髓鞘化的治疗策略提供了实验证据。

中 M3-129-0008

奥培米芬促进髓鞘形成及改善中枢神经系统损伤所致功能障碍的作用研究

刘薇 王斐 梅峰

陆军军医大学

髓鞘形成不足是多种中枢神经系统 (Central nervous system, CNS) 损伤的典型特征，少突胶质前体细胞 (Oligodendrocyte precursor cells, OPC) 分化效率下降是导致髓鞘形成不足的重要原因，然而目前临床上尚无有效的促 OPC 分化药物。近年来研究显示雌激素受体调节剂 (Selective estrogen receptor modulators, SERMs) 可以促进 OPC 分化。本研究发现，一种获得 FDA 批准的 SERMs 奥培米芬 (Ospemifene, OS)，具有促进原代 OPC 分化和髓鞘形成的能力；我们进一步观察到 OS 可以改善低氧所致髓鞘发育异常和远期运动功能；基于 EAE 小鼠模型，研究发现 OS 治疗可以显著改善脊髓损伤部位的髓鞘再生和 EAE 临床评分，且呈现剂量依赖性；利用可以标记新生髓鞘的报告基因小鼠 NG2-CreERT; Tau-mGFP 构建大脑脱髓鞘模型，研究发现 OS 可以促进损伤区域的新生髓鞘形成。综上所述，本研究揭示了 OS 具有促进髓鞘形成、改善 CNS 损伤所致功能障碍的能力，并阐述了其作用机制，有望为脱髓鞘相关 CNS 疾病提供一种有效的治疗策略。



中 M3-129-0013

小胶质细胞依赖 TREM2 介导的胞葬作用调控应激小鼠神经发生

游自立, 吴梓强

电子科技大学

神经发生区域的小胶质细胞具有典型的表型特征。通过分析抑郁易感型小鼠及抑郁症患者的转录组数据,提示小胶质细胞 TREM2 信号通路与抑郁症的发生发展相关联。分别采用 TREM2 基因敲除与 AAV 脑源过表达 TREM2,体内外实验显示小胶质细胞依赖 TREM2 途径清除凋亡神经元以维护神经发生微环境的稳态,阻断 TREM2 介导的胞葬作用导致新生神经元减少。调控小胶质细胞的促神经发生作用可改善应激小鼠的神经可塑性,行为学数据表明靶向调控小胶质细胞 TREM2 信号可增强机体的应激韧性。本研究从基因表达谱、形态、功能等多个方面,鉴定了一种神经发生相关的小胶质细胞的表型特征,通过调节小胶质细胞依赖 TREM2 信号介导的胞葬作用,有利于神经发生并发挥抗抑郁作用。

中 M3-129-0014

质细胞中组胺受体在缺血性脑损伤中的特异性调控作用及机制研究

蒋磊 胡薇薇 陈忠

浙江大学

目标 缺血性脑卒中后,神经胶质细胞(星形胶质细胞、少突胶质细胞)的动态反应对神经修复至关重要,但其调控机制尚不明确。组胺受体作为潜在药物靶标,其中枢损伤修复中的细胞特异性作用亟待解析。本研究旨在解析组胺受体在星形胶质细胞与少突胶质细胞中对缺血性脑损伤及修复过程的特异性调控机制,以发掘针对胶质细胞的新型治疗靶标。

方法 我们构建了组胺受体条件性基因敲除小鼠,并利用 Cre-Loxp 系统在不同类型细胞中选择性敲除组胺受体。通过细胞培养实验、动物模型以及免疫组化和分子生物学等技术,系统性地研究了组胺受体在缺血性脑损伤不同病理过程中的细胞特异性作用及机制。

结果 急性缺血早期激活组胺 H1 受体可促进星形胶质细胞摄取并代谢胞外过多的谷氨酸,减轻兴奋性毒性损伤。在缺血后期少突胶质细胞 H2 受体通过 Wnt/ β -catenin 通路“负性”调控其分化及髓鞘再生。星形胶质细胞上过表达 H2 受体能够减少胶质瘢痕,进而促进脑缺血后期的轴突生长,其机制可能是 H2 受体通过激活 Gs 蛋白下游信号,而非 β -arrestin 蛋白下游信号,调控星形胶质细胞的脂质代谢,增强其向梗死中心区迁移,从而减少缺血周边区的胶质瘢痕。在此基础上,通过冷冻电镜结构解析、结构导向的药物设计等手段,发现了有 Gs 蛋白信号偏向性作用的新型 H2 受体激动剂。

结论 研究表明,组胺受体在缺血性脑损伤中展现出细胞特异性调节作用,为该疾病的治疗提供了更精准的药物靶标。我们的研究为进一步理解神经系统中组胺受体的功能及其在脑损伤中的作用机制提供了重要线索,为开发更有效的缺血性脑损伤治疗策略奠定了基础。



●中 M3-神经胶质 ● Poster

中 M3-129-0005

星形胶质细胞尼古丁受体介导体感皮层痛觉感知

滕藤 李红丽 张宽
陆军军医大学基础医学院

初级体感觉皮层(S1)位于大脑中央后回,是哺乳动物大脑处理感觉信息的主要中枢。尼古丁受体($\alpha 7$ -nAChR),即 N 型乙酰胆碱受体 $\alpha 7$ 亚型,是中枢神经系统中重要的乙酰胆碱受体亚型,对 Ca^{2+} 有极高的通透性,广泛分布于大脑多个区域并发挥重要功能。S1 区星形胶质细胞(AST)钙活动可介导感觉信息的感知与处理,而痛觉刺激又可激活听觉皮层 AST 上的 $\alpha 7$ -nAChR。然而,目前关于 S1 区表达 $\alpha 7$ -nAChR 的 AST 是否参与感觉信息处理和感觉行为调控,目前研究较少。本实验用 9~12 月龄雄性 $\text{Chrna7}^{\text{loxP/loxP}}$ 小鼠($\alpha 7$ -cKO 组)与 $\text{Chrna7}^{\text{WT/WT}}$ 小鼠(cWT 组),在小鼠双侧 S1 定位注射病毒,实现局部双侧 S1 区特异性 AST 上 $\alpha 7$ -nAChR 的敲除,待 3~4 周病毒充分表达后,进行 5 分钟旷场试验,以评估小鼠运动能力;用 55°C 热板试验和 Von frey 针刺试验,来评估其热响应性和机械痛觉。S1 区 AST 上 $\alpha 7$ -cKO 组检测到热板反应潜伏期为 $16.63 \pm 7.79\text{s}$,与 cWT 组 ($15.09 \pm 3.51\text{s}$)相比显著差异($P < 0.05$);旷场试验显示 $\alpha 7$ -cKO 组运动总距离 ($P = 0.51$)和平均运动速度($P = 0.33$)与 cWT 组相比没有明显差异;同样, $\alpha 7$ -cKO 组 Von Frey 回缩率($P = 0.99$)和反应阈值($P = 0.94$)与 cWT 组相比无明显差异。本实验提示 S1 区 AST 上 $\alpha 7$ -nACh 敲除可导致热感觉迟钝,但不影响小鼠运动能力和机械痛觉。S1 区表达 $\alpha 7$ -nAChR 的 AST 参与热感觉信息处理,调控感觉相关行为,可作为研究感觉感知与调控的新靶点。

中 M3-129-0007

视神经中少突胶质细胞更新不足导致视神经相关轴突缺失和视力缺陷

吴双伶 直俊杰 吴昊芊
陆军军医大学组胚教研室

与年龄相关的视觉功能衰退是老年人中普遍存在的健康问题,但目前尚无有效治疗方法。在成年小鼠(3-8 月龄)中,视神经轴突变性和髓鞘丢失具有年龄依赖性。与成年小鼠相比,中年(13-18 月龄)和老年(20-22 月龄)雌雄小鼠视神经均出现显著轴突变性和髓鞘缺失,并伴随功能损伤。成年视神经中少突胶质细胞的更新过程持续活跃,但其在衰老视神经中的纵向变化及功能意义尚不明确。本研究通过细胞谱系标记和追踪技术,首次揭示少突胶质细胞生成能力随视神经衰老呈年龄依赖性下降。为探究活跃的少突胶质细胞更新是否对维持轴突和视觉功能至关重要,我们条件性地诱导敲除了幼年小鼠少突胶质细胞前体细胞中的转录因子 *Olig 2*。*Olig 2* 基因敲除导致少突胶质细胞更新受阻,加速轴突丢失和视网膜退行性改变,进而损害视神经信号传导,证实少突胶质细胞更新是维持轴突存活和视觉功能的重要机制。为验证促进少突胶质细胞生成是否能预防与年龄相关视觉损伤,我们对 12 月龄小鼠给予氯马斯汀(一种促髓鞘形成药物)或诱导敲除少突胶质前体细胞的毒覃碱受体 1。两种干预均显著增加了老年视神经中新生少突胶质细胞的产生,从而保护了视觉功能和视网膜结构完整性。总之,我们的数据表明,视神经中动态的少突胶质细胞更新是维持轴突存活和视觉功能所必须的,并且增强新生少突胶质细胞的产生代表了逆转与年龄相关的视觉功能下降的一种潜在方法。



中 M3-129-0009

海马 CA1 区 BChE 通过星形胶质细胞与神经元的糖代谢“交谈” 调控社交隔离诱发的社会攻击行为

曾越腾,吴沙,黎正杨,赵梓作,刘贞君,王千罡,吴易峰,赵雨欣,张予瀚,李夏岚,何星邑,张佳祺,陈思
遵义医科大学珠海校区

精神疾病常伴随社会攻击行为,威胁健康和社会安全。已知全身低表达丁酰胆碱酯酶 (butyrylcholinesterase, BChE) 小鼠显示应激敏感性和攻击行为,但机制未明。前期结果提示:海马 CA1 区 BChE 可不依赖乙酰胆碱途径影响突触可塑性,其或牵涉星胶与神经元的糖代谢“交谈”。但在攻击行为的作用尚未阐明。本研究拟探查海马 CA1 区 BChE 是否通过调节星胶依赖的糖原合成、分解等过程,进而影响攻击行为的突触可塑性。研究采用 C57BL/6 雄性小鼠构建社交隔离模型 (Social isolation, SI) 及居民-入侵者测试 (Resident-intruder test, RIT) 诱发和检测攻击性,通过脑立体定位注射 AAV2/9-shBChE 定向下调海马 CA1 区 BChE 表达。RIT 结果显示低表达 BChE 组攻击行为增加。SI 组和低表达 BChE 组糖原颗粒密度、数量和糖原合成酶表达含量均上升,且伴随星胶激活态标志物的改变。树突棘密度与攻击行为呈现相关性。我们的结果表明海马 CA1 区 BChE 参与社交攻击行为的病理过程,并且或牵涉与星胶相关的糖原代谢过程,为精神疾病的异常行为病理机制提供新的研究方向。

●中 M3-神经胶质● Abstract

中 M3-129-0001

高尿素下调 BDNF 促进少突胶质前体细胞异常增殖诱导慢性肾病 伴发焦虑症的机制研究

张萌,胡骏逸,刘言呈,毕浩辰,涂博瀚,黄波月,冉建华
重庆医科大学

慢性肾病 (CKD) 患者伴发焦虑症的发生率高,被认为是 CKD 病死率的独立预测因子,但发病机制不明。本课题组在前期发现 CKD 模型小鼠、单纯高尿素模型——UT-B 敲除小鼠均出现焦虑样行为的前期工作基础上,解析高尿素诱发焦虑的病理机制。单细胞组学分析筛选出 CKD 伴发焦虑的关键病理细胞群少突胶质前体细胞 (OPCs) 和关键致病基因 BDNF。BDNF 作为神经营养因子已被证实可以促进少突胶质前体细胞的增殖、迁移和髓鞘化。高尿素模型小鼠杏仁核中 BDNF 的表达水平显著下降;电镜结果显示小鼠杏仁核中神经元轴突髓鞘松散或脱髓鞘的比例显著增高,神经突起密度降低。高尔基染色结果显示,高尿素模型小鼠杏仁核中神经突起密度减少,髓鞘碱性蛋白 (MBP) 表达水平下降以及神经突起脱髓鞘化。细胞实验显示高尿素减少 OPC ATP 含量,导致线粒体膜电位耗竭和 ROS 水平升高,提示线粒体能量代谢紊乱。此外,高尿素模型小鼠线粒体碎片化,形态异常,且线粒体融合蛋白 2 (Mfn2) 表达水平显著减少,提示线粒体融合障碍是高尿素相关能量代谢紊乱的重要分子机制。综上所述,高尿素通过下调 BDNF 表达,诱导 OPCs 营养不良和线粒体动力学紊乱,促进杏仁核 OPCs 异常增殖导致 CKD 伴发焦虑症的发生。



中 M3-129-0003

3D 打印在神经胶质瘤手术治疗中的应用展望

杨阳 丁兆习

山东数字人科技股份有限公司

神经胶质瘤与脑实质、脑神经、脑血管等颅内结构关系紧密，手术治疗难度极高，需要精确的术前计划。使用 3D 打印技术模拟出患者的脑内肿瘤及其它结构，可以辅助进行术前评估。该技术通过采集患者影像(CT、MRI 等)数据，应用计算机辅助设计技术构建出脑胶质瘤的数字模型，包括皮肤、颅骨、脑组织、脑血管以及肿瘤等结构，可以清晰的显示出颅内肿瘤的三维空间状态，如肿瘤位置、形状、大小及与周围结构的毗邻关系，并采用 3D 打印机按 1: 1 比例打印出模型。该模型可帮助医生制定周密的手术入路，以选择从皮肤切口到肿瘤切除范围，避免周围结构损伤和保证病变切除彻底，保证手术的精准性和安全性；在模型上可以进行模拟手术和演练，以增加手术者信心、奠定成功基础和提高手术质量；可为外科医生的培训提供高仿真的学习条件、模拟手术，增加锻炼机会，提高手术技巧，优化青年医师的学习曲线；使用模型可以改善医患沟通，让病人及家属直观了解病情，客观认识手术难度和手术风险，减少医患矛盾。该技术具有构建速度快、精度高，并具有个性化、远程化等优点，具有临床实用推广价值。

中 M3-129-0004

组蛋白 H3K18 乳酸化修饰对高原缺氧下小胶质细胞 Nogo 受体 1 表达的影响

王子元,方金玉,程全成,李蔓,王超,陈春花,刘怀存,张卫光

北京大学基础医学院人体解剖与组织胚胎学系

目的 高原缺氧可诱导小胶质细胞异常激活，但其表观遗传调控机制尚不明确。Nogo 受体 1 (Nogo receptor 1, NgR1) 作为小胶质细胞关键调控分子，是否受组蛋白乳酸化修饰调控尚未见报道。本研究旨在阐明高原缺氧下 H3K18 乳酸化修饰 (lactylation, la) 对 NgR1 表达的调控作用及其对小胶质细胞炎症反应的分子机制。

方法 建立 C57BL/6J 小鼠高原缺氧模型（模拟海拔 8000 m），检测前额叶皮质小胶质细胞激活标志物表达、H3K18la 水平；体外低氧（3% O₂）培养 BV2 小胶质细胞，通过乳酸钠处理、p300/CBP 抑制剂干预及染色质免疫共沉淀验证 H3K18la 对 NgR1 的调控；采用 NgR1 过表达和 RhoA 抑制剂解析下游信号通路。

结果 高原缺氧显著上调小鼠前额叶皮质 H3K18la 修饰，并伴随小胶质细胞激活和血脑屏障破坏。体外实验证实，低氧或乳酸钠处理可增加 BV2 细胞 H3K18la 水平，通过调控其与 NgR1 启动子结合促进 NgR1 转录；抑制 p300/CBP 可阻断此效应。功能实验显示，NgR1 过表达或激动显著上调促炎因子 MMP-8 和 iNOS 转录，而抑制 RhoA 可逆转炎症反应。

结论 高原缺氧通过乳酸-p300/CBP-H3K18la 途径上调 NgR1 表达，进而激活 RhoA 信号通路驱动小胶质细胞炎症反应。本研究揭示 H3K18la-NgR1 轴在高原脑病中的作用，为靶向乳酸化修饰或 NgR1 的干预策略提供了理论依据。

关键词 高原缺氧，小胶质细胞，H3K18la，NgR1



中 M3-129-0011

单细胞测序结合孟德尔随机化分析揭示了少突胶质细胞与免疫失衡相关的 ALS 机制

刘玉谦, 郭瑞云, 王妮, 侯宇, 马隼
河北医科大

ALS 的发病机制尚

不清楚, 遗传因素和环境因素可能是影响 ALS 发病的因素。在单细胞水平上量化特征基因数量和表达水平变化的研究很少, 确定与 ALS 进展的因果关系相关的关键基因仍然具有挑战性。

本研究对 12 例 ALS 患者的单细胞核转录组进行了表达谱分析, 包括 44,779 个细胞的特征性表达水平。为了确定不同细胞亚群对 ALS 的贡献, 我们采用了较为新颖的细胞分选贡献度, 分析了疾病组和对照组之间的细胞数量和基因表达变化。在每种细胞类型中 DEGs, 并定义 FC ($FC_{score(i,j)} = \sqrt{FC_{exp(i,j)} * FC_{prop(j)}}$) 来量化特征基因数量和表达水平的变化。通过该分析, 确定 ENPP6+少突胶质细胞对 ALS 的贡献最大。

本研究通过单核细胞转录组学和孟德尔随机化分析揭示了 ENPP6+少突胶质细胞群在 ALS 中的潜在作用及其与免疫调节机制的关系。ENPP6+少突胶质细胞群在 ALS 中的作用尤其值得注意, 作为新形成的少突胶质细胞的标记物, ENPP6 在髓鞘形成、神经信号传递和学习记忆中起着关键作用。我们发现的关键基因及其信号通路为 ALS 的病理机制提供了新的见解, 并进一步支持少突胶质细胞在 ALS 中的关键作用, 特别是在髓鞘形成和神经保护, 以及神经信号传导和学习记忆方面。进一步分析表明, 少突胶质细胞在免疫调节和代谢中发挥重要作用。

中 M3-129-0012

Th22 细胞调控 Müller 细胞炎症反应参与糖尿病视网膜病变的机制

王禹霏; 刘文强; 左中夫; 刘学政
锦州医科大学

糖尿病视网膜病变 (DR) 是成人视力损害的重要诱因, Müller 细胞介导的炎症反应是关键因素之一。Th22 细胞是 CD4⁺T 细胞亚群, 虽能分泌 IL-22, 但在 DR 中能否通过血-视网膜屏障浸润视网膜并调控 Müller 细胞炎症尚不明确。本研究通过注射链脲佐菌素, 构建糖尿病小鼠模型, 1 个月后, 眼底荧光造影可见糖尿病小鼠出现硬性渗出及新生毛细血管, HE 染色可见各层细胞变薄、细胞缺失、形态紊乱等 DR 样病理改变, 伊文思蓝染色可见染料渗漏的血-视网膜屏障破坏表现。IL-22/AFX1 (Th22 细胞标志物) 荧光双标证实 Th22 细胞浸润, ELISA 实验证实 DR 小鼠玻璃体腔中 IL-22 含量明显增加, IL-22Rα1 (IL-22 受体标志物) 与谷氨酰胺合成酶 (Müller 细胞标志物) 荧光双标证实 Müller 细胞表达 IL-22 受体, Western Blot 结果显示 Müller 细胞介导的炎症反应增强。糖尿病小鼠玻璃体腔注射 IL-22BP 拮抗 IL-22, 能显著抑制 Müller 细胞活化及其介导的炎症反应, 改善 DR。利用磁珠分选技术从脾脏分离 Th22 细胞, 高糖环境促进 IL-22 分泌, 并增加体外培养的 Müller 细胞分泌炎症因子的能力。共培养实验进一步证实, 高糖通过 IL-22 依赖机制显著刺激 Müller 细胞炎症反应, 该过程与 Müller 细胞内 Act1/TRAF6 信号通路激活相关。本研究结果提示, 糖尿病时 Th22 细胞浸润到小鼠视网膜中, 并分泌 IL-22 细胞因子, 作用于 Müller 细胞, 激活 Act1/TRAF6 通路促进 Müller 细胞炎症反应, 参与 DR 发生发展。



●中 M4-神经系统病变● Podium

中 M4-129-0004

老年骶段脊髓“谭氏体”和 Megaloneurite 的神经解剖学研究

李银花,贾云格,侯维,魏子淳,温晓欣,徐熙萌,饶晨旭,王宇,谭会兵
锦州医科大学

NADPH-diaphorase (N-d) 和血管活性肠肽 (Vasoactive intestinal peptide, VIP) 广泛分布于腰骶脊髓中,并支配盆腔脏器。谭会兵等首次在老年大鼠腰骶脊髓的骶副交感核及背联合核区域观察到特征性衰老相关的形态学改变,即老年相关性 N-d 阳性小体 (Aging-related NADPH-diaphorase body, ANB) 或称谭氏体 (Tan body)。腰骶脊髓作为调控泌尿生殖功能的关键神经中枢,其退行性改变与老年盆腔脏器功能障碍具有潜在关联。在后续跨物种研究中,本团队进一步在老年犬以及非人灵长类动物的骶段脊髓中发现 N-d 和 VIP 免疫双标阳性的 Megaloneurite,其平均直径可达正常神经纤维的 4 倍以上,且呈现典型的退行性膨大体结构。形态学分析发现, Megaloneurite 与 ANB 在骶段脊髓的空间分布存在显著重叠,但 ANB 与 VIP 免疫反应不存在共定位,我们推测 Megaloneurite 与 ANB 可能是衰老状态下骶段脊髓出现的两种不同的神经退行性病变,或二者可能代表不同阶段的退行性病变进程。鉴于人体标本的特殊性,本团队应用 VIP 免疫组织化学反应在老年人体脊髓标本发现, VIP 阳性的 Megaloneurite 同样存在于骶段脊髓,在 α -synuclein 阳性对照实验中发现有路易体。我们的研究表明, ANB 和 Megaloneurite 可能作为一种特殊的衰老标志物,与老年盆腔内脏器官功能减退及疾病密切相关,为阐明老年性排尿障碍及便秘的神经机制提供了新的解剖学证据,并为开发针对退行性神经结构的靶向干预策略奠定了理论基础。

中 M4-129-0007

BRD7 在癫痫中的作用机制及研究

李语佳,陈婕,谢佳玲,周翠兰,徐杨
南华大学衡阳医学院应用解剖与生殖医学研究所

癫痫是一种由大脑异常放电引起的常见神经性疾病,现有药物副作用明显,亟需寻找新的治疗药物;溴结构域蛋白 BRD7 通过影响基因转录参与神经可塑性的调控,但其在癫痫中的作用鲜有报道。为此,本研究采用 8 周龄雄性 C57BL6/J 小鼠,采用 Racine 评分系统评估癫痫发作行为,通过 Western Blot、免疫组织化学和 qPCR 检测海马中 BRD7、即早基因及 TRPV4 的表达;我们首先观察了癫痫刺激对小鼠脑内 BRD7 表达的影响;然后,通过给予 BRD7 抑制剂 BI9564,观察 BRD7 在戊四氮 (PTZ) 和匹罗卡品所致癫痫中的作用;通过在小鼠海马过表达 BRD7,进一步观察 BRD7 功能的获得对小鼠癫痫发生发展的影响。结果显示, PTZ 刺激显著上调小鼠海马 BRD7 表达;海马过表达 BRD7 显著缩短模型小鼠癫痫发作潜伏期、增加发作易感性并降低小鼠存活率; BRD7 抑制剂 BI9564 能够显著延长模型小鼠的癫痫发作潜伏期、降低发作易感性,并减少即早基因与 TRPV4 的表达; TRPV4 激动剂 GSK1016790A 可逆转 BI9564 的抗癫痫作用。本研究的结果表明 BRD7 是治疗癫痫的新靶点。



中 M4-129-0011

Multi-modal integration of structural MRI and transcriptomic profiling reveals neuroanatomical and molecular signatures in the Shank3-PDZ^{-/-} mouse model of autism spectrum disorder

Ding-Ding Yang, Xuxia Wang, Funchun Lin, Sheng-Xi Wu, Guo-Hong Cai

空军军医大学神经生物教研室/军事医学创新中心

State Key Laboratory of Magnetic Resonance Spectroscopy and Imaging, Innovation Academy for Precision Measurement Science and Technology, Chinese Academy of Sciences, Wuhan, China

The Shank3-PDZ^{-/-} mice has emerged as a well-established model for autism spectrum disorder (ASD). However, systematic investigations into global neuroanatomical alterations in this model remain limited. To elucidate the structure and transcriptome consequences of Shank3-PDZ deficiency, we performed whole brain 7 tesla (T) structural magnetic resonance imaging (MRI) on Shank3-PDZ^{-/-} mice and transcriptome sequencing on 10 volume abnormal brain regions indicated by MRI, including olfactory bulb (OB), anterior olfactory nucleus (AON), hippocampus (Hip), piriform cortex (Pir), amygdala (Amy), Corpus callosum (CC), retrosplenial granular cortex (RSG), anterior cingulate cortex (ACC), cerebellum (cb), corpus striatum (Cpu). Venn diagram analysis revealed consistent downregulation of Fos alongside significant upregulation of Hif3a, Acer2, and Tes3-ps across all examined regions, and significantly enriched in the sphingolipid metabolic pathway. Through weighted gene co-expression network analysis (WGCNA) integrating structural MRI-derived volumetric eigenvalues, we identified a gene module centered on Crmp1, Gria1 and Slc9a4 that exhibited strong positive correlation with total brain volume (Pearson's $r = 0.91$, $p = 3e-12$). This multi-modal approach successfully bridges macroscopic neuroanatomical changes with molecular signatures, providing mechanistic insights into structural-functional abnormalities in Shank3-PDZ^{-/-} mice. Our findings establish a framework for investigating neurodevelopmental disorders through integrated imaging-genomic methodologies.

中 M4-129-0012

香紫苏醇靶向 UBE2D3 减轻帕金森病小鼠模型中小胶质细胞介导的神经炎症

李蔓,程全成,陈春花,张卫光

北京大学医学部

帕金森病 (PD) 是一种进行性神经退行性疾病, 其中神经炎症在疾病进展中起着关键作用。目前, PD 的治疗方法有限, 且疗尚不理想。香紫苏醇 (Sclareol, Scl) 是一种天然的抗炎化合物。利用 LPS 刺激 BV2 细胞构建炎症模型, 腹腔注射 LPS 的小鼠神经炎症模型, 黑质立体定位注射 LPS 和 α -Syn 过表达 PD 模型, 检测炎症因子、氧化应激水平, 小胶质细胞激活情况及神经元状态, 并探索其治疗作用。进一步利用 RNA-Seq、Pull-down、Co-IP 等技术寻找 Scl 的作用靶点。本研究表明, Scl 可显著降低脂多糖 (LPS) 诱导的 BV2 细胞中炎症因子的 mRNA 水平, 并减少氧化应激。在 LPS 注射的小鼠模型中, Scl 给药降低了炎症因子的水平, 抑制了小胶质细胞的活化, 并改善了运动和记忆障碍。此外, 在 PD 小鼠模型中, Scl 可缓解运动功能障碍, 并通过抑制小胶质细胞活化, 保护黑质中的酪氨酸羟化酶阳性神经元。进一步的, 我们的研究发现 Scl 可与泛素化连接酶 E2——UBE2D3 结合, 并促进 UBE2D3 的磷酸化, 由此抑制炎症。



中 M4-129-0014

Bmp6 介导的成纤维细胞与星形胶质细胞相互作用在帕金森病神经炎症中的作用及机制研究

苏兆文 王宏方 左冬悦
河北医科大学

帕金森病（Parkinson's disease, PD）是老年人常见的神经退行性疾病，目前发病机制尚不清楚。前期通过单细胞测序技术结合细胞间通讯网络分析，发现 PD 模型小鼠骨形态发生蛋白 6（Bone morphogenetic protein, Bmp6）介导的成纤维细胞与星形胶质细胞互作，激活 Smad 信号通路导致 PD 神经炎症，抑制该互作可以显著改善小鼠的神经炎症反应和运动功能障碍。本研究采用动物与细胞实验相结合，通过 scRNA-seq 及生物信息学分析、qRT-PCR、RNA pull-down、RIP、FISH 和双荧光素酶报告基因等实验技术，探讨 Bmp6 介导的成纤维细胞与星形胶质细胞交互作用在 PD 神经炎症中的作用及分子机制。研究结果显示，成纤维细胞 *Neat1* 通过竞争性结合 miR-124-3p，上调 Bmp6 的表达，Bmp6 通过旁分泌方式作用于星形胶质细胞 *Acvr1*，激活 Smad 信号通路并促进 NLRP3 炎症小体活化，进而诱发神经炎症导致 PD 运动功能障碍。本研究揭示了 Bmp6 介导成纤维细胞与星形胶质细胞相互作用调控 PD 神经炎症的新机制，为 PD 的精准治疗策略提供了重要理论依据。

中 M4-129-0020

过表达 Syt12 对 ALS 运动神经元的保护作用及机制研究

张雪,赵建涛,白雪,王雪枚,闫秋鹏,管英俊,陈燕春
山东第二医科大学基础医学院

肌萎缩侧索硬化症（ALS）是一种运动神经元变性疾病，发病机制不明确，无有效治疗方法。突触结构异常和功能障碍是 ALS 病变早期事件，改善突触功能可延缓 ALS 疾病进展。突触结合蛋白 12（SYT12）是一种突触囊泡蛋白，在突触囊泡融合和神经递质释放中发挥关键作用。本研究通过 DIA 定量蛋白质组学联合 RNA-seq 分析发现，SYT12 在 hSOD1-G93A 突变型 ALS 转基因小鼠发病期脊髓中表达显著降低。为进一步探究 SYT12 在 ALS 运动神经元退变中的作用及机制，我们选取 hSOD1-G93A 突变型 ALS 转基因小鼠和 NSC34 运动神经元样细胞，并通过 AAV 病毒构建过表达 Syt12 的 ALS 模型小鼠，应用形态学、影像学、动物行为学和分子生物学等多种技术方法，检测 SYT12 随疾病进展的表达规律及干预 Syt12 对 ALS 运动神经元退变的影响。结果显示，SYT12 在 ALS 神经元中低表达。过表达 Syt12 显著增强 hSOD1-G93A 突变型 NSC34 细胞活力、促进突起生长，增加神经递质释放；过表达 *Cplx1* 可反转过表达 Syt12 引起的效应改变。动物实验发现过表达 Syt12 延长 ALS 小鼠生存期，减少腓肠肌失神经变化，改善运动功能，延缓疾病进展，从结构和功能上改善神经元损伤，提升 ALS 小鼠脑和脊髓整体神经状况，发挥神经保护作用。机制研究发现，SYT12 与 SNARE 复合物调节因子 CPLX1 存在相互作用关系。过表达 Syt12 负向调控 CPLX1 影响 SNARE 复合物核心组分的表达。综上所述，SYT12 通过 CPLX1 调控 SNARE 复合物对 ALS 运动神经元发挥保护作用，SYT12 为 ALS 基因治疗的潜在靶点。



中 M4-129-0022

Mettl3 介导 Fzd3 m⁶A 修饰在 ALS 运动神经元退变中的作用

刘金梦,管英俊,陈燕春,张皓云,闫秋鹏,李牧,陈晓素,徐春杰,马晓楠
潍坊医学院

肌萎缩侧索硬化症（ALS）是一种致死性神经退行性疾病，以大脑和脊髓运动神经元选择性、进行性退变为主要特征，目前发病机制尚不明确，无有效治疗方法。近年研究发现，表观遗传修饰在神经退行性疾病中发挥重要作用，其中 m⁶A 修饰是哺乳动物 mRNA 上丰度最高的表观遗传修饰类型。本研究通过 LC/MC 检测发现，hSOD1-G93A ALS 转基因小鼠脊髓中 m⁶A 修饰水平较同窝野生型小鼠明显降低，且 Mettl3 表达降低，提示 ALS 疾病进程存在 m⁶A 修饰异常，推测与 Mettl3 调控有关。为进一步探究 Mettl3 在 ALS 发病中的作用机制，选用 hSOD1-G93A NSC34 运动神经元样细胞模型进行研究。RNA-seq 分析发现，沉默 Mettl3 后，hSOD1-G93A NSC34 细胞中下调基因与轴突导向、神经系统发育等功能相关；维甲酸诱导实验证实沉默 Mettl3 会抑制细胞突起生长。整合分析沉默 Mettl3 后的下调基因、ALS 运动神经元 m⁶A 甲基化组数据库和 KEGG 功能注释数据库发现，Mettl3 可能通过调控 Fzd3 m⁶A 修饰参与 ALS 运动神经元退变。MeRIP-qPCR 验证结果显示，hSOD1-G93A NSC34 细胞中 Fzd3 m⁶A 修饰水平较 hSOD1-WT NSC34 细胞组显著降低。Western blot 结果显示，沉默 Mettl3 后 Fzd3 表达降低。放线菌素 D 介导的 mRNA 稳定性实验进一步表明，沉默 Mettl3 会导致 Fzd3 mRNA 降解加速，表明 Mettl3 通过 m⁶A 修饰维持 Fzd3 mRNA 的稳定性，进而调控其表达，参与 ALS 发病。本研究后续将聚焦该调控网络上下游效应分子，为临床应用提供理论依据。

中 M4-129-0030

远隔缺血后适应减轻缺血性脑卒中再灌注损伤的神经保护机制

马微,李春艳,罗懿,杨金伟,赵文玉,赵庆娥,李力燕
昆明医科大学

昆明医科大学第二附属医院神经内科 缺血性脑卒中（IS）是全球致死致残的首要疾病，且发病呈年轻化趋势。静脉溶栓虽为主要治疗手段，但其治疗时间窗窄、易引发缺血再灌注（I/R）损伤以及预后不良。课题组前期研究发现远隔缺血后适应(RIPostC)能减轻 IS 大鼠 I/R 损伤，结合全转录组测序和生信分析提示 lncRNA000587 靶向 TGFβ1 通过下游 Bcl2 凋亡途径，稳定 RIPostC 干预 IS 大鼠线粒体正常功能，减轻 I/R 损伤。因此本研究在体外 OGD/R 条件下培养皮质神经元，体内建立 RIPostC 干预 MCAO/R 大鼠模型。发现 lncRNA000587 作为 ceRNA 定位于细胞质，过表达 lncRNA000587 上调 TGFβ1 的表达，抑制 OGD/R 诱导的细胞活力下降，减少细胞凋亡，TGFβ1、TGFβR1、Smad2/3、p-Smad2/3 的表达上调。RIPostC 干预改善 IS 大鼠神经功能和运动能力，减轻脑梗死体积和细胞凋亡程度，RIPostC 下调 ROS、Ca²⁺、mPTP，上调 ATP。综上所述，RIPostC 通过 lncRNA000587/TGFβ1/Bcl2 信号轴调控线粒体凋亡途径，减轻细胞凋亡，改善线粒体功能，减轻 I/R，发挥神经保护作用。本研究为深入阐明 RIPostC 神经保护机制和开发转化应用靶点提供了新的思路。



中 M4-129-0033

B7 家族相关分子 ERMAP 乳酸化修饰机制及其促进 M2 巨噬细胞极化改善 EAE 的研究

何可可, 苏敏*
贵州医科大学

目的 探讨（1）ERMAP 蛋白乳酸化修饰水平对 M2 型巨噬细胞极化和多发性硬化症（MS）及其动物模型自身免疫性脑脊髓炎（EAE）发生发展的影响；（2）ERMAP 蛋白乳酸化修饰位点 K7 和 K84 对其蛋白免疫调控功能的作用；（3）MTA1 是否为新的乳酸化修饰酶参与 ERMAP 蛋白乳酸化修饰调控。

方法 制备提纯不同批次的 ERMAP-Fc 融合蛋白及 ERMAP-His 蛋白（购自 MCE）运用 anti-ERMAP 和 anti-L-Lactyl 抗体，western-blot 检测两种抗体是否存在相同位置的条带表达。取 C57BL/6 小鼠脾和腹腔巨噬细胞以及小鼠 RAW264.7 和人 THP-1 巨噬细胞系，分别诱导其向 M1、M2 极化。FACs 分析 M1、M2 极化情况，CO-IP 结合 western-blot 正反向检测不同极化条件下，巨噬细胞表面 ERMAP 乳酸化修饰水平表达差异。表达纯化制备不同乳酸化修饰水平的 ERMAP-Fc 融合蛋白，收集 C57BL/6 小鼠脾细胞、腹腔巨噬细胞以及 RAW264.7 和 THP-1 细胞系，FACs 分析 M1、M2 巨噬细胞极化数量比例变化以及 T 细胞活化、增殖改变。运用野生型 B6 小鼠建立自身免疫病脑脊髓炎 EAE 模型，发病后用三种不同乳酸化修饰水平的 ERMAP-Fc 融合蛋白进行治疗，逐日观察神经功能变化，进行临床评分。根据 ERMAP 单蛋白乳酸化修饰位点分析结果分析，找到 ERMAP-His 和 ERMAP-Fc 蛋白乳酸化修饰位点，主要在赖氨酸 K7 和 K84 处。制备 K7 和 K84 位点的赖氨酸单点突变和联合突变为精氨酸的真核表达质粒，纯化后获得三种点突变的 ERMAP-Fc 融合蛋白，用抗-ERMAP 和泛乳酸抗体 CO-IP 检测点突变后的 ERMAP 蛋白乳酸化修饰水平是否发生变化，明确修饰位点的有效性。FACs 分析点突变后蛋白对 M1、M2 巨噬细胞极化数量比例以及 T 细胞活化、增殖的影响。运用 6 周龄 C57BL/6 小鼠建立自身免疫病模型 EAE，分为三组：WT/ untreated 组、WT/ EAE 组和 ERMAP-/- EAE 组。L-LA（乳酸）比色试剂盒检测三组小鼠不同疾病程度下，血清、脾脏和脊髓组织整体的乳酸水平变化，以及 Western-blot 及 CO-IP 检测血清、脾脏和脊髓组织总蛋白以及 ERMAP 蛋白的乳酸化修饰水平。取三组 EAE 模型小鼠脊髓进行单细胞测序分析疾病条件下脊髓内免疫细胞浸润情况，同时进行乳酸化修饰组学分析，根据结果取交集，发现 ERMAP-/-/EAE 小鼠脊髓组织存在多种免疫细胞浸润，AARS1/2 和 HDAC1-3 表达变化不明显，但不同的是，发现 MTA1 表达明显降低，因此推测，MTA1 可能是参与 ERMAP 乳酸化修饰相关的差异酶。RAW264.7 和 THP-1 巨噬细胞中分别敲低和过表达 MTA1，western-blot 及 qPCR 验证其成功敲除和过表达。诱导正常、敲低和过表达 MTA1 的 RAW264.7 和 THP-1 巨噬细胞分别向 M1、M2 巨噬细胞极化，FACs 检测巨噬细胞极化情况及其表面 ERMAP 的表达水平变化；CO-IP 分析敲除和过表达 MTA1 后，ERMAP 乳酸化修饰水平变化情况，明确 MTA1 与 ERMAP 乳酸化修饰及巨噬细胞极化的关系。

结果 （1）ERMAP 蛋白存在乳酸化修饰，并在 M2 型巨噬细胞修饰水平增高。（2）ERMAP 蛋白的乳酸化修饰水平增高可促进 M2 巨噬细胞极化、抑制 T 细胞反应，并改善自身免疫病 EAE 的发生发展。（3）ERMAP 单蛋白乳酸化修饰位点 K7 和 K84，其中 K84 位于 Ig V 结构域内，对蛋白免疫调节功能起着重要作用。（4）MTA1 可能是一种新的 ERMAP 蛋白乳酸化修饰的相关酶。

结论 B7 家族相关分子 ERMAP 蛋白赖氨酸上存在乳酸化修饰，乳酸化水平的增高，可增强其共抑制功能，有效促进巨噬细胞向 M2 型极化，抑制 T 细胞活化、增殖，起到改善 EAE 及 MS 的作用，其修饰的功能位点主要位于赖氨酸 K7 和 K84 处，而 MTA1 可能作为新的乳酸化修饰酶参与了 ERMAP 乳酸化修饰。



中 M4-129-0035

元宝枫改善 D-半乳糖（D-gal）诱导的阿尔茨海默病（AD）模型小鼠学习记忆障碍的物质基础及作用机制

高伟忠 高伟嘉 熊柳林

遵义医科大学第三附属医院

本研究旨在探讨元宝枫改善 D-半乳糖（D-gal）诱导的阿尔茨海默病（AD）模型小鼠学习记忆障碍的物质基础及作用机制。实验采用 90 只 C57BL/6J 雄性小鼠，通过新物体识别实验筛选后随机分为空白对照组、AD 模型组、元宝枫低/中/高剂量组、阳性药对照组：盐酸多奈哌齐组、依达拉奉组，连续 8 周腹腔注射 D-gal（300 mg/kg/d）构建 AD 模型。通过新物体识别实验和 Morris 水迷宫实验评估小鼠学习记忆能力，结果显示元宝枫显著改善 AD 小鼠的探索时间、逃避潜伏期及目标象限停留时间（ $P<0.05$ ）。病理学分析表明，元宝枫减轻了海马组织损伤，减少 A β 沉积及 Tau 蛋白过度磷酸化（p-Tau），并通过 HE 和 Nissl 染色证实其神经保护作用。ELISA 检测显示元宝枫显著提升大脑、血清及肝脏中 SOD、CAT、GSH-Px 活性，降低 MDA 水平（ $P<0.05$ ）。RT-qPCR 进一步揭示元宝枫上调海马中 Nrf2、SOD1、CAT、HO-1 基因表达，抑制 SA- β -gal 活性。

基于 LC-MS/MS 技术，结合网络药理学和分子对接分析，鉴定元宝枫中黄酮类、有机酸及萜类化合物为核心活性成分，其作用靶点与 AD 关键病理靶点（如 A β 、Tau 相关通路）显著交集。PPI 网络分析筛选出 Nrf2、SOD1、CAT 等核心靶点，并通过分子对接验证其与活性成分的强结合能力。研究证实，元宝枫通过多成分、多靶点调控氧化应激、神经炎症及 A β /Tau 病理级联反应，改善 AD 模型小鼠认知功能障碍。本研究为元宝枫抗 AD 的临床应用提供了实验依据及理论支撑。

●中 M4-神经系统病变● Poster

中 M4-129-0003

运动和粪菌移植对孤独症样大鼠行为及 HPA 轴的影响

陈雪梅 侯晓晖

广州体育学院

探讨自主跑轮运动对 ASD 大鼠行为异常与 HPA 轴激活状态的影响及肠道菌群在其中的作用。选取 SD 母鼠于孕期第 12.5 天腹腔注射丙戊酸，其子代作为 ASD 大鼠模型，注射生理盐水的母鼠子代为对照组。两组大鼠出生后第 23 天进行行为学筛选，随机分为非运动组（ASD）、运动组（ASDE）、移植组（FMT）和假移植组（sFMT）。ASD 组不进行干预；ASDE 组自第 28 天起进行 6 周自主跑轮运动干预；FMT 组自第 42 天起接受 4 周运动大鼠粪便悬液灌胃；sFMT 组则灌胃等量生理盐水。干预结束后，进行三室社交、旷场和水迷宫试验测试行为表现，ELISA 检测血清中皮质醇（CORT）、促肾上腺皮质激素（ACTH）及促肾上腺皮质激素释放激素（CRH）水平。与 CON 组相比，ASD 组大鼠的社交能力、社交新颖性偏好，自发活动和学习记忆能力显著下降，血清中 CORT、ACTH 和 CRH 水平显著升高（ $P<0.05$ ）；6 周自主跑轮运动后，ASD 大鼠的社交等行为能力显著改善，血清 CORT 水平显著降低（ $P<0.05$ ）。与 sFMT 组相比，接受 4 周粪菌移植的 FMT 组大鼠的社交等行为能力显著改善，血清 ACTH 水平显著降低（ $P<0.05$ ）。自主跑轮运动和粪菌移植不仅能改善 ASD 大鼠的社交能力、社交新颖性偏好、自发活动和学习记忆能力，还能降低 ASD 大鼠 CORT、ACTH、CRH 的表达水平，从而抑制 HPA 轴异常激活。结果表明，运动可以调控 HPA 轴，改善 ASD 大鼠行为，而肠道菌群可能在其中发挥调节作用。孤独症谱系障碍；下丘脑-垂体-肾上腺轴；运动；粪菌移植



中 M4-129-0010

丘脑中央内侧核内痛痒特异性神经元的形态学及功能学研究

窦雪瑛 彭霏 董玉琳

空军军医大学基础医学院人体解剖与组织胚胎学教研室

丘脑中央内侧核（Central Medial thalamic nucleus, CM）是丘脑中线核团的重要组成部分，既往研究表明 CM 同时参与痛与痒两种伤害性刺激的传递与调控，但其神经元基础及通路尚未阐明。本研究拟探究 CM 内痛激活（CM^{pain}）及痒激活（CM^{itch}）神经元的空间分布及功能差异性；揭示 CM^{pain} 及 CM^{itch} 的下游投射靶区。为此我们利用四环素调控系统（Tet-Off）介导的特异性神经元激活和标记技术，整合化学遗传、光遗传和在体光纤钙离子成像等技术，实现对 CM 内痛/痒特异性神经元的精准调控，同时采用病毒介导的神经束路追踪技术，探究痛/痒特异性神经元的神经环路。研究结果显示 CM^{pain} 及 CM^{itch} 神经元在该核团的吻中尾段均有存在，但在分布上互不重叠；激活或抑制痛/痒特异性神经元能显著影响小鼠对于相应刺激的行为反应，但不影响另一种神经元的功能。最后，我们发现 CM^{pain} 及 CM^{itch} 神经元下游投射脑区大部分重叠，仅在个别核团有差异。本实验从形态和功能上证明 CM 内存在形态和功能各自独立的两群神经元，分别参与痛或痒信息的传递或调控，该结果对于进一步理解痛觉和痒觉信息的神经编码机制具有重要意义，且对于疼痛或瘙痒治疗的临床转化具有指导意义。

中 M4-129-0013

Resolvin D1 联合运动康复通过 BDNF/TrkB/PI3K/AKT 通路缓解颅内出血小鼠神经损伤

吕晓宇,张自有,石纯,王思琪,李彤,张本斯

大理大学基础医学院

Resolvin D1 (RvD1) 是一种内源性抗炎介质，能够调节炎症反应并促进炎症的消退。研究表明，RvD1 在多种中枢神经系统环境中具有神经保护作用。然而，其在脑出血（ICH）病理生理过程中的作用以及与运动康复结合的潜在保护机制尚不明确。本研究利用胶原酶建立 ICH 小鼠模型，结果显示 RvD1 联合三周的运动康复治疗显著改善了小鼠的神经功能缺损、肌肉力量、学习和记忆能力，同时减少了焦虑等行为表现。RvD1 联合运动康复通过上调抗炎因子来抑制炎症状态，激活了 BDNF/TrkB/PI3K/AKT 信号通路。TUNEL 染色实验证实，残余的凋亡神经元数量减少，而透射电子显微镜观察显示，联合治疗后线粒体自噬体数量增加。进一步的孟德尔随机化和分子对接分析验证了 RvD1 与线粒体自噬和炎症因子相关靶点之间的关联，从而阐明了 RvD1 参与的机制。综上所述，RvD1 联合运动康复通过激活 BDNF/TrkB/PI3K/AKT 信号通路，有效减少小鼠在 ICH 后的神经元凋亡和炎症反应，并与线粒体自噬相关状态相互作用。这种综合治疗策略促进了神经系统的恢复，为该病症的临床管理提供了新的见解。



中 M4-129-0016

小胶质细胞 TFE3 介导的吞噬功能在帕金森病中的作用及机制研究

王宏方 刘清 苏兆文
河北医科大学人体解剖学教研室

帕金森病（Parkinson's disease, PD）是老年人常见的神经退行性疾病，目前发病机制尚不清楚。本研究通过单细胞测序技术结合数据分析、分子生物学、形态学和行为学等实验技术，发现 PD 小鼠黑质小胶质细胞的吞噬作用显著降低，且该功能与转录因子 E3（transcription factor E3, TFE3）的减少密切相关。过表达小胶质细胞 TFE3 可以增强 PD 小鼠小胶质细胞的吞噬功能，降低 α -syn 的含量，并改善其运动功能障碍。进一步采用转录组测序、双荧光素酶报告基因、乳胶微粒、多重免疫荧光染色、Western blot 和 qRT-PCR 等实验技术，证实 mTOR 可以调控 TFE3 的磷酸化，并影响 TFE3 的核易位。此外，TFE3 可以与 Mertk 启动子结合，调控 Mertk 的表达，从而影响小胶质细胞的吞噬作用。研究结果表明，小胶质细胞 mTOR 信号通路的激活，通过抑制 TFE3 的核易位，减少 Mertk 的表达，进而引起小胶质细胞吞噬功能障碍，导致 α -syn 的聚集以及 PD 模型小鼠的运动功能障碍。

中 M4-129-0034

基于网络药理学探讨黑芝麻活性成分对 SAMP8 小鼠认知功能的改善作用

谢秋梅,李育霖,柯思因,赵斌,韦家乐,李莎莎,凌雁武
右江民族医学院

通过 TCMS 数据库筛选出黑芝麻 7 种活性成分，应用 Pubchem 和 SwissTargetPrediction 数据库获取预测的药物靶点共 287 个，以“Alzheimer's disease (AD)”为疾病关键词，从 GeneCards、OMIM、TTD 数据库收集得到 2497 个疾病靶点。药物靶点与疾病靶点匹配经 Venny 2.1.0 映射获交集靶点 123 个，将 123 个交集基因导入 SRTING 数据库，建立 PPI 网络，通过 DAVID 数据库进行 GO、KEGG 富集分析，运用 Cytoscape 3.9.1 构建药物-成分-疾病-通路靶点网络，结果显示黑芝麻活性成分中叶酸、维生素 E 等与 PPI 网络 PIK3R1、GSK3B 等多个核心靶点蛋白发生作用。通过黑芝麻提取物灌胃快速老化模型 SAMP8 小鼠进行实验验证，结果表明黑芝麻活性成分激活 PI3K-AKT 通路，上调 Bcl-2/Bax 比值，改善线粒体稳态，同时抑制 GSK-3 β 活性，减少 A β 生成及 Tau 蛋白磷酸化，对 SAMP8 小鼠认知功能有明显的改善作用。提示黑芝麻提取物多成分、多靶点的调控特性与 AD 复杂病理特质相互契合产生协同效应，可成为中药成分-疾病靶点互作协同干预 AD 有效策略。



●中 M4-神经系统病变● Abstract

中 M4-129-0001

MPTP 诱导的 PD 模型小鼠脑尿素循环改变的病理机制研究

张盛尧,万果然,张萌,王健,骆军令,汪琼芳,黄波月,冉建华
重庆医科大学

帕金森病的代谢研究对于揭示病理机制以及开发新的治疗方法具有重要意义,有助于改善患者的生活质量和延缓疾病进展。近年来研究发现,PD 患者出现广泛脑区尿素水平增加,但其具体机制尚不明确。因此本研究拟建立 MPTP 诱导的 PD 小鼠模型,探讨黑质、纹状体中尿素循环关键酶及相关产物的改变,解析 PD 脑组织中高尿素的机制。PD 模型小鼠出现前爪步幅减小、进入开放臂次数比例和开放臂停留时间比例降低等行为学改变,伴随着黑质、纹状体中酪氨酸羟化酶表达下降,提示模型成功。WB 检测发现,PD 模型小鼠黑质、纹状体中尿素循环关键酶 CPS1、OTC、ARG1、ODC1 的表达水平上调,尿素水平增加;免疫荧光染色观察到以上分子与酪氨酸羟化酶存在共定位,提示 PD 模型小鼠黑质、纹状体中尿素循环水平与多巴胺神经元功能呈负相关。尿素通道蛋白(UT-B)表达升高,提示 PD 尿素转运增强。体外培养 PC12 神经元在高尿素负荷下,尿素循环关键酶和 UT-B 均表达增强,与在体实验结果一致。通过 siRNA 敲低 PC12 中的 ODC1,逆转了尿素循环关键酶表达水平,且酪氨酸羟化酶表达下降。综上所述,PD 中尿素循环增强、尿素增加促进 UT-B 表达,导致 PD 小鼠脑区尿素水平升高,阻断尿素循环关键酶 ODC1 可能成为治疗 PD 的关键靶点。

中 M4-129-0002

大鼠弓状核 Kisspeptin 神经元调控围绝经期内脏脂肪增多的机制研究

白钰,王文娟,孙艳荣,栾丽菊,王珂,秦丽华
北京大学

本研究拟探讨围绝经期低雌激素状态下,是否会通过雌激素受体调控神经肽 Kisspeptin 的转录和表达,进而影响 ARC Kisspeptin 神经元的数量和功能,导致大鼠内脏脂肪异常增多。成年雌性 SD 大鼠随机分为假手术组、去卵巢组和去卵巢后雌激素治疗组。去卵巢组大鼠体重从第四周开始明显增加,腹部脂肪细胞直径变大但其数量没有明显增加;下丘脑弓状核 ER α 阳性神经元增多,ER β 和 GPR30 无显著差异。Kisspeptin 表达增多,且存在 ER α 与 Kisspeptin 共表达。CUT&tag 测序和 STRING 生信分析预测 ER α 下游可能与 Kisspeptin 神经肽有相互作用的基因。Kisspeptin 神经元激活后,大鼠体重增长速度减缓,体重增量减少,抑制该神经元后,体重增长速度加快,体重增量增加。围绝经期低雌激素很可能通过减少 ER α 调控 Kisspeptin 的转录和表达,使弓状核 Kisspeptin 神经元数量功能减弱,进而影响内脏脂肪分化异常,最终导致内脏脂肪增多和体重增加。



中 M4-129-0005

国家发育和功能人脑组织资源库中肌萎缩侧索硬化症病例的神经病理学特征

代丰秋,王乃利,张迪,陈震,仇文颖,钱晓菁,马超
中国医学科学院北京协和医学院基础医学研究所

肌萎缩侧索硬化症（Amyotrophic lateral sclerosis, ALS）是一种以上下运动神经元退行性病变为特征的致命性神经退行性疾病。中国医学科学院北京协和医学院国家发育和功能人脑组织资源库作为全国最大的脑资源库，为本文中 ALS 的研究提供了重要的病理样本。本文旨在分析该资源库中 ALS 病例的神经病理学特征，为 ALS 的病理机制研究提供依据。对资源库中保存的 7 例 ALS 病例进行回顾性分析，收集其年龄、性别等基本信息，并对脊髓和大脑皮层样本进行 pTDP-43、p62 免疫组化染色及 Kluver 染色，评估运动神经元丢失、病理包涵体形成及脱髓鞘病变情况。结果：7 例 ALS 病例的年龄分布为 34 岁至 69 岁，其中男性 5 例，占比 71.4%；女性 2 例，占比 28.6%。神经病理学显示：脊髓下运动神经元显著丢失，并观察到 pTDP-43 和 p62 阳性胞质包涵体；Kluver 染色显示脊髓侧索皮质脊髓束出现脱髓鞘改变；Brodman 4 区运动皮层中 Betz 细胞显著丢失。国家发育和功能人脑组织资源库中的 ALS 病例表现出典型的神经病理学特征，包括上、下运动神经元的丢失、pTDP-43 和 p62 病理包涵体的形成、皮质脊髓束脱髓鞘病变以及 Betz 细胞的丢失。这些发现为 ALS 的病理诊断和机制研究提供了重要依据，同时也凸显了该资源库在神经退行性疾病研究中的价值。

中 M4-129-0006

嗅球巨噬细胞在阿尔茨海默病进展中的作用研究

余亮 何淼
北京协和医学院基础学院

阿尔茨海默病（Alzheimer's disease, AD）是最常见的神经退行性疾病，神经炎症在 AD 的发病机制中起到关键作用，小胶质细胞是神经炎症的主要参与者。然而近年来，越来越多的证据发现，外周免疫与 AD 之间存在密切关系。有研究证实恢复外周单核巨噬细胞的能量代谢，减轻其炎症状态可以逆转 AD 相关的认知减退。本研究旨在讨论 AD 发生时人脑嗅球是否会伴随外源性巨噬细胞的浸润，以及浸润的巨噬细胞和 AD 进展的关联。我们对来自国家发育和功能人脑组织资源库的嗅球组织冰冻切片，使用泛巨噬细胞标记物 IBA1 以及小胶质细胞特异标记物 TMEM119、P2RY12，进行了免疫荧光共定位实验。实验结果发现，AD 人脑嗅球处存在 IBA1+ TMEM119- 和 IBA1+ P2RY12- 的巨噬细胞，间接证明了外源性巨噬细胞的浸润。具体而言，对于 IBA1+ TMEM119- 巨噬细胞，在 AD 神经病理为 L、I 及 H 的嗅球分组，该类浸润巨噬细胞数量均显著多于 AD 病理为 N 的嗅球分组；对于 IBA1+ P2RY12- 巨噬细胞，相较于 N 组，该类巨噬细胞仅在 L 组的嗅球嗅小球层显著增多。这提示在 AD 病理发生的早期，嗅球处就有外源性巨噬细胞的浸润。



中 M4-129-0008

外周非伤害性感觉神经元参与神经病理性疼痛调控的研究

田小芬；尹湘莎；孙宝飞；马超

中国医学科学院北京协和医学院基础医学研究所人体解剖与组织胚胎学系 北京 100005 神经病理性疼痛（Neuropathic pain, NP）是由躯体感觉系统，包括外周纤维和中枢神经元的病变或疾病引起的，常表现为自发性疼痛、痛觉过敏等，影响全球约 7-10% 的人群，给患者和社会带来巨大负担。当前对于 NP 外周机制的研究集中在痛觉或伤害性感觉神经元的异常兴奋性，而外周非伤害性 A 纤维在神经损伤所致 NP 中的确切作用尚无明确定论。我们聚焦于 MafA 阳性的外周非伤害性感觉神经元，结合化学遗传学和痛觉行为学范式，探讨该群神经元在 NP 中的作用及其机制。在这项研究中，我们通过构建 AAV-MafA-Cre 病毒，并与 AAV-DIO-hM3D (Gq) -mCherry/AAV-DIO-hM4D (Gi) -mCherry 混合注射，特异性地对 MafA⁺ 神经元进行激活/抑制性调控。与大直径有髓纤维标记物 NF200/肽能伤害性感觉神经元标志物降钙素基因相关肽（CGRP）/非肽能伤害性感觉神经元凝集素 B4（IB4）共染可见，MafA 主要表达于 NF200⁺ 大直径非伤害性感觉神经元。疼痛行为学结果提示，在 Naive 状态下，化学遗传学抑制/激活 MafA⁺ 神经元不影响基础痛阈；在由坐骨神经分支损伤（SNI）导致的神经病理性疼痛状态下，抑制 MafA⁺ 非伤害性感觉神经元可缓解疼痛，而激活 MafA⁺ 神经元加重神经病理性疼痛。由此提示外周非伤害性 MafA⁺ 感觉神经元参与神经病理性疼痛的调控。

中 M4-129-0009

运动训练激活 Wnt/ β -catenin 通路改善 APOE- ϵ 4 介导的 AD 血脑屏障损伤与认知缺陷

杨运杰 牟连伟
广州体育学院

阿尔兹海默病（Alzheimer's disease, AD）是一种致死性老年痴呆病，发病机制不清，治疗面临重大挑战。载脂蛋白 E- ϵ 4（Apolipoprotein E-epsilon 4, APOE- ϵ 4）是 AD 中最高遗传风险因素，导致血脑屏障（Brain-blood barrier, BBB）功能障碍、神经退行性变和痴呆等，而运动训练不仅能有效降低 AD 的发病风险，还能减缓其认知功能下降和疾病进展。然而，运动训练是否通过调控 APOE- ϵ 4 的表达发挥改善 AD 认知的作用尚有待阐明。采用 5 $\times$ FAD 小鼠和 APOE- ϵ 4 敲入小鼠进行杂交，我们发现，APOE- ϵ 4 减少 5 $\times$ FAD 小鼠脑血流量，减少大脑内皮细胞中紧密连接蛋白 Claudin-5 和葡萄糖转运蛋白 GLUT-1 的表达，抑制 Wnt/ β -catenin 信号通路，加速 BBB 的破坏、神经元丢失和学习记忆缺陷。而运动训练可有效激活 Wnt/ β -catenin 信号通路，改善 APOE- ϵ 4; 5 $\times$ FAD 小鼠 BBB 完整性，防止进一步的神经元丢失和学习记忆缺陷。综上所述，本研究揭示了 APOE- ϵ 4 通过抑制 Wnt/ β -catenin 通路加剧 AD 小鼠血脑屏障损伤及认知缺陷的分子机制，并首次证实运动训练可通过激活该通路逆转 APOE- ϵ 4 的病理效应。这一发现不仅为 APOE- ϵ 4 介导的 AD 进展提供了新的理论依据，同时为运动干预作为 AD 非药物疗法的临床应用奠定了分子基础。未来研究可进一步探索运动训练对 APOE- ϵ 4 人群的精准干预策略，以及 Wnt/ β -catenin 通路下游靶点的药物开发潜力。



中 M4-129-0015

间歇性低压低氧预适应通过 HIF-1 α -GADD45 α -NF- κ B 通路改善神经炎症的机制研究

李子昂, 李蔓, 龚琳力, 姚义凡, 张卫光, 陈春花
北京大学医学部基础医学院人体解剖与组织胚胎学专业

本研究旨在探索间歇性低压低氧预适应 (Intermittent Hypobaric Hypoxia, IHH) 在缓解脂多糖 (Lipopolysaccharide, LPS) 诱导的神经炎症损伤中的作用机制。通过建立 LPS 诱导的神经炎症大鼠模型, 本研究采用行为学试验、实时荧光定量 PCR、Western Blot、免疫荧光和转录组测序等方法检测 IHH 对大鼠大脑皮层中促炎因子表达水平、小胶质细胞的激活状态、神经元凋亡水平的影响, 同时深入探索了 IHH 神经保护作用的分子机制。在体外研究中, 通过建立 LPS 诱导 BV2 细胞炎症模型, 进一步评估了间歇性低氧 (Intermittent Hypoxia, IH) 干预对小胶质细胞促炎因子分泌及激活状态变化的影响。研究结果显示, IHH 干预可显著降低大脑皮层及细胞模型中肿瘤坏死因子 α (TNF- α)、白细胞介素 1 β (IL-1 β) 及白细胞介素 6 (IL-6) 等关键促炎因子表达水平, 同时抑制小胶质细胞 M1 型极化并减少神经元凋亡, 从而改善 LPS 引发的运动及认知功能障碍。进一步探索证实, IHH 通过抑制生长阻滞与 DNA 损伤诱导基因 45 α (GADD45 α) 表达抑制 NF- κ B 通路活化, 且使用 HIF-1 α 抑制剂可消除 IHH 神经保护作用。以上研究结果表明, IHH 通过激活 HIF-1 α 抑制 GADD45 α -NF- κ B 信号轴, 抑制小胶质细胞异常活化及神经炎症级联反应。本研究揭示了 HIF-1 α 在 IHH 的神经保护作用中的关键作用。

中 M4-129-0017

APOE4 介导动脉粥样硬化及帕金森病大脑黑质 tau 病理的机制研究

丁九阳 孙宝飞
贵州医科大学

贵州医科大学功能与疾病人脑组织库重点实验室 APOE4 是动脉粥样硬化及阿兹海默病的风险基因, 但其是否可介导帕金森病仍未完全明了。本研究阐述了 APOE4 基因介导冠心病及帕金森病大脑黑质 tau 过度磷酸化的机制。本实验收集携带 APOE4 基因的冠心病及正常对照死者尸体标本大脑及冠脉组织, 检测大脑黑质区域磷酸化 tau 水平; 给予 APOE3 及 APOE4 转基因小鼠高脂饮食诱导动脉粥样硬化模型, 检测小鼠黑质区域胆固醇含量, 磷酸化 tau 及其激酶 GSK3 β 水平。结果显示, 推荐 APOE4 基因的尸体样本大脑黑质磷酸化 tau 显著增加, 动脉内斑块沉积增多; 与喂养高脂饮食 APOE3 小鼠相比, 喂养高脂饮食 APOE4 小鼠黑质区域磷酸化 tau 水平明显增高, 多巴胺能神经元减少, 伴有血清及黑质区域胆固醇含量增高, 活化的 GSK3 β 水平增高; 给予体外培养原代神经元胆固醇可明显激活 GSK3 β , 磷酸化 tau 水平增高; 给予高脂饮食喂养 APOE4 小鼠腹腔注射促胆固醇外排的药物后, 可明显缓解小鼠多巴胺能神经元退变及行为学异常。以上实验表明, 在外周, APOE4 可诱导动脉粥样硬化, 而在中枢神经系统, APOE4 可使多巴胺能神经元胆固醇水平增高, 导致 tau 激酶 GSK3 β 活化, 从而导致 tau 磷酸化, 最终导致帕金森样病理及行为学改变。APOE4 可作为治疗动脉粥样硬化及帕金森病潜在的靶点。



中 M4-129-0018

Alox12 抑制剂 ML355 改善小鼠脑缺血再灌注损伤

王涛;和祯泉;牛鹏程;李晴晴;路光远;牛建国
宁夏医科大学

本研究从 GEO 数据库获取单细胞转录组数据，以 *Pecam1* 和 *Vwf* 筛选出脑缺血再灌注损伤（CIRI）模型组（tMCAO）与对照组（Sham）的小鼠脑内皮细胞。通过 KEGG 通路富集分析内皮细胞差异表达基因，发现“不饱和脂肪酸代谢”通路变化最为显著，其中 *Alox12* 在 tMCAO 组中表达显著升高，提示其可能在 CIRI 病理过程中发挥重要作用。动物实验中，通过激光散斑成像和 Longa 评分小鼠 tMCAO 模型构建成功建立。Western blot 与 qPCR 结果显示，*Alox12* 在 tMCAO 小鼠脑组织及 OGD/R（缺氧/复氧）处理的 Bend.3 内皮细胞中表达显著升高。在 tMCAO 模型建立后 1h、24h、48h 分别通过尾静脉注射 ML355（3 mg/kg）进行干预，结果显示 ML355 能显著降低 Evans Blue 渗漏，减小脑梗死体积，改善神经功能（mNSS 评分），并上调脑组织中紧密连接蛋白 ZO-1 和 Occludin 的表达。此外，在 Bend.3 细胞 OGD/R 模型中，ML355（20 μ mol/L）处理同样显著上调了 ZO-1 和 Occludin 的表达。综上所述，特异性抑制 *Alox12* 基因可通过保护血脑屏障功能改善小鼠脑缺血再灌注损伤，为 CIRI 治疗干预提供了潜在新靶点。

中 M4-129-0019

SNAP25 在肌萎缩侧索硬化症脊髓运动神经元退变中的作用

白雪,高学帅,张雪,王晨晨,闫秋鹏,陈燕春
山东第二医科大学

肌萎缩侧索硬化症（ALS）是一种慢性进行性神经退行性疾病，发病机制尚不明确，无有效治疗手段。突触结构和功能异常是 ALS 病变的重要特点，也是 ALS 疾病的早期事件。本研究聚焦突触相关蛋白 25（SNAP25）的表达变化与 ALS 发病的关系，首先对 GEO 数据库中 GSE106803 项目的 hSOD1-G93A 突变型 ALS 转基因小鼠脊髓转录组测序数据差异表达进行分析，结果显示，ALS 小鼠 *Snap25* 基因表达低于同窝 WT 小鼠。研究进一步选取 hSOD1-G93A 突变型 ALS 转基因小鼠和 hSOD1-G93A 突变型 NSC34 细胞验证 SNAP25 的差异表达，通过 qRT-PCR、Western blot 检测发现 SNAP25 在 ALS 转基因小鼠发病期及 hSOD1-G93A 突变型 NSC34 细胞中 mRNA 和蛋白表达水平较对照组降低，通过免疫荧光双标技术检测发现 ALS 转基因小鼠脊髓中 SNAP25 与神经元（NeuN）共表达，且 SNAP25/NeuN 双阳性细胞中 SNAP25 的 IOD 值较对照组降低，提示 SNAP25 在神经元的低表达与 ALS 疾病进展有关。进一步构建 *Snap25* 过表达的 hSOD1-G93A 突变型 NSC34 细胞模型，应用 CCK8 检测细胞活力变化，使用维甲酸诱导分化后观察细胞生长和突起的变化，Western blot 检测轴突膜蛋白 GAP43 的表达变化，结果显示，过表达 *Snap25* 可提高细胞活力、增加细胞突起的数量与长度，上调 GAP43 表达。本研究通过生物信息学分析和体内外实验证实，SNAP25 表达异常与 ALS 发病密切相关，SNAP25 通过影响神经突起的生长对 ALS 运动神经元发挥保护作用，相关机制有待于深入探讨。



中 M4-129-0021

TFB2M 通过改善线粒体功能对 ALS 神经元的保护作用

陈晓素，管英俊，陈燕春，刘金梦，李牧，吕舒畅，马小楠，徐春杰
潍坊医学院

肌萎缩侧索硬化症（ALS）是一种以运动神经元进行性变性为主要特征的慢性神经退行性疾病。研究表明，线粒体呼吸链复合物活性下降及线粒体 DNA（mtDNA）损伤导致的线粒体功能障碍是 ALS 神经元退化的重要因素。线粒体转录因子 B2（TFB2M）作为 mtRNA 聚合酶的辅助因子，在调控 mtDNA 转录及维持线粒体功能中发挥重要作用。为探讨 TFB2M 是否通过改善线粒体功能对 ALS 神经元发挥保护作用，通过 RNA-seq 筛选 hSOD1-G93A 突变型 ALS 转基因小鼠脊髓中差异表达基因，并进行了功能富集分析及实验验证，结果发现，ALS 转基因小鼠脊髓中 Tfb2m 表达较野生型（WT）小鼠下调。免疫荧光双标染色结果显示 TFB2M 在脊髓灰质前角与 NeuN 标记的神经元共定位，ALS 小鼠脊髓 TFB2M/NeuN 双阳性细胞中 TFB2M IOD 值降低，表明 TFB2M 在 ALS 神经元中表达显著降低。为探究 TFB2M 的作用机制，选取 hSOD1-G93A 突变型 N2A 细胞模型，以 hSOD1-WT 细胞作为对照。qRT-PCR 和 Western blot 结果显示，TFB2M 在 hSOD1-G93A 突变型 N2A 细胞中表达降低。过表达 Tfb2m 后，Seahorse XF 细胞能量代谢分析系统检测发现，hSOD1-G93A 突变型 N2A 细胞基础呼吸和最大呼吸及 ATP 产量显著升高；qRT-PCR 结果显示，mtDNA 编码的 13 个线粒体氧化磷酸化亚基表达水平升高，表明线粒体氧化磷酸化效率得到改善。CCK-8 实验证实，过表达 Tfb2m 可显著提升 hSOD1-G93A 突变型 N2A 细胞的活力。本研究结果表明，TFB2M 通过改善线粒体功能对 ALS 神经元发挥保护作用，其具体机制有待进一步研究。

●中 M4-神经系统病变● Abstract

中 M4-129-0023

RNF122 通过泛素-蛋白酶体途径调控 ALS 中 SOD1 蛋白清除

侯羽
河北医科大学

肌萎缩侧索硬化症（ALS）是一种致命的神经退行性疾病，其特征为运动神经元的逐渐退化和死亡。超氧化物歧化酶 1（Superoxide Dismutase 1, SOD1）蛋白突变是家族性 ALS 的重要致病因素，突变的 SOD1 容易异常聚集，诱发神经毒性，并通过损伤细胞内的泛素-蛋白酶体途径（UPP）进一步加剧病情。UPP 是真核细胞内降解异常和短寿命蛋白的主要系统，其功能异常可能导致突变 SOD1 蛋白的累积并加剧 ALS 的神经退行性病变。E3 泛素连接酶 RNF122 是一种在细胞蛋白质稳态调控中发挥关键作用的酶，能够特异性识别靶蛋白并将泛素分子连接到靶蛋白上，从而标记靶蛋白使其进入后续的降解途径。在 ALS-SOD1 小鼠模型中，UPP 关键蛋白的功能失调显著，同时发现 E3 泛素连接酶 RNF122 表达显著上调，提示其可能通过调控 SOD1 的泛素化修饰和代谢参与 ALS 的病理过程。本研究系统分析了 RNF122 的表达变化及其对 SOD1 蛋白聚集和 UPP 功能的调控作用，初步揭示 RNF122 在 ALS 中的潜在机制，为深入理解 ALS 的发病机制及开发靶向治疗策略提供了新的实验依据。



中 M4-129-0024

美洲大蠊提取物对 5×FAD 小鼠学习记忆功能的影响及其机制研究

朱建华 王婷 张丽桐
大理大学

研究美洲大蠊 40 %醇提物 (PAE) 对 5×FAD 小鼠学习记忆能力的影响及可能机制, 为使用 PAE 治疗阿尔茨海默病患者提供依据。选取 30 只 8 月龄 5×FAD 小鼠, 随机分为模型组 (Mod 组)、PAE 200 mg/kg/d 组 (PAE-L 组) 和 PAE 400 mg/kg/d 组 (PAE-H 组), 以 10 只野生型 C57BL/6 小鼠作为对照组 (WT 组)。药物干预 8 周后: 用水迷宫试验、新物体识别试验和旷场试验测定小鼠的学习记忆能力与运动能力; 检测各组小鼠基底前脑 ChAT 阳性神经元数目、海马及皮层 A β 斑块面积, 并测定小鼠海马组织的 SOD、MDA。新物体识别试验和水迷宫试验均显示 PAE-L 组小鼠学习记忆能力显著高于 Mod 组 ($P<0.05$)。Mod 组小鼠基底前脑 ChAT 阳性神经元数目显著低于 WT 组 ($P<0.01$)、海马和皮层中 A β 斑块面积占比显著高于 WT 组 ($P<0.01$); 与 Mod 组相比, PAE-H 组小鼠基底前脑 ChAT 阳性数目均增多、海马和皮层中 A β 斑块面积占比降低 ($P<0.01$)。 (5) 与 WT 组相比, Mod 组小鼠海马脑内 MDA 升高 ($P<0.01$), SOD 含量显著降低 ($P<0.01$); 与 Mod 组相比, PAE-L 组小鼠海马内 MDA 显著降低 ($P<0.01$), SOD 含量显著增高 ($P<0.05$)。提示 PAE 能显著改善 5×FAD 小鼠学习记忆能力, 其作用可能是通过增强神经元的抗氧化能力, 从而增加基底前脑胆碱能神经元的数目、减少脑内淀粉样蛋白沉积达到的

中 M4-129-0025

血管紧张素(1-7)通过激活 Mas 受体减轻心肺复苏后脑损伤的机制研究

朱丽, 王润
成都市金牛区人民医院

背景 心脏骤停 (CA) 患者即使恢复自主循环 (ROSC), 仍常因脑缺血再灌注损伤导致不良预后。目前临床缺乏特异性治疗手段。肾素-血管紧张素系统中的血管紧张素(1-7) [Ang(1-7)] 可通过 Mas 受体发挥抗炎、抗氧化作用, 但其在 CA 后脑保护中的作用尚未明确。

目的 探讨 Ang(1-7) 是否通过调控 Mas 受体改善 CA-心肺复苏 (CPR) 后的脑损伤。

方法 采用电诱导室颤法建立大鼠 CA-CPR-ROSC 模型。实验分组 ($n=18$ /组): 假手术组 (Sham); CA+CPR 组 (常规复苏); CA+CPR+Ang(1-7) 组 (Mas 受体激动剂干预); CA+CPR+A779 组 (Mas 受体拮抗剂干预)。生理指标: 持续监测 ROSC 后 6 小时内心率 (HR)、平均动脉压 (MAP)、血氧饱和度 (SpO₂)。神经功能: 采用神经功能缺损评分 (NDS, 0-10 分, 分数越高功能越差)。病理学: HE 染色观察海马区神经元损伤。分子机制: qPCR 和 Western Blot 检测 AT1R、AT2R、Mas 受体表达。

结果 生理稳定性: 各组 HR、MAP、SpO₂ 无统计学差异 ($P>0.05$), 排除血流动力学干扰。神经功能: Ang(1-7) 组 NDS 显著低于 CA+CPR 组 (3.2 ± 0.5 vs 5.8 ± 0.7 , $P<0.05$), 提示功能改善。A779 组 NDS 进一步升高 (7.1 ± 0.6 , $P<0.05$), 表明 Mas 受体抑制加重损伤。病理与机制: Ang(1-7) 组神经元坏死减少, A779 组损伤加剧。Ang(1-7) 显著上调 MasR 表达 (+2.1 倍) 并抑制 AT1R (-60%), A779 组作用相反。

结论 Ang(1-7) 通过激活 Mas 受体、抑制 AT1R 通路, 减轻 CPR 后脑损伤, 为临床治疗提供了潜在靶点。



中 M4-129-0026

经鼻高流量氧疗对全身麻醉术后患者脑氧饱和度的影响的研究

龚雪, 林敏, 谢莹, 胡悦
成都市双流区第一人民医院

背景 气管插管拔管后低氧血症是麻醉复苏期最常见的并发症之一, 其危险因素包括高龄、合并基础疾病、手术类型和麻醉因素等。经鼻高流量吸氧装置 (humidified high flow nasal cannula, HFNC) 是一种新型的辅助呼吸治疗和气道管理方式, 以恒定的高氧流量速率提供含有温加湿功能的气体, 增加患者氧合, 改善低氧和吸功能, 减少住院时间及气道相关并发症。

目的 探讨麻醉复苏期间使用经鼻高流量氧疗和传统鼻导管氧疗对患者术后脑氧饱和度的影响。

方法 采用前瞻性随机对照设计, 选择我院全身麻醉患者。所有患者均在手术台上仰卧位拔管, 无任何形式的物理刺激。拔管后, 通过面罩以 5L/min 给氧, 并将患者转移到麻醉后监护室(PACU)。随机分为经鼻高流量氧疗组 (A 组) 和传统鼻导管氧疗组 (B 组)。经鼻高流量氧疗组 (A 组): 设置吸氧浓度为 40%, 起始流量为 25 L/min 予患者适应, 1 min 后调节流量至 50 L/min 并维持至患者离开复苏室返回病房; 传统鼻导管氧疗组 (B 组): 患者采用普通鼻导管吸氧, 氧流量 3~5 L/min。两组均于吸氧前及吸氧后 30 min 行脑氧饱和度 (rSO₂) 测定, 记录呼吸参数。主要结局指标是复苏期低氧血症的发生率和脑氧饱和度变化差异。次要结局指标包括: PACU 时长; 肺不张的发生率;

结果 与入 PACU 时相比, 经鼻高流量组出 PACU 前的脑氧饱和度提高, 平均脑氧饱和度升高 4.78%, 而传统鼻导管氧疗组脑氧饱和度降低, 平均脑氧饱和度降低了 0.43%。两组脑氧饱和度的变化差异有统计学意义 ($P=0.047$)。与入 PACU 时相比, 两组患者出 PACU 前的氧合指数均有所提高, 其中经鼻高流量组出 PACU 前的氧合指数提高了 1.18%; 传统鼻导管氧疗组出 PACU 前的氧合指数提高了 2.33%, 两组氧合指数的变化差异无统计学意义 ($P=0.803$)。此外, 两组 PACU 时长、肺不张的发生率无显著性差异。

结论 使用经鼻高流量氧疗比传统鼻导管氧疗更能改善患者的脑氧饱和度, 具有脑保护的优势。

中 M4-129-0027

SIRT1 通过调控 Nav1.3 介导脊髓 CaMKII α 阳性神经元的兴奋性参与神经病理性疼痛

王源增, 张义丹, 马楠, 赵雯, 任秀花, 孙琰琰, 臧卫东, 曹靖
郑州大学基础医学院人体解剖学系

目的 神经病理性疼痛是一种常见的慢性疼痛疾病, 主要归因于脊髓中枢敏化。脊髓背角 (SDH) 中钙/钙调素依赖性蛋白激酶 II α (CaMKII α) 的激活是脊髓敏化的主要驱动因素。然而, SDH 中 CaMKII α 阳性 (CaMKII α +) 神经元诱导神经病理性疼痛的具体机制尚不明确。本研究旨在探讨脊髓 CaMKII α 神经元在慢性压迫性损伤 (CCI) 诱导的神经病理性疼痛中的作用, 并研究 CaMKII α 神经元激活中潜在的表现遗传机制。

方法 使用 CCI 诱导的神经病理性疼痛小鼠模型、Sirt1^{loxP/loxP} 小鼠及化学遗传学病毒, 探究脊髓 CaMKII α 神经元激活是否参与神经病理性疼痛及其机制。通过转录组测序、蛋白质免疫印迹 (Western blotting)、定量逆转录 PCR (qRT-PCR) 及免疫荧光分析检测相关分子的表达及神经元激活状态。免疫共沉淀用于观察蛋白质结合关系, 染色质免疫沉淀 (ChIP)-PCR 用于分析 Scn3a 启动子区组蛋白 H3 的乙酰化水平。

结果 在 CCI 小鼠的脊髓 CaMKII α 神经元中, 钠通道 Nav1.3 的表达升高, 而 SIRT1 的表达降低。CCI 后 CaMKII α 神经元过度激活, 抑制其活性可缓解 CCI 诱导的疼痛。过表达 SIRT1 可逆转



Nav1.3 的上调并减轻疼痛，而敲低 SIRT1 或过表达 Nav1.3 则促进 CaMKII α +神经元激活并诱发疼痛。通过敲低脊髓 SIRT1，Scn3a（编码 Nav1.3）启动子区的组蛋白 H3 乙酰化水平升高，导致 Nav1.3 表达增加。

结论 研究结果表明，神经损伤后脊髓 SIRT1 的异常降低会表观遗传地增加 Nav1.3，随后激活 CaMKII α +神经元并引起神经性疼痛。

中 M4-129-0028

硫酸乙酰肝素蛋白聚糖在 tau 蛋白中的研究进展

吴怡瞳 付源

浙江大学医学院附属第一医院

Tau 蛋白是一种微管相关蛋白，主要存在于中枢神经系统的神经元中，其异常磷酸化及病理性聚集与阿尔茨海默病等多种神经退行性疾病密切相关。硫酸乙酰肝素蛋白聚糖（HSPGs）是一类广泛分布于细胞表面及细胞外基质的大分子复合物，由核心蛋白和共价连接的一条或多条硫酸乙酰肝素（HS）链构成。近年来的研究表明，HSPGs 在 tau 蛋白“过度磷酸化—异常聚集—跨细胞传播”的病理级联中发挥关键作用。HSPGs 通过其 HS 链的负电荷特性与 tau 蛋白结合，作为分子支架促进其错误折叠与病理性自组装。在跨细胞传播过程中，HSPGs 亦通过促进 tau 蛋白释放、介导其细胞间转运以及增强胞内摄取，推动病理改变在神经网络中的扩散。HS 链的特异性硫酸化模式在 tau 病理过程中具有重要调控作用，尤其是 6-O-、3-O-及 N-硫酸化修饰与 tau 蛋白结合与聚集密切相关。因此，靶向阻断 tau-HSPGs 相互作用界面或竞争性抑制 HSPGs，可能成为延缓或阻断 tau 相关神经退行性病变的重要策略。然而，如何在有效抑制病理级联反应的同时维持 HSPGs 的生理功能，是实现此类治疗干预的关键挑战。

中 M4-129-0029

基于纳米金刚石的 miR-7 递送系统对多巴胺能神经元的保护作用

韩玉萍

成都医学院

帕金森病（PD）作为一种神经退行性疾病，其核心病理特征表现为黑质区多巴胺能神经元的进行性丢失以及 α -突触核蛋白异常聚集形成的路易小体。针对这一病理机制，我们注意到 miR-7 能够特异性靶向调控 α -突触核蛋白的编码基因 SNCA，从而有效降低其表达水平，这为 PD 的治疗提供了新的干预靶点。基于这一发现，本研究创新性地构建了纳米金刚石负载的 miR-7 递送系统。实验数据表明，该递送系统不仅能够被多巴胺能神经元高效摄取并成功表达 miR-7，更重要的是可以显著抑制 α -突触核蛋白的表达，同时有效缓解氧化应激损伤并恢复多巴胺水平。这些系统性研究结果充分证明，基于纳米金刚石的基因递送策略在 PD 治疗领域展现出重要的临床应用前景。



中 M4-129-0031

短期空间训练改善 APP/PS1 小鼠的 A β 病理和神经炎症

黄灿

北京协和医学院

β 淀粉样蛋白 (A β) 沉积是阿尔茨海默病 (AD) 的关键病理特征之一。大量研究表明, 认知训练可有效改善 AD 患者学习记忆功能。莫里斯水迷宫 (MWM) 是动物实验中经典的认知评估方法, 但值得注意的是, MWM 本身即构成一种空间学习训练过程。本研究采用 APP^{swe}/PS1 Δ E9 转基因小鼠 (一种广泛应用的 AD 动物模型), 探讨短期空间训练对 AD 病理进程的影响。研究结果显示, 短期 MWM 空间训练能够显著减少 APP/PS1 小鼠脑内 A β 斑块沉积, 且该效应至少可持续 14 天。此外, 训练还显著降低了聚集小胶质细胞的比例。这些发现表明, 即使是短期的空间认知训练也能有效缓解 AD 相关的 A β 病理进程。因此, 在基于 MWM 实验评估 AD 模型病理改变时, 需充分考虑训练效应可能带来的干预影响。

中 M4-129-0032

睡眠剥夺通过激活食欲肽信号通路促进阿尔茨海默病 Tau 病理进展

郭茜 李宏莲

华中科技大学

阿尔茨海默病 (Alzheimer's disease, AD) 发病异质性高, 机制未完全阐明, 因而临床上尚无安全有效的治疗手段。但是目前明确, AD 两大神经病理学特征为细胞内磷酸化 Tau 形成的神经纤维缠结和细胞外由 A β 沉积形成的老年斑。睡眠不足是 AD 的关键风险因素, 但是睡眠不足影响 AD 病理的分子机制仍不明确。我们关注到神经递质食欲肽 orexin-A, 在睡眠剥夺的健康志愿者以及中重度 AD 患者的脑脊液中含量显著升高, 因此我们推断睡眠剥夺可能通过激活食欲肽信号引起 AD 病理和认知功能障碍。我们将 C57 小鼠和 3 $\times$ Tg-AD 模型小鼠进行 6 周慢性睡眠剥夺, 发现小鼠认知功能下降, 海马和皮层食欲肽受体表达上调, 提示食欲肽信号激活; 接着, 我们使用重组人源性食欲肽处理 SH-SY5Y 细胞和 hiPSC 诱导分化的神经元, 体外模拟神经细胞的食欲肽信号激活, 细胞中 Tau 出现过度磷酸化, 进一步对上游发挥主要作用的激酶和脂酶进行探究, 发现磷酸脂酶 PP2A 活性受损; 为明确造成 PP2A 失活的上游因素, 我们检测了 PP2A 的翻译后修饰和内源性抑制剂水平, 观察到 PP2A 内源性抑制剂 SET 水平上调, 并与 PP2Ac 结合增多; 食欲肽双受体拮抗剂的预处理逆转以上现象; 睡眠剥夺的 C57 和 3 $\times$ Tg 小鼠海马和皮层部位出现 Tau 过度磷酸化, PP2A 活性下调, SET 水平上调。以上结果初步表明, 睡眠剥夺通过激活食欲肽信号通路促进 AD Tau 病理进展和认知功能障碍。本研究试图为 AD 发病提供新线索, 为 AD 预防和治疗提供分子靶标和干预方案。



●中 N-组织学和胚胎学● Podium

中 N-129-0003

基于 GARS 基因沉默后的蛋白质组学变化解析肌萎缩的机制

陈鹏 杨胜波 王猛
遵义医科大学

甘氨酸-tRNA 合成酶（GARS）是蛋白质合成的一个关键酶，为从蛋白质合成减少途径阐明骨骼肌萎缩的机制，本研究通过沉默 GARS 后，利用蛋白质组学技术筛选 GARS 关联的关键蛋白质，探索关键蛋白质对信号通路的影响。将 L6 细胞随机分成对照组（Control）、阴性对照组（shRNA-NC）和 GARS 沉默组（shRNA-GARS）；shRNA-GARS 慢病毒转染 L6 细胞，RT-qPCR 和 WB 检测 GARS 的表达水平；倒置显微镜下观察细胞形态变化，测量细胞直径；蛋白质组学技术检测 shRNA-NC 组和 shRNA-GARS 组细胞内的差异蛋白，进行生物信息学分析，筛选出 GARS 影响的关键蛋白质及信号通路；RT-qPCR 和 WB 验证筛选出的关键蛋白及信号通路的蛋白表达变化。结果发现，与对照组相比，shRNA-GARS 组细胞生长状态差，由椭圆型变为瘦长型，细胞皱缩，胞内有空泡；GARS 的表达明显下调，细胞直径减小， $P < 0.05$ ；检测到差异表达蛋白质 695 个（上调 352 个；下调 343 个）；GO 分析发现，这些蛋白主要与细胞骨架、增殖、分化、发育过程及免疫反应等相关；KEGG 分析发现，差异蛋白主要富集到 PI3K/AKT 通路和细胞质 DNA 感应途径等；PFIN 分析和综合组学结果发现 GARS 影响的关键蛋白是 Trim21（上调）、NRP1（下调）和 Tmem65（下调），均涉及 PI3K/AKT 通路；RT-qPCR 和 WB 检测 Trim21、NRP1 和 Tmem65 的表达变化与组学结果一致；与对照组比较，shRNA-GARS 组 PI3K 表达下调、AKT 和 mTOR 磷酸化水平下降， $P < 0.05$ 。结果表明，沉默 GARS 后，L6 细胞发生萎缩，其发生与 Trim21、NRP1 和 Tmem65 的表达变化抑制 PI3K/AKT/mTOR 通路致蛋白质合成减少有关。

中 N-129-0009

GHR（生长激素受体）阳性周细胞调节视网膜血管发育并参与 OIR 病变形过程

张曦,戴宇鹏,高兴,李涛,梅峰
陆军军医大学组织胚胎学教研室

视网膜新生血管性疾病对人类视力影响极大，甚至可以导致失明。目前这类疾病的发病机制仍不完全清楚。在我们前期研究中发现，人和小鼠脑组织的 GHR 可在周细胞较为特异表达，通过对 GHR 的调节，可以显著影响脑血管生长。因此，我们利用 GHR^{creERT2}；mT/mG 小鼠对具有丰富血管和周细胞的视网膜组织进行观察，发现 GHR 在视网膜周细胞大量表达，并在发育阶段随年龄增大而增多。利用条件敲除小鼠 PDGFR β ^{creERT}；GHR(f/f)和敲除鼠 GHR^{creERT2}；DTA 分别在发育阶段敲除 GHR，均发现视网膜血管明显减少，尤其是深层血管网。在 OIR（氧引起的视网膜病变）模型中，同样对 GHR 进行基因敲除干预，发现 OIR 中新生血管（NV）显著减少。眼内局部注射 GHR 阻断剂（GH120R 和 ATL-1103）同样可以减少 OIR 中 NV 的形成。相反，全身或者眼内注射 GH 可以明显增多 NV。

GHR 阳性周细胞在视网膜血管发育过程起重要作用，并参与 OIR 病变中新生血管的形成过程，GHR 的这一重要作用将为临床视网膜新生血管性疾病（如：ROP）带来新的治疗靶点。



中 N-129-0011

APOE 通过线粒体自噬影响甲状腺癌细胞凋亡的机制研究

孙思诺 周艳孟 王媛媛

河北北方学院

前期研究发现甲状腺乳头状癌（PTC）患者血浆和癌组织载脂蛋白 E（APOE）明显升高，APOE 通过促进细胞增殖、抑制凋亡参与 PTC 细胞的侵袭行为。APOE 是 PTC 中的线粒体自噬相关基因并与氧化应激密切相关。但 APOE 是否通过线粒体自噬调节 PTC 细胞的增殖和凋亡尚不清楚。为明确 APOE 是否通过线粒体自噬调节 PTC 细胞的增殖和凋亡，本研究采用细胞培养、瞬时转染及稳转株筛选，成功构建了 APOE 过表达（oe-APOE-TPC-1）和沉默（shAPOE-K1）细胞株；过表达和沉默效率均为（ $P<0.05$ ）；ROS 和 JC-1 检测表明 shAPOE 和 oe-APOE 组细胞 ROS 含量分别为对照组的 1.31 和 0.34 倍（ $P<0.05$ ），JC-1 红色荧光含量分别为对照组的 1.25 和 0.28 倍（ $P<0.05$ ），绿色荧光含量分别为对照组的 0.64 和 3.57 倍（ $P<0.05$ ）。透射电镜结果显示，shAPOE 组中自噬小体含量明显少于对照组，oe-APOE 组的结果相反，oe-APOE+Mdivi-1（20uM）和 oe-APOE+3-MA（20uM）处理后自噬小体明显减少。Western blot(WB)、免疫荧光（IF）以及荷瘤鼠的免疫组化结果显示，shAPOE 组线粒体自噬相关指标 LC3A/B、Beclin1 的表达下降（ $P<0.05$ ），P62、TOMM20、TIM23 的表达上升（ $P<0.05$ ），线粒体自噬通路指标 PINK1、Parkin 的表达亦显著降低（ $P<0.05$ ）；oe-APOE 组的 WB、IF 结果显示，上述指标的表达趋势与 shAPOE 组相反（ $P<0.05$ ）；oe-APOE+3-MA（20uM）处理后 Beclin1、P62 的表达趋势被逆转（ $P<0.05$ ）。qRT-PCR 结果显示 shAPOE 组 PINK1、Parkin 的 mRNA 水平降低，oe-APOE 组表达升高。平板克隆及流式细胞术结果显示，与对照组相比 oe-APOE-TPC-1 能促进 PTC 细胞的增殖（ $P<0.05$ ）、抑制 PTC 细胞的凋亡（ $P<0.05$ ），而 shAPOE-K1 则相反（ $P<0.05$ ），值得注意的是，oe-APOE+Mdivi-1（20uM）能逆转 APOE 对 PTC 细胞的增殖和凋亡的影响（ $P<0.05$ ）。可见：APOE 可通过 PINK1/Parkin 途径介导线粒体自噬进而影响甲状腺乳头状癌细胞的增殖和凋亡。

中 N-129-0013

FTO 介导 Lnc RMRP m6A 去甲基化修饰在糖尿病性白内障线粒体功能障碍中的作用及机制

宋沛蓉,陈鹏,谷雨,李菲,狄国虎

山东省青岛市青岛大学医学部基础医学院

基础医学院人体解剖与组织胚胎学 糖尿病性白内障(diabetic cataract, DC)是糖尿病严重的眼部并发症。通过临床样本分析发现，高糖环境下白内障患者前囊组织及晶状体上皮细胞（LEC）中 FTO 表达上调，m6A 去甲基化水平增强。本研究聚焦 N6-甲基腺苷（m6A），深入探讨 FTO 介导的 Lnc RMRP 去甲基化修饰在晶状体透明性调控中的作用。机制研究揭示：FTO 通过促进线粒体活性氧累积，降低线粒体膜电位及膜活性，加重高糖诱导的 LEC 损伤。甲基化 RNA 免疫沉淀测序（MeRIP-Seq）及转录组测序（RNA-Seq）鉴定 Lnc RMRP 为 FTO 下游靶标，MeRIP-qPCR 进一步证实 FTO 通过去甲基化作用负向调控 Lnc RMRP 表达。构建 RMRP 基因敲除（RMRP^{-/-}）LEC 模型，发现线粒体结构异常、拷贝数减少、mtDNA 编码蛋白表达下降，氧化磷酸化水平降低等特征。构建 AAV-FTO 前房注射模拟 DC 动物模型，进一步实施 AAV-Lnc RMRP 基因治疗干预，发现 Lnc RMRP 过表达可缓解白内障表型。本研究首次揭示 FTO/Lnc RMRP-线粒体功能调控轴在 DC 发生发展中的关键作用，为临床防治提供了新的分子靶点。



中 N-129-0014

角膜上皮细胞线粒体能量不足：干眼症病理学的一个关键因素

Wenshuo Han, Fei Li, Yu Gu, Guohu Di, Peng Chen

青岛大学

干眼症是因泪液分泌不足或蒸发过快导致的眼表疾病，会造成角膜上皮损伤与视力障碍，其发病和眼表细胞能量代谢异常密切相关。本研究旨在探究能量代谢异常在干眼症病理中的作用，并评估辅酶 Q10（CoQ10）纳米滴眼液改善干眼症的效果。研究构建了东莨菪碱诱导的小鼠干眼模型和氯化钠高渗诱导的人角膜上皮细胞模型。结果显示，模型中能量代谢指标 p-AMPK、COX IV 表达显著下调，细胞和线粒体内 ROS 水平上升，NLRP3 炎症小体通路激活；细胞氧化磷酸化水平降低，代谢模式转向糖酵解。基于 CoQ10 可维持 ATP 合成、抑制 ROS 生成的特性，研究开发出 CoQ10 纳米滴眼液。体内外实验证实，该制剂能有效改善角膜上皮能量代谢，恢复 p-AMPK/AMPK 平衡与 COX IV 表达，重建氧化磷酸化代谢模式，同时降低线粒体 ROS 生成，抑制 NLRP3 炎症通路活性。研究表明，能量代谢障碍引发的线粒体功能失调和 NLRP3 炎症小体激活是干眼症重要病理机制。CoQ10 纳米滴眼液通过增强线粒体氧化磷酸化效率、抑制 ROS-NLRP3 轴活化，逆转角膜上皮代谢失衡与炎症反应，为干眼症治疗提供了新策略。

中 N-129-0017

DLEU2-ELAVL1-RCC2 轴对甲状腺乳头状癌细胞迁移侵袭的影响

左素微,王媛媛,周艳孟

河北北方学院

甲状腺乳头状癌（PTC）的发病率正在迅速上升，淋巴结转移是其复发和不良预后的主要原因。课题组此前通过 LncRNA 芯片和血液检测发现 DLEU2 在 PTC 组织和血浆中高度表达，并认为 DLEU2 可能作为竞争性内源性 RNA 参与 PTC 的发生和进展。然而，DLEU2 是否通过与 RNA 结合蛋白（RBP）的相互作用影响 PTC 的恶性表型仍不明确。本研究旨在利用多种实验技术探讨 DLEU2-ELAVL1-RCC2 轴在调节 PTC 细胞迁移和侵袭中的作用机制。生物信息学预测结果证实 DLEU2-ELAVL1-RCC2 之间存在靶向调控关系。FISH 与免疫荧光共定位实验显示，DLEU2 与 ELAVL1 在 PTC 细胞的细胞质中共同表达。并且成功构建 DLEU2 过表达与沉默细胞株（oe-DLEU2-BCPAP vs sh-DLEU2-K1）、ELAVL1 过表达与沉默细胞株（oe-ELAVL1-BCPA vs sh-ELAVL1-K1）。Western Blot 与 qRT-PCR 结果表明，在 oe-DLEU2 组中，ELAVL1 和 RCC2 的 mRNA 及蛋白水平显著升高（ $P < 0.05$ ）；而在 sh-DLEU2 组中结果呈现相反趋势。oe-ELAVL1 组中，RCC2、Wnt5a、 β -Catenin 和 Vimentin 蛋白水平显著升高（ $P < 0.05$ ），E-Cadherin 表达显著降低（ $P < 0.05$ ）；在 sh-ELAVL1 组中，RCC2 和 N-Cadherin 蛋白水平下降，E-Cadherin 表达上升（ $P < 0.05$ ）；放线菌素 D 加药处理后，qRT-PCR 结果显示 sh-ELAVL1 组中 RCC2 的 mRNA 稳定性低于对照组（ $P < 0.05$ ）。划痕实验和 Transwell 实验结果表明，oe-ELAVL1 组显著促进了 PTC 细胞的迁移和侵袭能力（ $P < 0.05$ ），而 sh-ELAVL1 组则抑制了细胞的迁移和侵袭（ $P < 0.05$ ）。可见：DLEU2-ELAVL1-RCC2 轴可通过 Wnt5a/ β -Catenin 信号通路促进 PTC 细胞的迁移和侵袭。



●中 N-组织学和胚胎学● Poster

中 N-129-0006

IGF-1 通过 AMPK 途径调节糖尿病胃轻瘫大鼠胃平滑肌细胞缝隙连接重构的实验研究

苏锦宇 张高源 张默函
延边大学

本研究旨在探讨高糖通过 AMPK 途径诱导胃平滑肌细胞 GJ 改变及 IGF-1 干预机制。实验采用糖尿病大鼠模型及原代胃平滑肌细胞作为研究对象，通过免疫组织化学、荧光示踪及流式细胞仪检测、Western Blot、蛋白磷酸抗体芯片等多学科实验技术，分析高糖条件下胃平滑肌 GJ 重构、AMPK 活性及通路变化及介入 IGF-1 后的干预效果。动物实验结果发现 DGP 模型大鼠胃排空延迟、胃肠推进速率降低以及胃窦平滑肌收缩功能下降，其胃平滑肌组织 Cx43 蛋白表达增加，膜浆比升高，磷酸化位点 Ser368 的磷酸化水平增加，导致 GJ 通道开放率下降。IGF-1 干预后对上述指标均有所改善。细胞实验结果显示，与 Normal Glucose 组相比，High Glucose 组大鼠胃平滑肌细胞带有两种荧光标记的细胞数量占总细胞数量的百分比显著降低，使细胞间染料传递率降低，结合 PCR-array 的检测结果显示，高糖条件下大鼠胃平滑肌细胞 19 个 GJ 相关基因异常表达，说明高糖抑制大鼠胃平滑肌细胞 GJ 功能，表明存在重构现象。而介入 IGF-1 干预后发现 IGF-1 通过调控关键基因如 Gjc3 和 Gja1 对大鼠胃平滑肌细胞 GJ 重构有所缓解。上述结果提示高糖情况下 DGP 大鼠胃平滑肌存在 GJ 重构且 IGF-1 可以改善 DGP 大鼠胃平滑肌 GJ 功能，进而恢复胃动力。针对其具体机制，体内和体外实验结果同时验证了高糖条件下大鼠胃平滑肌细胞 AMPK 活性增强，伴随 AMP/ATP 比值增加和上游激酶 TAK1 蛋白、LKB1 蛋白的活性以及 CaMkk β 的表达上升，使用 AMPK 抑制剂 Compound-C 后部分缓解了高糖诱导的大鼠胃平滑肌细胞 GJ 功能损伤。介入 IGF-1 后，发现 IGF-1 显著降低了 AMPK 通路上游 AMP/ATP 的比值、TAK1、LKB1 蛋白的活性以及 CaMkk β 的表达，通过 AMPK 下游分子如 CaMKII、p53、AKT1 调控 Cx43 功能，进而缓解大鼠胃平滑肌细胞至组织 GJ 重构。至此我们得出结论：（1）糖尿病胃轻瘫大鼠胃平滑肌存在缝隙连接重构（2）AMPK 参与缝隙连接重构的发生（3）IGF-1 能够通过 AMPK 调控缝隙连接的重构

中 N-129-0010

BACH1/ERMAP 信号轴调控胶质瘤免疫逃逸的机制研究

瞿勋茹, 苏敏, 汪祖利
贵州医科大学

胶质瘤作为高侵袭性脑肿瘤，其免疫抑制微环境致使现有免疫治疗疗效受限。本研究发现转录因子 BACH1 可特异性结合 ERMAP 启动子并转录调控其在胶质瘤中的异常高表达，临床样本分析显示 ERMAP 与 BACH1 表达呈正相关且均与不良预后显著相关。机制上，BACH1/ERMAP 轴通过抑制 CD8⁺ T 细胞活化增殖及 IFN- γ 、TNF- α 分泌，并阻碍巨噬细胞向 M1 型极化，进而构建免疫抑制微环境；同时 ERMAP 依赖激活 P-ERK 信号通路促进胶质瘤细胞增殖、迁移和侵袭。体内实验证实，敲除 BACH1/ERMAP 可减少肿瘤体积，增加肿瘤微环境中 CD8⁺ T 细胞浸润并降低其耗竭标志物 PD-1 表达，延长小鼠中位生存期，同时减少调节性 T 细胞和髓系抑制细胞浸润。本研究首次揭示 BACH1/ERMAP 轴通过调控免疫逃逸及促癌通路驱动胶质瘤进展，为胶质瘤免疫治疗提供了靶向 BACH1/ERMAP 轴的新策略，后续拟通过分子对接和单克隆抗体技术筛选 ERMAP 特异性抑制剂以推进临床转化。



中 N-129-0012

HSP70.1 通过抑制 PPP1CC 泛素化调控小鼠滋养外胚层发育

林子杭 王世鄂
福建医科大学

滋养外胚层的形成对早期胚胎发育和妊娠成功建立至关重要。本研究以小鼠植入前胚为主要研究模型，通过显微注射、RNA 干扰、Real-Time PCR、免疫荧光染色、Western-blot、CoIP/MS、GST pull down、酵母双杂交、体内泛素化、胚胎体外移植等实验，阐明热休克蛋白 70.1 (Heat shock protein 70.1, Hsp70.1) 调控小鼠滋养外胚层形成的分子机制。结果表明，HSP70.1 在小鼠桑椹胚时期细胞质中特异性高表达，敲低其表达会影响囊胚的形成，并引起滋养外胚层标志基因 Cdx2 表达量降低。使用 mCherry mRNA 与 Hsp70.1 siRNA 进行示踪注射，发现 Hsp70.1 敲低后的细胞无法形成滋养外胚层，进一步影响胚胎植入率，同时 Hsp70.1 表达降低将导致 Hippo 信号通路中 PPP1CC、CDX2、active-YAP 表达降低，p-YAP 表达增高。HSP70.1 可能通过蛋白酶体途径抑制 PPP1CC 降解，敲低/过表达 HSP70.1 后 PPP1CC 结合的 K48 多聚泛素化明显升高/降低。蛋白对接、Co-IP、酵母双杂交、GST pull down 结果表明，HSP70.1 与 PPP1CC 不存在蛋白直接结合，而是通过 ARIH1 发挥的桥梁作用进行连接。早胚同时敲低 Hsp70.1 与 ARIH1，能够挽救小鼠胚胎发育率，同时下游基因表达恢复至正常水平。以上结果提示，HSP70.1 在滋养外胚层分化及早胚植入过程中发挥重要作用，其作用机制可能是与 ARIH1 互作，保护 PPP1CC 免于被泛素蛋白酶体途径降解，促进 YAP 活化入核，维持 Cdx2 表达影响滋养外胚层形成。该研究结果将为促进囊胚形成和胚胎植入的研究提供理论依据，对改进辅助生殖技术和治疗妊娠失败提供新的思路 and 策略。

●中 N-组织学和胚胎学● Abstract

中 N-129-0001

吴茱萸碱通过调控 TLR4-MyD88-NF- κ B 通路改善 D-gal 诱导衰老中的炎症和肠道屏障损伤

万果然,张盛尧,张萌,王健,骆军令,汪琼芳,黄波月,冉建华
重庆医科大学

衰老相关的慢性炎症已成为多种老年疾病的主要病理特征。近年来，炎症激活影响肠道屏障功能在衰老及其相关疾病中的作用引起了广泛关注。中药小分子化合物吴茱萸碱 (Evodiamine, EVO) 因其抗炎、抗肿瘤和神经保护作用被认为是一种潜在的抗衰老药物，但其是否在衰老过程具有肠道保护作用仍需进一步探索。本研究使用 40mg/kg 的 EVO 治疗由 D-galactose (D-gal) 诱导的 C57 小鼠衰老模型，探讨 EVO 对衰老相关炎症反应和肠道屏障功能的影响。HE 染色结果表明 D-gal 组小鼠结肠黏膜上皮细胞损伤，固有层炎症细胞浸润，肠道平滑肌层萎缩且断裂，腺体结构变化等。经 EVO 治疗后，结肠组织的病理损伤显著改善。WB 和 Elisa 检测结果表明，在衰老小鼠中，TLR4-MyD88-NF- κ B 炎症通路显著激活，伴随 IL-6 和 TNF- α 等炎症因子的升高；EVO 治疗后上述炎症标志物的表达下降。此外，紧密连接蛋白 ZO-1 和 Occludin 的表达在 D-gal 模型中明显下降，而 EVO 治疗后表达上调，提示 EVO 具有修复肠道屏障功能的潜力。综上所述，EVO 可通过调控 TLR4-MyD88-NF- κ B 炎症通路抑制炎症反应和修复肠道屏障，有效调节肠道微环境，从而减缓衰老相关的肠道生理功能障碍。



中 N-129-0002

蛋白组学分析肌动蛋白丝组分变化以解析卒中后痉挛肌肌节变化的机制

杨胜波 何昀 刘光润
遵义医科大学解剖教研室

本研究通过定量蛋白质组学分析大鼠脑卒中后痉挛肌内肌动蛋白丝的组分变化以解析卒中后痉挛肌的肌节出现变化的机制。将大鼠 12 只，随机分为正常、卒中后第 3 天、第 6 天和第 9 天四组。线栓法制作脑卒中后腓肠肌痉挛模型后，行 Zea-Longa 评分和肌张力检测，Mallory 磷钨酸苏木精染色肌节，定量蛋白组学分析肌动蛋白丝的组分变化。结果发现，与正常组比较，各卒中组的 Zea-Longa 评分和肌张力明显升高，腓肠肌肌节长度增加和宽度减小($P<0.05$)。生物信息学分析发现，各卒中组腓肠肌内细胞骨架类蛋白表达出现明显变化，尤以肌动蛋白丝上的蛋白表达变化明显。卒中后第 3 天，上调的蛋白有 Ablim1、Tpm3、Lmod2、Dbnl、Parvb 和 Capg，Actn2 和 Pdlim1；下调的蛋白有 Tpm1 和 Gsn，Actn3 和 Pdlim7。卒中后第 6 天，新增 Tpm2、Parva 和 Dstn，Pdlim3 和 Ldb3 表达上调，Lmod3 表达下调。卒中后第 9 天，出现 Actn2、Pdlim7 和 Cfl2 表达下调。结论：这些变化的蛋白质是能够促进肌动蛋白丝延长和调控 Z 盘生长的蛋白质，其表达变化可能是脑卒中后痉挛肌内肌节变化的机制。

中 N-129-0004

松果体细胞通过合成内源性褪黑素降低 ROS 水平维持增殖活力

蓝倩云,宋军,张智广,许振国,王璐旻,周瑞祥
福建医科大学

松果体作为哺乳动物神经内分泌系统的重要组成部分，可通过分泌褪黑素（Melatonin，MLT）调控昼夜节律与机体稳态。有研究报道松果体 MLT 的降低与睡眠障碍、肿瘤、神经退行性病变等疾病密切相关。为探讨松果体 MLT 的合成及其功能，本研究取第 1、3、7、11、14、30 周龄大鼠松果体，通过质谱检测 MLT 水平，组织学分析松果体组织细胞组成，免疫组化检测 MLT 合成关键限速酶 N-乙酰基转移酶（Aralkylamine N-acetyltransferase，AANAT）表达水平，结果发现伴随大鼠年龄的增大组织中 MLT 含量逐渐降低，组织内松果体细胞减少，并出现大量空泡结构，但 AANAT 表达水平与年龄无显著相关。为探究内源性 MLT 合成对松果体细胞的影响，构建永生化的松果体细胞系，用去甲肾上腺素和 5-羟色胺干预激活松果体细胞 MLT 合成，通过 siRNA 沉默 Aanat 基因干扰 MLT 合成，评估 MLT 对松果体细胞生物学特性的影响。结果发现，松果体细胞 Aanat 基因沉默降低内源性 MLT 的合成，细胞出现增殖活力下降，凋亡增加等现象。为探究内源性 MLT 合成对松果体细胞的作用机制，检测细胞内 ROS 水平，结果发现 MLT 合成下降引起细胞内 ROS 升高，同时增加 LC3 和 p62 等自噬相关分子表达。以上研究表明，松果体细胞的内源性 MLT 合成可以降低细胞内 ROS 水平，维持细胞增殖，降低细胞凋亡。永生化的松果体细胞系的建立也将为松果体 MLT 功能研究建立基础。



中 N-129-0007

基于网络药理学探讨葛木芡连汤通过 cAMP-PKA-CREB 信号通路调控肠屏障和巨噬细胞极化缓解溃疡性结肠炎的作用机制

张乐誉, 解天俭, 李姝融, 张玮函, 尚子翔, 余可, 杨思琪, 曹明朴, 樊译蔓, 何梓梁, 李恒希
昆明医科大学

本研究旨在探究云南戴派经方葛木芡连汤通过 cAMP-PKA-CREB 信号通路调控肠屏障和巨噬细胞极化, 以缓解溃疡性结肠炎 (Ulcerative Colitis, UC) 的作用机制。体内使用 DSS 构建 UC 模型, 体外构建 LPS 诱导的 RAW264.7 炎症细胞模型, 分组为对照组、模型组、低剂量组 (250mg/kg)、中剂量组 (500mg/kg)、高剂量组 (750mg/kg)、美沙拉嗪组 (200mg/kg) 和 H-89 抑制剂组。采用组织学 HE、PAS 染色实验, 分子生物学 Western Blot、RT-qPCR、免疫荧光、ELISA 实验等。基于网络药理学筛选出葛木芡连汤中活性成分, 与 UC 进行靶点交集, 构建 PPI 网络, 进行 GO 富集和 KEGG 富集, 建立靶点—通路网络图, 确定 cAMP-PKA-CREB 信号通路。结果显示, 与模型组相比, 中剂量组治疗效果最佳, 组织病理学分析发现, 结肠黏膜损伤减轻, 炎症浸润程度减少, 上皮细胞糖原储存减少; Western Blot、RT-qPCR 结果显示, cAMP、p-PKA、p-CREB (Ser133) 和总 CREB 相关 mRNA 及蛋白表达上调, 加入 H-89 抑制剂后上述上调作用受到抑制 ($P<0.01$); 免疫荧光显示, iNOS、TNF- α 表达下调, Arg-1、IL-10 表达上调, M1/M2 比值降低 ($P<0.05$), ELISA 显示血清中 TNF- α 、IL-6 含量下降, IL-10 含量上升 ($P<0.005$)。综上所述, 葛木芡连汤通过激活 cAMP-PKA-CREB 信号通路促进肠屏障修复和巨噬细胞极化, 减轻炎症反应, 从而缓解溃疡性结肠炎。

中 N-129-0008

人胚胎眶上壁软骨和骨重叠发育过程的观察

李紫萌, 孔祥攀, 赵鹏, 村上弦, 金哲悟
江南大学

岩见沢明日佳病院内科 成人的眶上壁由额骨 (FB) 眶部和后方的蝶骨小翼构成, 而在人胚胎发育过程中骨性结构衔接处存在重叠现象, 其具体发育需要进一步明确。本研究中观察了胎龄 (GA) 7-39 周之间的 38 例人胚胎连续序列切片中的眶上壁的特点。观察结果示, GA 7-8 周时蝶骨小翼从眶蝶区向前外侧延伸, 直到 GA 9 周将覆盖上壁的后内侧象限, 随后几乎到达上壁的中心区域。同时, FB 出现在大脑额叶前方, 抵至上壁的前外侧角, 随后继续向后延伸并覆盖到眶的前半部分。此外, 来自筛板的上外侧板覆盖了眶上壁的内侧缘, 并且在 GA 11-16 周时其面积为最大。在软骨与骨相互交界处, FB 则部分重叠并延伸到蝶骨小翼或筛骨的下方。我们发现 FB 与蝶骨小翼在眶上壁中心区域至少有三分之一部分的重叠现象, 而蝶骨小翼骨化较晚, 出生后不会退化和吸收。另外, 胎儿颅前窝的不平坦结构特点还有受到外界的鼻隆起时间较晚和颅窝内结构向颅底深面塌陷密切相关, 即胎儿期与成人的眼、鼻和额叶的结构具有显著差异。因此, 我们认为重叠部位的骨和软骨的滑动和迁移现象, 将影响眶上壁和颅前窝的重构和生长发育。



中 N-129-0015

Senolytics 对代谢综合征大鼠衰老肝细胞的清除作用研究

张大勇;李诚信;汪千红;陈林欣;孙一蹇;姜华峰
浙大城市学院医学院

本研究旨在探索 Senolytics 类药物在非酒精性脂肪性肝病 (NAFLD) 相关肝细胞衰老中的干预效果。通过建立以游离脂肪酸 (FFA) 诱导的人肝细胞 HL7702 衰老模型,我们发现 D+Q (达沙替尼+槲皮素) 和 ABT-263 在体外均能显著降低衰老相关蛋白 (p53、p21、p16) 的表达,减少脂质积聚,并显著降低 HL7702 衰老细胞数量。基于体外实验结果,我们进一步构建了高热量饲料诱导 SD 大鼠 NAFLD 实验动物模型进行体内研究。结果显示, D+Q 和 ABT-263 均可缓解体重增加、腹围增加、葡萄糖耐量下降以及肝脏甘油三酯水平升高等代谢紊乱表现,改善肝细胞脂肪变性。特别是 D+Q 在降低血清甘油三酯、减轻肝组织衰老细胞数量、下调衰老相关分泌表型相关基因 (IL-6、IL-1 β 、iNOS) 表达方面表现更为显著。总之, D+Q 在体内外均显示出优于 ABT-263 和 Fisetin 的 Senolytics 活性,尤其在缓解 NAFLD 进程中的肝细胞衰老及其代谢异常方面更具潜力。本研究为从细胞衰老角度探讨 NAFLD 治疗新方法提供了有价值的基础实验数据。

中 N-129-0016

Syncytin-1 调节 CXCR4 信号通路对子痫前期滋养细胞迁移和侵袭的影响

张海峰,王雅楠,陈雪玲,薛蕴珊,杨菊,陈海滨
汕头大学医学院

子痫前期是妊娠特发性疾病,以妊娠 20 周后母体新发高血压和蛋白尿为主要特征,严重威胁母婴健康。既往研究表明 Syncytin-1 与 CXCR4 均参与子痫前期的发生发展,但具体机制尚不明确。本研究旨在探究 Syncytin-1 与 CXCR4 相关信号通路在子痫前期滋养细胞中发挥的生物学功能。通过构建 Syncytin-a 条件性诱导敲除小鼠、String 数据库预测、分子对接、免疫荧光、免疫共沉淀探究 Syncytin-1 和 CXCR4 潜在作用关系;通过生物信息学预测子痫前期胎盘组织的差异表达基因及信号通路;使用过氧化氢处理 HTR-8/SVneo 细胞模拟子痫前期氧化应激状态,并收集正常妊娠和子痫前期产妇产胎盘组织验证信号通路的变化情况;在 HTR-8/SVneo 细胞中敲低 Syncytin-1 探究下游信号通路变化,并检测细胞迁移和侵袭能力;通过 CXCR4 抑制剂 AMD3100 和激动剂 NUCC390 进行回复实验。结果显示 Syncytin-1 与 CXCR4 存在共定位及相互作用;子痫前期细胞模型和子痫前期胎盘组织中 Syncytin-1 和 CXCR4 相关信号通路 (GNAQ/CALM2/NFATC1) 被抑制。HTR-8/SVneo 细胞中 Syncytin-1 被敲降后, CXCR4/GNAQ/CALM2/NFATC1 被抑制, HTR-8/SVneo 细胞迁移和侵袭能力降低,而使用 AMD3100 和 NUCC390 处理 HTR-8/SVneo 细胞后可回复该生物学效应。Syncytin-1 表达下调可通过抑制 CXCR4/GNAQ/CALM2/NFATC1 信号通路,抑制滋养细胞的迁移和侵袭能力,进而参与子痫前期的发生发展。



中 N-129-0018

不同染色方法对长期多聚甲醛固定组织免疫荧光染色效果的影响

皇甫李仁 熊柳林

昆明医科大学神经科学研究院

本研究系统比较了3种荧光染色方法对4%多聚甲醛固定1年的猴脑组织冰冻切片的染色效果。以4%多聚甲醛固定1年的猴脑组织冰冻切片为研究对象，比较了三种免疫荧光染色方法的效果差异：

（1）常规免疫荧光染色法：组织切片复温经PBST洗涤后直接封闭透膜，一抗（NeuN、IBA1、GFAP）孵育和荧光二抗标记；（2）优化免疫荧光染色法：在常规方法基础上引入柠檬酸钠-EDTA 抗原修复（95℃，20 分钟）后进行封闭透膜，一抗孵育和荧光二抗标记；（3）多重免疫荧光染色法：组织切片复温经PBST洗涤后进行柠檬酸钠-EDTA 抗原修复，3%过氧化氢封闭阻断后进行封闭透膜，孵育第一个一抗，HRP 标记二抗后进行TYR 荧光染料（488）反应。重复以上方法至一抗后进行TYR 荧光染料反应，依次循环标记抗体。采用酪胺信号放大（TSA）技术，通过HRP 标记二抗催化酪胺荧光素共价结合实现多重标记。结果显示：常规染色因抗原遮蔽无阳性信号；经抗原修复后，小胶质细胞标记物IBA1 和星形胶质细胞标记物GFAP 呈现阳性染色，但神经元标记物NeuN 仍为阴性；采用TSA 技术的多重免疫荧光染色可同时检测上述三种抗原，其中NeuN 信号最强。该研究表明，长期固定导致的抗原遮蔽效应具有抗原特异性，多重免疫荧光结合抗原修复技术能有效突破这一限制，但需注意脱片风险。本研究为长期固定组织的免疫荧光检测提供了方法学参考，建议根据目标抗原特性选择最佳染色方案。

●中 O-干细胞与发育生物学● Podium

中 O-129-0001

MSCs 联合 Atg7 介导的自噬促进骨骼肌损伤修复的机制研究

张琼尹 杨雪松 王广

暨南大学

骨骼肌损伤修复是肌源性祖细胞从静止到激活、增殖、分化、融合以形成新的肌纤维的过程，这与发育中肌肉的形成高度相似。如何利用肌祖细胞的发育特性促进骨骼肌损伤后的快速修复值得深入研究。间充质干细胞（MSCs）因其多向分化潜能与旁分泌功能被广泛应用于组织修复，但其在骨骼肌损伤修复中的实际作用仍有待深入探讨与验证。我们发现在肌发育过程中细胞自噬显著激活，其中自噬关键基因 Atg7 在肌祖细胞分化形成骨骼肌过程中扮演了重要角色。因此本研究旨在联合 Atg7 及 MSCs 找寻快速促进骨骼肌损伤修复的治疗策略。首先我们利用心脏毒素（CTX）构建小鼠胫骨前肌损伤模型并利用慢病毒载体构建过表达 Atg7 的间充质干细胞（Atg7OE-MSCs）治疗体系。通过行为学实验分析小鼠运动能力恢复情况；利用组织学染色、qPCR、Western Blot 等方法检测自噬、Myogenic Regulatory Factors（MRFs）和炎症相关因子的表达。结合体外 C2C12 损伤模型共同探究 Atg7OE-MSCs 对肌细胞再生的影响。我们的研究表明，Atg7OE-MSCs 具有更显著的快速促进骨骼肌损伤修复的疗效，Atg7 在骨骼肌损伤修复过程中起到了关键的调控作用。



中 O-129-0002

LDLR 通过 Wnt/ β -catenin 信号通路影响雌性小鼠骨骼肌及骨微结构的研究

胡悦,刘慧玲,赵超越,陆美晴,陈彦利,方晓燕,白志坤,黎飏,钟斌,李海,王金花
右江民族医学院

骨质疏松症是老年人群骨骼肌质量减少与骨微结构退变的共患病，其机制尚未明确。本研究通过构建骨骼肌 LDLR 敲低老年雌性小鼠模型，探讨 LDLR 对骨骼肌及骨微结构的作用及其可能机制。实验设 6 只青年小鼠为青年对照组，同时将 24 只老年雌性 C57BL/6J 小鼠随机分为老年对照组、空载体组、LDLR 敲低组，这些组尾静脉对应注射生理盐水、生理盐水、空载体、LDLR 敲低载体，干预 8 周后测试骨骼肌功能、观察微细结构和检测骨骼肌质量标志物，观察骨微结构、测定骨微结构的各项参数，评估骨骼结构和质量变化，并检测 Wnt/ β -catenin 信号通路的关键分子，探讨其中的作用机制。结果显示：老年对照组较青年对照组前肢抓力下降 47% ($P<0.01$)，腓肠肌 LDLR mRNA 升高 43% ($P<0.05$)，肌纤维间隙增宽，骨小梁体积分数 (BV/TV) 下降 51% ($P<0.01$)，皮质骨厚度减少 19% ($P<0.05$)，证实了老年小鼠出现了肌肉萎缩、肌肉质量减少，同时伴随骨质量下降。LDLR 敲低组较空载体组抓力提升 19% ($P<0.05$)，腓肠肌 LDLR mRNA 降低 62% ($P<0.01$)，肌纤维排列紧密，MYF5 与 MYH2 mRNA 分别增加 64%和 45% ($P<0.01$)；骨小梁数量增加 38% ($P<0.05$)，Wnt5a 蛋白表达降低 55% ($P<0.01$)， β -catenin 蛋白升高 171% ($P<0.01$)。结论：敲低骨骼肌 LDLR 可能通过调控 Wnt/ β -catenin 信号通路改善老年雌性小鼠骨骼肌功能与骨微结构，这为靶向防治肌少-骨质疏松症提供潜在候选分子和实验依据。

中 O-129-0006

PDLIM2 通过 β -actin 激活 β -catenin 通路促进人脂肪干细胞化学诱导和循环拉伸载荷成骨分化

石玉莲,樊庭宇,刘家瑄,欧阳钧,戴景兴
南方医科大学

人脂肪干细胞 (hASCs) 的成骨分化能力在骨组织工程中具有重要应用价值，但其分子调控机制尚未完全阐明。本研究探讨了 PDLIM2 通过 β -actin/ β -catenin 信号通路调控 hASCs 成骨分化的作用及机制。实验采用 Western blot 检测成骨分化过程中 PDLIM2、 β -actin 及 β -catenin 的蛋白表达变化，免疫荧光观察其亚细胞定位，ALP 染色评估成骨分化表型。通过 siRNA 敲降 PDLIM2 表达，并联合 Jasplakinolide (微丝聚合剂)、细胞松弛素 D (微丝解聚剂) 及 SKL2001 (β -catenin 激活剂) 等药物分析其对成骨分化的影响。结果显示，PDLIM2 在成骨分化过程中表达上调，敲降 PDLIM2 显著抑制 ALP 活性及成骨相关基因表达；Jasplakinolide 促进成骨分化，而细胞松弛素 D 则抑制该过程。回复实验证实，Jasplakinolide 可挽救 PDLIM2 敲降导致的成骨分化降低，SKL2001 亦可逆转 PDLIM2 缺失的成骨抑制作用。此外，10%拉伸形变、0.5 Hz 的循环拉伸刺激可上调 PDLIM2 表达，而敲降 PDLIM2 后拉伸促成骨的能力显著降低，且该现象可被 Jasplakinolide 部分回复。而机械拉伸刺激可能通过上调 PDLIM2 表达进一步强化该调控网络。本研究为骨组织工程提供了潜在干预靶点。



中 O-129-0007

Zyxin/testin/ β -actin 复合物通过调控 YAP 蛋白核定位促进骨再生

樊庭宇, 石玉莲, 刘家瑄, 欧阳钧, 戴景兴
南方医科大学

人脂肪干细胞（hASCs）的成骨分化能力在骨再生医学中占据着关键地位，具有广阔的应用前景。然而，其在分子层面的调控机制仍存在诸多未知。本研究探讨了 hASCs 中黏着斑复合物 zyxin/testin/ β -actin 通过调控 YAP 蛋白核定位促进骨再生的机制。生物信息学分析揭示卵巢切除（OVX）小鼠骨髓间充质干细胞的黏着斑功能显著降低，且 zyxin 是其中的关键差异分子。免疫共沉淀、GST-pulldown 和分子动力学模拟证实了 zyxin、testin 和 β -actin 相互作用。Zyxin 的 LIM 结构域与 testin 的 PET/LIM 结构域协同结合 β -actin，形成功能性复合物。核蛋白分析结果显示该复合物可通过促进 YAP 核转位进而增强成骨分化能力。在 OVX 小鼠模型实验中，我们观察到，注射经微丝聚合剂（Jasplakinolide）预处理的 hASCs 能够有效改善骨丢失，而干扰复合物的形成则无法产生同样的效果。本研究为基于 hASCs 的骨组织工程提供了新的分子靶点和治疗策略。

中 O-129-0011

ADSCs 移植通过激活 PI3K/AKT/M-TOR 信号通路改善衰老睾丸支持细胞功能的研究

江艳玲, 张维炊, 罗紫艺, 朱金凤, 杨春
广东医科大学

睾丸支持细胞（Sertoli cells, SCs）是生殖细胞发育的关键支持者和精子发生的协调者。随年龄增长，SCs 数量的减少和分泌功能逐渐减退，可直接导致男性睾丸功能衰退。研究显示 PI3K/AKT/m-TOR 信号通路是细胞内重要的调节通路，它能够促进 SCs 的增殖和抗凋亡，调节自噬，维持 SCs 的正常功能和精子发生过程。研究表明脂肪源干细胞（Adipose-derived stem cells, ADSCs）激活 PI3K/AKT/m-TOR 信号通路可抑制自噬。尽管已有研究证实 ADSCs 可通过调控自噬改善衰老细胞的功能，但 ADSCs 是否通过 PI3K/AKT/M-TOR 信号通路调节自噬来改善衰老 SCs 功能有待进一步研究。本研究通过构建体内和体外实验体系，分别使用 30 只 SD 大鼠和 TM4 细胞，设置对照组、模型组以及 ADSCs 干预组。本研究重点关注 PI3K/AKT/m-TOR 信号通路介导的自噬反应，利用 Western Blot 法检测三组样本相关蛋白表达变化。体外实验结果显示：与模型组相比，干预组衰老 TM4 细胞 PI3K/AKT/m-TOR 信号通路相关蛋白 P-PI3K、PI3K 表达均降低，Beclin1、LC3B、P62/SQSTM1 自噬相关蛋白表达下降。体内实验结果显示：与模型组相比，干预组 SD 大鼠睾丸组织 PI3K、P-PI3K、M-TOR 的表达均提高，干预组 Beclin1、LC3B 的蛋白表达降低，而 P62/SQSTM1 表达升高。以上结果表明 PI3K/AKT/m-TOR 通路对改善衰老睾丸功能关键，ADSCs 治疗效果与该通路调控密切相关。



中 O-129-0013

间充质干细胞外泌体通过 AMPK/FOXO3 信号通路抑制心肌铁死亡 改善缺血再灌注损伤

邱子雄, 付泳霖, 陈文杰, 崔晓军
广东医科大学

心肌缺血再灌注 (MIRI) 是心脏经历缺血后恢复血流时, 由再灌注引发的组织损伤, 且一直是临床治疗中的一大挑战。近年来, 铁死亡作为一种新的细胞死亡方式, 已被证明与心肌损伤密切相关。间充质干细胞外泌体 (MSC-Exo) 因其独特的生物学特性、较低的免疫原性以及其在细胞修复中的潜力, 展现了在铁死亡抑制中的应用前景。AMPK/FOXO3 信号通路在调节细胞代谢、氧化应激反应以及保护细胞免受损伤方面起着至关重要的作用。本研究旨在探讨 MSC-Exo 通过激活 AMPK/FOXO3 信号通路在心肌缺血再灌注损伤中抑制铁死亡的机制, 以期为临床治疗 MIRI 提供新的治疗策略。

为实现研究目标, 本研究采用超速离心法从 MSC 中分离外泌体, 并通过透射电子显微镜和 Western blot 对其形态和身份进行鉴定。此外, 使用 PKH26 膜染料标记 MSC-Exo 并通过荧光倒置显微镜观察其在 AC16 心肌细胞中的摄取效率。采用缺氧/复氧 (H/R) 心肌细胞模型, 研究 MSC-Exo 对铁死亡相关指标 (如 ROS、MDA、ACSL4、GPX4、GSH 等) 的影响, 同时分析 AMPK、FOXO3 及其磷酸化状态的变化。通过建立小鼠冠状动脉闭塞再灌注模型, 评估 MSC-Exo 对心肌损伤的保护作用。初步实验结果表明, MSC-Exo 能够显著降低铁死亡相关指标, 改善抗氧化能力, 并通过 AMPK/FOXO3 通路抑制铁死亡, 减轻心肌缺血再灌注损伤。研究结果为 MSC-Exo 在 MIRI 治疗中的潜在临床应用提供了实验依据。

●中 O-干细胞与发育生物学● Poster

中 O-129-0003

携带 CHMP2B 突变的额颞叶痴呆患者来源 iPS 细胞系的建立

王佳轩, 王旭萌, 郭祥葛, 任乾
河北医科大学

额颞叶痴呆 (FTD) 是仅次于阿尔茨海默症和路易体痴呆的第三大神经退行性认知障碍性疾病, 其典型病理变化包括严重的萎缩, 神经元的丢失, 胶质增生和含有包涵体的异常神经元的出现。约有 50% 的 FTD 患者为遗传性。由于缺乏合适的体内和体外模型, 导致针对其致病机制和治疗靶点的研究进展缓慢。本研究通过体外诱导重编程技术, 成功将一例携带 CHMP2B 突变的额颞叶痴呆患者的外周血单个核细胞诱导为人工诱导多能干细胞 (iPS 细胞)。并通过 STR 分析、PCR、核型分析、流式细胞分析、免疫荧光、支原体检测、Sanger 测序等多种手段, 对建立 iPS 细胞系进行了鉴定。结果显示, 建立的 iPS 细胞系个体识别正常, 染色体的形态、数量和结构正常, 多能性干细胞标记物的表达正常, 具备三胚层分化的能力, 并且其遗传信息与供体细胞一致。本细胞系的建立, 可作为额颞叶痴呆的体外模型, 为进一步的发病机制的探索和治疗靶点的筛选, 以及潜在的治疗药物的开发提供了新的研究平台。



中 O-129-0004

FAK/AKT 信号通路在幼龄大鼠颅骨生长发育过程中的作用机制研究

张晓璐, 王雷, 邵国

内蒙古科技大学包头医学院第一附属医院

颅骨是大脑的重要保护屏障, 颅骨缺损时会对小儿颅脑的正常生长发育产生严重影响。局部黏着斑激酶 (FAK) 是骨细胞内机械转导的感受器, 通过感应力的变化, 将机械信号转导为化学信号传入胞内, 参与骨细胞增殖、分化等一系列生命活动。通过监测大鼠颅骨生长发育规律, 对出生后 1 到 12 周 (体成熟) 的 SD 大鼠头围、颅骨厚度、脑容积以及颅骨中 FAK/AKT 信号通路表达情况。结果发现, 1-12 周大鼠的头颅各经线 (鼻尖至枕后粗隆间连线; 两眶内测缘连线; 两下颌角连线; 两眶外缘连线) 随着周龄的增加而逐渐升高; 颅骨厚度在出生后 1-12 周增长 71.35%, 其中 2-8 周增长最为显著 (增长 50.05%, $P<0.05$); 脑容积在出生后 1-12 周增长 69.30%, 1-3 周增长较快 (增长 40.35%, $P<0.001$)。值得注意的是, 脑容积与颅骨厚度的增长呈正相关 ($R=0.83$, $P<0.01$), 提示颅脑发育存在协同调控机制; Western-blot 结果显示, 随着大鼠颅骨的生长发育, FAK 蛋白水平也逐渐升高, FAK 与颅骨各径线的变化呈正相关, 并且 FAK 的表达与 AKT 表达也呈正相关。因此, 我们推测 FAK 在大鼠的颅骨生长发育中发挥重要作用, 与颅骨的生长发育规律相一致, FAK 通过激活 AKT 信号通路在颅骨生长发育中发挥作用, FAK 可能作为颅骨快速生长发育期的生物标志物, 为临床上的颅骨缺损修复治疗中时机的选择提供基础理论依据。

中 O-129-0005

硬脑膜中 FAK-Twist1 信号通路在幼龄大鼠颅骨生长发育中的作用机制研究

王雷, 张晓璐, 文平, 张春阳

内蒙古科技大学包头医学院第一附属医院

硬脑膜是附着在颅骨内表面的一层厚而致密的胶原膜, 在颅脑的生长发育过程中发挥重要作用, 未成熟硬脑膜参与颅骨生长发育。局部黏着斑激酶 (FAK) 主要感受机械应力的变化并将其转换为胞内化学信号进行传导, Twist1 在硬脑膜中广泛表达, 维持颅骨骨缝的开放状态。通过选取新生 SD 大鼠建立大鼠生长发育模型, 观察大鼠出生后颅脑生长发育规律, 对出生后 1-12 周 (体成熟) 大鼠硬脑膜中成骨相关基因和 FAK-Twist1 通路的表达进行检测。结果发现, 大鼠头围随着出生后周龄增加而逐渐增加; 大鼠脑重与体重的生长呈正相关 ($R=0.9688$, $P<0.001$), 出生后 1-12 周大鼠体重和脑重分别增长 96.01% 和 71.19%, 但 1-4 周时脑组织生长快于体重生长, 5-12 周时二者同步生长; Western-blot 的结果显示, 硬脑膜中 FAK 表达水平在出生后呈现先升高后降低的趋势, 4 周左右达到峰值随后逐渐下降; Twist1 表达水平则在出生后逐渐下降, 8-9 周 (性成熟) 降至最低值随后缓慢升高; 硬脑膜中成骨相关基因 Runx2 的表达趋势与 Twist1 相同, 出生时 Runx2 的表达量为 12 周的 0.64 倍, 10 周左右降至最低, 12 周有小幅回升。这些结果表明, 硬脑膜通过感受大脑生长发育过程中产生的力, 通过压力感受器 FAK 将这种力转化成化学信号, 调控硬脑膜中 Twist1 的表达以维持颅缝开放, 参与颅骨生长和增厚。硬脑膜作为沟通大脑与颅骨之间的信息和物质通道, 在颅骨生长发育过程中发挥了重要作用。



中 O-129-0010

法洛四联症胎儿前额叶皮层神经发育异常及代偿机制的解析

王秋琳 方长乐 熊柳林
遵义医科大学

现有研究表明，法洛四联症患者除典型的心脏症状外，可能伴随前额叶皮层相关的神经发育异常，这种异常可能肇始于胎儿阶段，然而目前仍缺乏系统性的研究证据。本研究利用单细胞核转录组测序技术对法洛四联症和正常胎儿的前额叶皮层组织进行了分析。结果发现，与同龄正常胎儿相比，法洛四联症胎儿的前额叶皮层存在显著的神经发育异常。进一步我们鉴定出关键的异常细胞亚型：抑制性神经元中的 $SGCZ^{high}$ 亚型，胶质细胞中的 $NRG1^{high}$ 亚型及少突胶质细胞谱系。进一步的分析揭示了这些异常表型背后的关键驱动基因，包括 *FLRT2*、*NELL1*、*ERBB3* 和 *PDGFRA* 等。值得注意的是，研究还发现法洛四联症胎儿中存在一种独特的代偿性适应机制：胶质前体细胞表现出向具有神经保护功能的 $NRG1^{high}$ 亚型分化的倾向增强。系统的细胞通讯网络分析证实了上述细胞亚型异常与代偿现象的存在，还解析出多个参与法洛四联症神经发育缺陷的关键信号通路，包括 *ERBB3-PDGFR*、*NGF* 等。这些通路的异常可能是导致前额叶皮层神经发育障碍的重要分子基础。综上，本研究首次在单细胞分子水平上为法洛四联症胎儿前额叶皮层神经发育异常提供了直接证据，深化了对法洛四联症神经病理机制的系统认识。未来可以在此基础上进一步探索这些异常表型与临床神经发育结局的关联性，以及潜在的干预靶点。

●中 O-干细胞与发育生物学● Abstract

中 O-129-0008

过表达 CD47-APMAP 外泌体的免疫逃逸能力及其对 AD 小鼠的作用研究

刘新宇 王亚如 易西南

构建过表达 CD47-APMAP 外泌体 (EXO)，评估其免疫逃逸能力及其在阿尔兹海默症 (AD) 治疗中的作用。①构建过表达 CD47-APMAP 慢病毒载体，转染到脂肪间充质干细胞(ADSMC)；②超滤超离法提取 EXO，经透射电镜及纳米颗粒分析仪(NAT)鉴定，纳米流式细胞仪检测 EXO 膜表面 CD47、APMAP 表达；③用 PKH26 标记的 EXO 通过鼻腔吸入的方式进入 C57BL/6 小鼠，分为空白对照组、EXO 组、过表达 CD47-EXO 组、过表达 APMAP-EXO 组、过表达 CD47-APMAP-EXO 组，给药 2×10^8 Particles/mL，于 1h、2h、3h 取小鼠脑部，切片后通过荧光观察 EXO 在脑内存留时间。④将 EXO 通过鼻腔吸入的方式进入 APP/PS1 小鼠，增加一组 AD 组，其他组同上，一周 5 次给药，单次给药 2×10^8 Particles/mL，持续 8 周。给药前后通过水迷宫检测小鼠的空间学习和记忆能力；⑤给药后，刚果红染色观察 AD 小鼠脑内 $A\beta$ 斑块沉积情况；Western Blot 和 ELISA 检测 $A\beta$ 蛋白的表达水平。结果显示：①CD47-APMAP 过表达质粒载体能在 293T 细胞中稳定表达，其 CD47、APMAP 基因的表达是对照组的 13、11.5 倍($P < 0.05$)；②过表达 CD47-APMAP 慢病毒滴度为 3.96×10^8 TU/ml；③荧光结果显示 CD47-APMAP-EXO 组在小鼠脑内停留时间最长，荧光表达最强。④水迷宫结果 CD47-APMAP-EXO 组较其他组小鼠空间学习和记忆能力效果最好。⑤刚果红染色 CD47-APMAP-EXO 组 $A\beta$ 斑块的沉积减少最多；WB、ELISA 检测小鼠



脑组织中 A β -42 的水平 CD47-APMAP-EXO 组降低效果最好。研究结果表明，CD47-APMAP-EXO 可以增加药物在脑内治疗 AD 的时间。

中 O-129-0009

鼻内注射干细胞/干细胞衍生物在缺血缺氧性脑损伤啮齿动物模型中的疗效：系统回顾与 Meta 分析

吕飞
河北医科大学

背景 缺血缺氧性脑损伤（HIBI）可以导致明显的神经和认知缺陷，目前没有任何治疗方法可以再生受损的大脑。鼻内递送干细胞/干细胞衍生物因非侵入性和跨血脑屏障特性，以及神经再生修复的特性成为潜在疗法，但目前尚无荟萃分析来评估其在缺血缺氧性脑损伤相关模型中的疗效并综合证据，我们旨在探索鼻内注射干细胞/干细胞衍生物疗法是否对啮齿动物模型有效

方法 我们检索了 PubMed、Embase、Web of Science 和 Cochrane Library 至 2024 年 12 月 10 日的研究。提取了运动功能、认知功能、脑白质损伤体积、神经炎症和 BDNF 数据。OriginPro 软件（版本 2024b）用于提取数值，RevMan 5.4.1 用于分析数据。使用 SYRCLE 偏倚风险工具评估研究质量。

结果 我们评估了 18 项干细胞治疗研究和 6 项外泌体治疗研究。与对照组相比，鼻内干细胞注射改善了运动功能，改善了认知功能，减少了脑白质损失，脑灰质损失以及梗死体积，降低了炎症因子和小胶质细胞的水平。鼻内干细胞衍生物注射改善了脑损伤体积。结合基因改造可改善干细胞治疗脑损伤体积的疗效，干细胞联合疗法可改善干细胞治疗脑损伤体积和运动功能的疗效。

结论 我们的结果表明，鼻内注射干细胞或干细胞衍生物可有效治疗缺血缺氧脑损伤，并降低神经炎症水平。由于模型的局限性，需要更多的动物试验和临床试验。

中 O-129-0012

人尿源性干细胞在 Muller 细胞的氧化应激损伤修复中的作用

王磊 王廷华
昆明医科大学神经科学研究院

本研究探讨人尿源干细胞（HUSC）培养上清液对 Muller 细胞在氧化应激损伤中的修复作用。氧化应激是眼科常见损伤，是视网膜病变中的重要致病机制。本研究通过使用 1200 μ g/ml 浓度的 NaIO₃ 诱导 Muller 细胞氧化应激损伤，创建了模拟视网膜损伤的体外实验模型。实验分为三组：正常对照组、NaIO₃ 处理组和 NaIO₃+HUSC 培养上清液干预组。形态学结果显示，与 NaIO₃ 处理组相比，NaIO₃+HUSC 组细胞数量显著增多，细胞活力也显著提高，且接近正常对照组的水平，表明 HUSC 培养上清液能有效减轻 NaIO₃ 引起的细胞损伤。ROS 检测结果发现，HUSC 上清液能够显著降低氧化应激诱导的活性氧（ROS）水平，减少细胞内自由基的积累。此外，流式细胞术检测和 Annexin V 染色结果显示，HUSC 培养上清液对细胞凋亡有显著抑制作用，NaIO₃ 诱导的细胞凋亡在 NaIO₃+HUSC 组中得到了有效抑制，细胞存活率大幅提高。CCK-8 实验证实，HUSC 培养上清液能够改善 Muller 细胞的生长活性，进一步支持了其氧化应激损伤的修复作用。这些结果表明，HUSC 培养上清液在修复眼部氧化应激损伤方面具有潜力，可能为保护视网膜神经胶质细胞损伤提供新的思路。



●中 P-生殖生物学与生殖健康●Podium

中 P-129-0001

小鼠卵巢颗粒细胞中 PA1 在排卵和黄体生成中的作用和机制研究

胡玉暄;马君贤;李卫;李臻
空军军医大学基础医学院

广州市妇女儿童医疗中心 排卵前的 LH 峰激活卵泡颗粒细胞（GCs）中多条信号途径，诱导或激活相关转录因子调节基因的转录，触发排卵并最终形成黄体。PTIP 相关蛋白 1（PTIP Associated protein 1, PA1）是组蛋白甲基化转移酶复合体 MLL3/4 复合体的重要组分，通过参与 H3K4 甲基化修饰或作为转录共激活因子调节基因的转录，已被证实在胚胎发育、脂肪分化等多个发育生物学过程中具有重要作用，但尚无其在女性生殖系统中的功能研究报道。我们通过免疫组织化学染色发现 PA1 在小鼠在卵巢各级卵泡颗粒细胞的细胞核中均有表达，窦卵泡 GCs 中表达水平最高。通过构建卵巢颗粒细胞 Pa1 特异性敲除小鼠（Sf1-pa1^{F/F}），发现敲除小鼠不孕，动情周期紊乱，无法排卵且缺乏正常的黄体，排卵相关效应基因 Edn2、Adamts9 和黄体标志物 Cyp11a1、Star 的表达水平显著降低，同时 Sf1-pa1^{F/F} 小鼠卵巢颗粒细胞 p-ERK1/2 水平显著降低，通过 IHC 和 WB 检测了敲除小鼠颗粒细胞 H3K4me1/2/3 的水平，发现没有显著改变。因此，小鼠卵巢颗粒细胞中 PA1 可能作为转录辅因子，与相关转录因子协作参与排卵和黄体生成过程。

中 P-129-0004

TRPV1 在隐睾小鼠生精细胞凋亡中的作用研究

魏金花, 赵妍秋, 程胖, 李臻
空军军医大学

阴囊低温对哺乳动物的精子发生至关重要，而隐睾患者由于睾丸持续暴露于较高温度下，会导致生精细胞凋亡，进而造成男性不育，并增加睾丸癌的风险。瞬时受体电位香草酸亚型 1（TRPV1）是一种广泛存在于哺乳动物体内的热敏蛋白，在多种细胞凋亡过程中发挥重要的作用。然而，TRPV1 是否参与隐睾诱导的生精细胞凋亡尚不清楚。本研究首先检测了 TRPV1 在小鼠中的表达和定位，并观察其在实验性隐睾小鼠睾丸中的表达模式。结果显示，TRPV1 在小鼠生精上皮各时期以及各级生精细胞均有表达，并且高表达于精母细胞的细胞膜上。进一步通过隐睾模型发现，隐睾后 9 天小鼠睾丸体积、睾体比以及附睾尾部精子数量均显著降低，生精上皮大量脱落，生精小管管腔出现多核巨细胞，生精细胞凋亡数量显著增加，同时 TRPV1 mRNA 和蛋白表达量显著增多。再通过对 Trpv1^{-/-}隐睾与野生型隐睾小鼠发现，Trpv1^{-/-}小鼠隐睾后睾丸损伤减轻，附睾尾部精子数量变多，生精细胞凋亡以及精母细胞染色体 DNA 双链断裂减少。转录组测序及 qPCR 和 Western blot 验证结果显示，Trpv1^{-/-}隐睾小鼠精母细胞中凋亡相关分子 Capn1、Capn2、Bax、Aifm1、Caspase 3、Map3k5、Itpr1 和 Fas 表达下调。我们的研究结果表明，TRPV1 通过调控凋亡相关基因的表达，促进了隐睾小鼠精母细胞的凋亡。



中 P-129-0005

PA1 通过胆固醇代谢调控小鼠睾丸间质细胞睾酮合成的作用机制

马君贤 胡玉暄 李臻

空军军医大学

睾丸间质细胞产生的睾酮对于精子的发生和维持男性生育能力至关重要。我们前期的研究显示 PTIP 相关蛋白 1 (PTIP Associated protein 1, PA1) 表达于睾丸间质细胞中, 但 PA1 对睾丸间质细胞睾酮的作用目前尚未有相关报道。本研究的目的是探究 PA1 在小鼠睾丸间质细胞睾酮合成中的作用。利用 Cre/Loxp 系统构建睾丸间质细胞特异性敲除 Pa1 (*Cyp17a1-pa1^{-/-}*) 小鼠模型, 交配实验结果显示与对照组相比 3 月龄的 *Cyp17a1-pa1^{-/-}* 小鼠的产仔率和怀孕率无异常, HE 染色显示睾丸和附睾的形态无明显差异。当 *Cyp17a1-pa1^{-/-}* 小鼠发育至 6 个月时, 与对照组相比其产仔率和怀孕率显著降低; HE 染色显示睾丸有空泡化改变; CASA 检测显示精子数目和精子活力显著降低, 异常精子数目显著增多; 睾酮水平和性欲也显著下降; 油红 O 染色和透射电镜结果显示睾丸间质细胞脂滴减少。免疫荧光和 Western Blot 结果显示 *Cyp17a1-pa1^{-/-}* 小鼠中合成睾酮的关键酶 3 β -HSD 较对照组显著降低; 此外组蛋白甲基化转移酶 H3K4me1/2/3 也显著降低。综上所述, PA1 在小鼠间质细胞中可能通过甲基化转移酶调控胆固醇的平衡, 维持正常的睾酮水平, 其缺失影响小鼠睾丸的精子发生。

中 P-129-0006

HASPIN N 端区域调控 AURKA 磷酸化及精母细胞减数分裂进程

司徒成昊, 李豪杰, 徐瑶婷, 蒋欣怡, 祝辉, 郭雪江

南京医科大学

减数分裂是产生单倍体配子的特殊细胞分裂, 其异常是男性不育的重要因素, 该过程受到蛋白质磷酸化的严密调节。前期我们系统解析了哺乳动物精母细胞减数分裂过程中蛋白质磷酸化调控网络, 证实丝氨酸/苏氨酸激酶 HASPIN 在该过程中具有重要调控功能, 但关于该蛋白 N 端区域的功能尚未完全阐明。通过构建 N 端 1-243 氨基酸缺失的 *Haspin ^{Δ 1-243/ Δ 1-243}* 小鼠模型, 我们发现 HASPIN N 端缺失可导致雄性小鼠出现睾丸体积显著缩小、附睾精子数量减少以及精子受精后胚胎囊胚发育率降低等表型; 显微观察显示突变体精母细胞在减数分裂中期呈现染色体排列紊乱, 并伴随凋亡细胞比例显著增加。进一步构建减数分裂中期精母细胞的磷酸化蛋白质谱, 鉴定到 24,332 个磷酸化位点, 其中 *Haspin ^{Δ 1-243/ Δ 1-243}* 精母细胞中有 1,898 个磷酸化位点水平下调, 特别值得注意的是 AURKA T279 位点 (对应人源 AURKA T288) 的磷酸化水平显著降低。鉴于 AURKA 作为调控减数分裂中期染色体排列的关键蛋白, 其 T279 位点磷酸化是维持正常功能的必要条件, 我们通过免疫共沉淀实验证实 HASPIN 与 AURKA 存在直接相互作用, 且 HASPIN 缺失导致 AURKA T279 磷酸化水平下降及激酶活性抑制。综上, HASPIN N 端通过调控 AURKA 磷酸化影响减数分裂进程, 为男性不育的分子机制提供了新见解。



中 P-129-0008

脂肪干细胞调控 PERK-Nrf2 介导的信号通路改善睾丸间质细胞衰老的作用研究

朱金凤, 江艳玲, 罗紫艺, 杨春
广东医科大学东莞校区

睾丸间质细胞衰老引发的睾酮水平下降可导致男性不育及其他系统性疾病, 氧自由基代谢紊乱是其功能障碍的关键因素, 但目前仍缺乏有效的针对性治疗手段。脂肪干细胞(Adipose-derived stem cells, ADSCs)具有显著的抗氧化和抗衰老特性, 但其在睾丸间质细胞中的抗衰老作用及潜在机制尚不明确。本研究采用 TM3 细胞和 36 只 SD 大鼠, 分别构建体内和体外实验体系, 分为对照组、模型组和治疗组。其中, 模型组通过 D-半乳糖构建衰老模型, 治疗组则在 D-半乳糖造模成功后给予 ADSCs 治疗。研究重点聚焦 PERK-Nrf2 介导的氧化应激与内质网应激, 通过流式细胞术、Western Blot 及免疫荧光等生物技术检测相关分子的表达变化。结果显示: 在体外水平上, 与模型组相比, 治疗组的 TM3 细胞迁移能力和 Ki67 表达均显著增加, 而 ROS、SA- β -gal 表达以及处于 Annexin V+/PI-和 Annexin V+/PI+的 TM3 细胞比例均降低。在体内水平上, 与模型组相比, HE 染色显示治疗组大鼠睾丸间质细胞的空泡化减少, 生精小管内的细胞密度增加且排列紧密。ELISA 显示治疗组的血清睾酮水平升高。进一步的蛋白检测结果显示: 与模型组相比, 体内及体外治疗组中 3 β -HSD、17 β -HSD、CYP11A1、Bcl-2、PERK、eIF2 α 、ATF4、Nrf2 和 HO-1 的表达均升高, 而 NQO1 的表达则下降。以上结果表明 ADSCs 可能通过激活 PERK-Nrf2 介导的信号通路, 促进衰老睾丸间质细胞增殖、抑制其凋亡与 ROS 生成, 从而延缓其衰老。

中 P-129-0009

TRPS1 通过 Esrrg 调控小鼠植入前胚发育的机制研究

廖舒敏, 林子杭, 孙建东, 王世鄂
福建医科大学

哺乳动物的植入前胚发育是一个复杂且精确调控的动态过程, 胚胎着床前最重要的两个事件分别是合子基因组激活 (zygotic genome activation, ZGA) 和第一次细胞谱系建立产生内细胞团和滋养外胚层细胞。其中, ZGA 作为生命起始时的第一次转录事件, 探究其发生发展的调控机制对于攻克早期胚胎在体外发育阻滞的难题至关重要。本研究以小鼠植入前胚为研究模型, 运用显微注射、Real-Time PCR、免疫荧光、CUT&Tag 和 EMSA 等实验方法, 揭示雌激素相关受体蛋白 γ (estrogen related receptor gamma, ESRRG) 在小鼠植入前胚全过程的表达模式及作用, 并进一步阐明 Esrrg 与毛-发-鼻-指 (趾) 综合征-1 (tricho-rhino-phalangeal syndrome-1, TRPS1) 之间的调控关系及影响植入前胚发育的作用机制。实验结果表明, ESRRG 在植入前胚发育过程中的表达呈现动态变化, 其 mRNA 在 1-细胞胚特异性高表达, 蛋白水平在 2-细胞胚和 4-细胞胚表达较高且主要定位在细胞核; 抑制 Esrrg 后会降低 ZGA 时期的基因转录活性, 使 2-/4-细胞胚发育过渡异常。此外, TRPS1 与 Esrrg 的启动子直接结合, 敲减 Trps1 会抑制 Esrrg 及下游 Tnks2 和 Sp1 表达, 从而导致 2-细胞胚发育阻滞, 影响 ZGA 的顺利发生; 而敲减 Trps1 并回补 Esrrg 能挽救植入前胚发育的阻滞现象, 并使 Tnks2 和 Sp1 恢复至正常水平。以上结果提示, 小鼠 ZGA 进程存在 TRPS1-Esrrg-Tnks2/Sp1 调节通路。本课题为进一步阐明小鼠早期胚胎发育过程中 ZGA 的调控机制, 以及对改进辅助生殖技术提供实验依据。



●中 P-生殖生物学与生殖健康● Poster

中 P-129-0002

锌金属蛋白酶 ZMPSTE24 通过参与睾丸间质细胞分化和睾酮合成影响精子发生过程

林维灿, 严佳欣, 韩晨阳, 苏正威, 董琳凤, 张丽虹
福建医科大学

福建医科大学基础医学院人体解剖学系 福州 350122 全球约 7%-12%的男性被不育困扰, 睾丸间质细胞主要负责睾酮的合成与分泌, 其分化和功能异常会直接影响精子发生过程, 造成男性不育。ZMPSTE24 是一种锌金属蛋白酶, 主要参与核纤层蛋白 A 前体的加工和内质网阻塞转运体的疏通, 以往的研究发现 *Zmpste24* 全身敲除小鼠早衰, 但其在睾丸间质细胞和精子发生中的功能还未见报道。本实验采用 *Zmpste24* 全身敲除小鼠, 探究 *Zmpste24* 在睾丸间质细胞分化和睾酮合成中的功能和可能机制。研究发现 *Zmpste24*^{-/-}雄性小鼠不育, 生精小管内各级生精细胞严重减少, 精子发生明显异常; 睾丸间质细胞数目明显减少, 透射电镜下间质细胞内有大量脂滴堆积; 睾丸组织 RNA-seq 分析和 qPCR 验证结果显示, 间质细胞分化相关基因 *Notch2*、*Dhh*、*Nestin*、*Nr2f2* 等表达水平异常, 睾酮合成关键酶基因 *Cyp17a1*、*Hsd17b3* 等表达降低。我们推测 *Zmpste24* 缺失可能通过影响睾丸间质细胞的分化和睾酮合成等生物学过程, 导致 *Zmpste24*^{-/-}小鼠精子发生异常, 但是其涉及的具体机制还有待进一步研究。

中 P-129-0003

锌金属蛋白酶 ZMPSTE24 对于维持正常精子发生的关键性和机制研究

林正涵, 苏楠, 严佳欣, 韩晨阳, 苏正威, 张丽虹
福建医科大学基础医学院

福州 350122 不育困扰全球约 7%-12%的男性, 基因突变可导致精子发生异常进而造成男性不育。ZMPSTE24 是一种锌金属蛋白酶, 主要参与核纤层蛋白 A (LaminA) 的成熟过程。之前的研究显示其缺失会导致早衰且雄性不育, 但其在精子发生中的具体功能还未见报道。本实验采用 *Zmpste24* 基因敲除 (*Zmpste24*^{-/-}) 小鼠, 探究 *Zmpste24* 在精子发生中的功能和可能涉及的分子机制。研究发现, *Zmpste24*^{-/-}成年雄性小鼠不育, 生精小管内生精细胞明显减少, 附睾内精子大量减少, 且严重畸形。有趣的是 *Zmpste24*^{-/-}小鼠生精上皮的改变并不呈现一致性, 按留存生殖细胞的数目、种类以及损伤程度由重到轻, 我们划分出 KO-1、2、3 三种生精上皮损伤表型, 并进行进一步研究; 睾丸组织 RNA-seq、qPCR 和免疫组织化学染色发现睾丸组织内铁死亡相关基因和蛋白表达异常, 透射电镜下生殖细胞内线粒体呈铁死亡样改变。基于以上结果, 我们推测 *Zmpste24* 在精子发生中扮演重要角色, 其缺失可能会诱发生殖细胞铁死亡。



●中 P-生殖生物学与生殖健康● Abstract

中 P-129-0007

多组学解析雄性生殖衰老的免疫微环境重塑

姚嘉慧, 谢云, 蒋盛威
中山大学

雄性生殖系统衰老是导致男性生育力下降的重要因素,但其区域特异性分子机制及跨物种生物标志物尚未明确。本研究旨在:(1)系统解析自然衰老雄性小鼠生殖道不同解剖区域的转录组时空变化规律;(2)聚焦衰老敏感区域——附睾起始部,揭示单细胞水平的衰老相关分子机制;(3)筛选具有临床转化潜力的生殖衰老标志物,为干预年龄相关性生育衰退提供新策略。

通过肌肉力量测试、骨密度检测、血清睾酮 ELISA 及组织学分析(H&E、 β -半乳糖苷酶染色)评估全身与生殖系统衰老表型。对3月龄(成年)和21月龄(老年)小鼠的7个生殖道区域(睾丸、输出小管、附睾起始部、头、体、尾)进行普通转录组测序($n=4$),鉴定区域特异性标记基因及年龄相关差异表达通路。针对附睾起始部开展单细胞转录组测序,解析主细胞、基质细胞等群体的衰老特征。通过免疫组化、免疫荧光、ELISA 等方法检测小鼠组织及145例人类精浆样本中关键分子(如 PLA2G2D)的表达动态。

老年小鼠呈现系统性衰老表型:血清睾酮下降64%、精子数量减少83%,附睾起始部 β -半乳糖苷酶阳性细胞比例增加5.7倍。生殖腺体解剖转录组揭示:(1)7个生殖道区域表达12个特异性标记基因(如睾丸 Prm2、输出小管 Adam28、起始部 Rnase13/Wfdc13/Wfdc9等);(2)附睾起始部衰老相关差异基因显著富集于T细胞激活通路($p=3.2e-5$)。老年附睾起始部T细胞比例增加2.3倍,主细胞中 SASP 相关基因(如 Mmp3)及基质细胞胶原代谢基因(Col1a1/Col3a1)异常表达,细胞互作网络分析揭示 IGF1-FGFR1 等促衰老通路激活。(3)免疫调控因子 Pla2g2d 在老年小鼠生殖道表达量增加3.8倍。跨物种验证发现,PLA2G2D 在人类精浆表达水平与年龄显著正相关($r=0.71$, $p<0.001$)。本研究首次在多尺度揭示雄性生殖系统衰老的时空异质性,并提出 PLA2G2D 作为潜在跨物种生殖衰老标志物。

中 P-129-0010

睾丸支持细胞中 AMPK-ZHX2-IGF1 信号传导调控吞噬功能影响精子发生

金晓航,张胜,张煜星,李伟
西京学院

细胞内重要能量感受器 AMPK (Adenosine 5'-monophosphate-activated protein kinase) 参与调控睾丸支持细胞(SCs)中 ZHX2 的表达。生物信息学分析显示脂代谢相关转录因子 ZHX2 (Zinc fingers and homeoboxes protein 2) 在精子发生障碍患者睾丸病理组织中异常低表达,少精症、唯支持细胞综合征(SCOS)患者睾丸病理组织可证实了这一表达趋势。ZHX2 在小鼠睾丸中特异性表达于 SCs 细胞核,细胞学实验证实,敲低 TM4 支持细胞中 ZHX2 表达后,可显著抑制 TM4 细胞的吞噬功能。因为脂代谢是 SCs 吞噬死亡生精细胞后的关键代谢步骤,而 AMPK 是脂肪水解过程的核心控制信号,则 AMPK/ZHX2 表达异常导致的 SCs 吞噬功能紊乱可能是引发 SCs 脂代谢异常进而损伤精子发生的重要因素。六月龄 ZHX2^{-/-}小鼠即出现雄性生育力受损症状:同胎生仔数显著降低、精子密度减少、精子活力降低、生精小管结构异常、管内脂滴和残余小体增加,提示内源性 ZHX2 是维持支持细胞正常哺育功能的关键因子。高通量筛选发现编码胰岛素样生长因子1(insulin like growth factor 1)的 IGF1 基因可能为 ZHX2 直接作用下游靶基因,IGF1 启动子区包含 ZHX2 结合的保守位点;体外转染实验中瞬时过表达 ZHX2 可显著抑制 TM4 细胞上 IGF1 的



表达水平。这些结果提示，睾丸支持细胞中 AMPK-ZHX2-IGF1 信号通路可能调控吞噬功能影响精子发生。

●中 Q-肿瘤研究● Podium

中 Q-129-0001

POH1 通过稳定 Smad3 促进肺癌的侵袭转移

原昉 魏潇凡 张宏权
北京大学医学部

北京大学基础医学院人体解剖与组织胚胎学系 SMAD3 是 TGF- β /SMADs 信号的关键蛋白，在肺癌侵袭转移中发挥重要作用，但 SMAD3 在肺癌中的去泛素化调控机制及其细胞功能完全不清楚。在本研究中，我们确定 POH1 为肺癌细胞特异性调控 SMAD3 蛋白稳定性的去泛素化酶。并从分子机制、细胞功能、动物模型及临床数据等不同维度解析 POH1 通过稳定 SMAD3 在肺腺癌发展中的作用。我们证实 POH1 延长 SMAD3 的半衰期，促进其稳定性。在肺癌细胞中，POH1 与 SMAD3 直接相互作用。POH1 通过切割 K63-链去除与 K63 相连的多种多聚泛素链，从而降低 SMAD3 的泛素化。功能上，POH1 诱导细胞发生 EMT，促进肺癌细胞的增殖、运动和侵袭，而该效应依赖 POH1 对 SMAD3 的稳定性调控。动物实验发现稳转 POH1 的肺癌细胞发生明显的肝转移。最后我们利用肺腺癌临床样本和数据库证实 POH1 与 SMAD3 的蛋白水平呈强正相关性。两者在肺癌中的高表达均与病人不良预后相关。总之，本研究发现了一种新的介导 SMAD3 蛋白稳定的去泛素化酶 POH1，与肺腺癌的不良进展相关。本研究解析了 TGF- β /SMADs 通路新的调控机制，并为肺腺癌提供潜在新的药物和治疗靶点。

中 Q-129-0004

褪黑素通过调节树突状细胞功能改善脓毒血症

许振国,林楚欣,宋军,张智广,毕侨益,蓝倩云,周瑞祥
福建医科大学

脓毒血症 (Sepsis) 作为宿主因感染免疫应答失调所导致的致死性器官功能障碍综合征，其复杂的病理生理机制使临床治疗面临高死亡率及干预手段匮乏的双重挑战。近年研究表明，树突状细胞 (Dendritic cells, DCs) 在脓毒血症病程中呈现动态数量变化及功能异常，其免疫调节特性与疾病进展及预后密切相关。褪黑素 (Melatonin, MLT) 作为一种具有多效性调控功能的内源性吲哚胺类物质，前期研究提示其可能通过免疫调节途径改善脓毒血症病理进程，但其作用机制尚未明确。本研究通过盲肠结扎穿孔术 (CLP) 建立脓毒血症小鼠模型，系统评估 MLT 干预对疾病进程的影响。实验结果显示：MLT 治疗组小鼠生存时间显著延长，病理组织学分析 (HE 染色) 显示主要脏器 (肝、肺、肾) 炎性浸润及组织结构损伤明显减轻。流式细胞检测发现，MLT 干预显著降低脾脏 DCs 数量，CD11c⁺ MHC II⁺ 细胞占比下降，同时抑制 DCs 成熟标志物 MHC II、CD80 及 CD86 的表达。q-PCR 检测显示腹腔灌洗液中促炎因子 IL-6、IL-12 及 IFN- γ mRNA 水平较对照组下降。为进一步验证 MLT 对 DCs 功能的直接调控作用，本研究建立脂多糖 (LPS) 诱导的骨髓来源树突状细胞 (BMDCs) 体外模型。流式检测显示 MLT 预处理显著抑制 LPS 刺激的 BMDCs 表面 MHC II、CD80 及 CD86 表达。q-PCR 证实 MLT 可剂量依赖性下调 IL-6、IL-12 及 IFN- γ 等炎症介质的 mRNA 转录水平。本研究初步揭示了 MLT 通过调控 DCs 功能缓解脓毒血症器官损伤的机制，表明 DCs 是 MLT 发挥脓毒血症保护作用的重要靶点，为开发基于 MLT 的脓毒血症免疫调节疗法提供了理论依据。



中 Q-129-0009

circEPB41L5 及其编码多肽 P260 通过自噬抑制胆管癌增殖的分子研究

王悦 张云山 陶陆阳

苏州大学苏州医学院人体解剖与组织胚胎学系

大多数 circRNAs 在胆管癌中的功能及发病机理仍不明。本研究已明确 circEPB41L5 在胆管癌上皮组织中明显下调，并证实 circEPB41L5 及其编码多肽 P260 可诱导胆管癌细胞自噬，减弱胆管癌细胞的增殖、迁移和侵袭能力。在此基础上，进一步阐释：1) circEPB41L5-has_miR-637-NGFR 轴激活 AMPK/mTOR 通路，抑制胆管癌发生发展的分子研究；2) circEPB41L5 编码的多肽 P260 与 IRS-1 互作调控 AMPK/mTOR 通路，抑制胆管癌发生发展的作用机制。项目通过 ceRNA 网络和编码多肽两个维度探查 circEPB41L5 对胆管癌的分子调控作用，可能作为胆管癌新的生物学标记和治疗靶点，为胆管癌的诊断和治疗提供新的理论基础。

中 Q-129-0011

三氟甲基喹啉衍生物靶向 CTH 抗胶质母细胞瘤的活性和机制研究

罗智琼 孙宝飞 骆衡

贵州医科大学基础医学院人体解剖学教研室

胶质母细胞瘤（GBM）是中枢神经系统中最常见且最具侵袭性的原发性恶性脑肿瘤，属于 IV 级胶质瘤。喹啉是一类天然活性氮杂环化合物。研究者从一系列新型三氟甲基喹啉衍生物中筛选出具有抗 GBM 活性的化合物 TKL002，采用 MTT 法、流式细胞术及 Western blot 实验评估其体外抗 GBM 活性，结果表明，TKL002 显著抑制 GBM 细胞的生长，诱导晚期凋亡，并将 GBM 细胞阻滞于 G2/M 期。利用小鼠急性毒性试验、GBM 皮下移植瘤模型和原位移植瘤模型评估其体内抗 GBM 活性及毒性，结果显示，TKL002 显著抑制 GBM 皮下瘤及原位瘤的生长，且体内给药毒性较小。利用点击化学反应、网络药理学、生物信息学分析、细胞热位移实验及基因过表达实验预测并验证其抗 GBM 的关键靶点，结果表明，CTH 是 TKL002 抗 GBM 的关键靶点，CTH 过表达增强了 GBM 细胞的生长和迁移能力以及 TKL002 的抗癌活性。此外，利用酶联免疫吸附测定（ELISA）、Western blot 实验和 Transwell 实验探讨其作用机制，结果显示，TKL002 通过下调 CTH 蛋白的表达，显著降低 GBM 细胞中的半胱氨酸和 H2S 含量，抑制 NF- κ B 蛋白表达及其磷酸化水平，降低炎症相关蛋白 TNF- α 和 IL-6 的表达，并通过调节上皮-间质转化（EMT）因子显著抑制 GBM 细胞的迁移和侵袭能力。综上所述，TKL002 具有良好的体内外抗 GBM 活性，能够靶向 CTH，减少 H2S 的产生，抑制 NF- κ B 磷酸化，从而抑制 GBM 的炎症反应及其迁移侵袭能力。



中 Q-129-0012

循环肿瘤细胞异质性与乳腺癌临床相关性研究

伊曼, 孙翠彬, 梁敏杏, 尹悦

桂林医科大学

桂林医科大学 乳腺癌是全球女性发病率最高的恶性肿瘤，我国发病率持续攀升。循环肿瘤细胞（circulating tumor cells, CTCs）作为肿瘤转移的“种子”，其数量及亚型与预后密切相关，早期检测可改善患者生存。CTCs 可进行上皮-间质转化（epithelial-mesenchymal transition, EMT），获得更多间质特性，而间质型 CTCs 代表更差的肿瘤预后。本研究纳入 111 例未治疗乳腺癌患者检测术前 CTCs 亚型。结果显示，CTCs 形成与临床分期、肿瘤直径、淋巴结转移、Ki-67 呈正相关（ $P < 0.05$ ）；混合型 CTCs 数目与临床分期、肿瘤直径、Ki-67 呈正相关（ $P < 0.05$ ）；而间质型 CTCs 数目随淋巴结转移增多而增多（ $P < 0.05$ ）。综上所述，CTCs 存在 EMT 且比例较高，CTCs 形成与临床分期、肿瘤直径、淋巴结转移情况、Ki-67 因素有关。较高的临床分期、较大的肿瘤体积和较高的 Ki-67 表达水平是混合型 CTCs 增多的主要驱动因素；而间质型 CTCs 的数量则主要随淋巴结转移数量的增加而显著升高，这可能提示患者预后较差。

中 Q-129-0013

肿瘤抑制因子 FRMD8 缺失通过双重机制引起乳腺肿瘤对他莫昔芬治疗耐药

武威杰, 于淼, 李前辰, 赵怡倩, 张磊, 孙意, 王振斌, 龚玉清, 王文静, 刘鸪莹, 张京, 唐岩, 徐小洁, 郭晓静, 战军, 张宏权
北京大学

以他莫昔芬为代表的内分泌治疗是 ER⁺乳腺癌重要的全身性治疗方式之一，但约 40% 的 ER⁺乳腺癌患者最终会发展为他莫昔芬耐药表型。ER α 水平表达降低是他莫昔芬耐药的主要原因，但其潜在的调控机制仍不明确。在针对 ER α 表达调控的研究中，我们发现 FRMD8 提高了 ER α 在转录和翻译后的表达水平。MMTV-Cre⁺; Frmd8^{fl/fl}; PyMT 小鼠中 FRMD8 的缺失加速了乳腺肿瘤的生长和 Luminal 表型的丢失，并引起对他莫昔芬治疗耐药。单细胞转录组分析显示，Frmd8 缺失降低了激素敏感型上皮细胞的比例，并下调了 ER α 的表达。机制上，一方面 FRMD8 缺失通过抑制 ESR1 的转录因子 FOXO3A 的表达来抑制 ESR1 的转录，另一方面，FRMD8 破坏 UBE3A 与 ER α 的相互作用，从而阻断 UBE3A 介导的 ER α 降解。在乳腺癌患者中，FRMD8 基因启动子甲基化水平升高，低水平的 FRMD8 预示着不良预后。我们的研究提示 FRMD8 是一个潜在的预测他莫昔芬治疗预后的标志物及逆转他莫昔芬耐药的潜在治疗靶点。

中 Q-129-0016

PSMD10 通过上调 EMT 进程增强胰腺癌铁死亡敏感性的作用及机制研究

张嘉敏, 贾苗苗, 陈文悦, 白清, 郝培培, 崔慧先

河北医科大学

胰腺癌是由多种病因导致的致死率最高的消化道恶性肿瘤，5 年生存率仅 10%。超过 80% 的胰腺癌患者就诊时已进展为转移性胰腺癌；揭示胰腺癌发生转移的肿瘤生物学机制，开发潜在的有效治疗手段是亟待解决的问题。本课题前期分析 TCGA 数据库中胰腺癌样本的转录本测序数据发现



PSMD10(Proteasome26S Subunit,Non-ATPase10)在胰腺癌组织中显著高表达且具有代表性,在PSMD10 高表达的胰腺癌样本中,上调的基因经过 KEGG 富集分析发现多条与胰腺癌转移相关的上皮间质转化(Epithelial-mesenchymal transition, EMT)通路被激活;细胞表型实验也证实了PSMD10 可以促进胰腺癌细胞的 EMT 转移过程。铁死亡是一种铁离子依赖性的膜脂质过氧化物毒性堆积导致细胞膜破裂的非调节性细胞死亡形式;细胞膜磷脂中的多不饱和脂肪酸是发生脂质氧化,导致细胞铁死亡的重要底物。有研究表明转移性肿瘤细胞的多不饱和脂肪酸脂质水平高于原发性肿瘤细胞,更容易受到化学诱导的铁死亡。利用细胞生物学实验、免疫组织化学染色、western blot、qpcr、免疫荧光染色、转录组、代谢组学等分子生化和组学测序手段,我们证实了胰腺癌细胞高表达 PSMD10 可以病理性重塑胰腺癌的 EMT 表型,增加不饱和脂质的表达水平,继而增强肿瘤细胞对铁死亡信号的敏感性。

亚太 A1-129-0008

基于肿瘤特异性代谢方式探究地榆皂苷 II 通过 HIF-1 α /糖酵解轴抑制非小细胞肺癌机制的研究

张骏(邮箱) 卞云枫 方姿霞 苏蓓曦 马佳琦 吉林医药学院组胚教研室 吉林 132013

天然中药成分具有作用靶点多、毒副作用轻的特点,因此运用中药结合现代医学治疗肿瘤已成为相关科研领域中的热点。我们对中药提取物地榆皂苷 II 是否通过 HIF-1 α /糖酵解轴抑制非小细胞肺癌的机制进行研究,并尝试探究其具体机制;通过 MTT、流式细胞术、平板克隆、划痕、Transwell 和 Western blot 等实验对地榆皂苷 II 在非小细胞肺癌中的增殖、凋亡、迁移和侵袭是否有影响进行验证;利用 Western blot 实验、免疫荧光实验、糖酵解相关试剂盒检测“Warburg”效应相关蛋白表达情况及乳酸葡萄糖的含量;进一步使用“Warburg”效应抑制剂 2-DG,探究地榆皂苷 II 是否通过 HIF-1 α /糖酵解轴抑制非小细胞肺癌;通过 MTT 和平板克隆实验验证地榆皂苷 II 可以抑制非小细胞肺癌的增殖,采取流式细胞术实验验证 100 μ M/ μ L 地榆皂苷 II 可明显促进 A549 和 H1299 细胞的凋亡,划痕和 Transwell 实验发现地榆皂苷 II 可以有效地抑制非小细胞肺癌的迁移和侵袭,同时地榆皂苷 II 抑制有氧糖酵解代谢产物乳酸的生成、降低非小细胞肺癌细胞对葡萄糖的摄取;通过 Western blot 实验发现地榆皂苷 II 显著抑制 HIF-1 α 、HK2、PKM2 和 PFKFB3 蛋白的表达情况;对于机制的探索证实地榆皂苷 II 可通过调节 HIF-1 α /糖酵解轴影响非小细胞肺癌细胞。中药提取物地榆皂苷 II 通过 HIF-1 α /糖酵解轴抑制非小细胞肺癌,将为地榆皂苷 II 在临床上的应用提供有力的理论基础。

●中 Q-肿瘤研究● Poster

中 Q-129-0002

PEA15 通过 NLRP3 介导细胞焦亡调控肝癌发展的机制研究

陈文悦,郝培培,贾苗苗,张嘉敏,白清
河北医科大学

肝癌是全球范围内导致癌症死亡的主要原因之一,深入了解其发病机制对于开发有效的诊断和治疗方法至关重要。细胞焦亡(Pyroptosis)是一种程序性细胞死亡形式,通常由炎性小体 NLRP3 激活炎症反应触发,与肝癌的发生、进展和治疗效果之间存在复杂的关系。PEA15(Phosphoprotein Enriched in Astrocytes 15)最初在星形胶质细胞中被发现,在肝癌中表达上调与患者的预后不良及细胞焦亡过程密切相关。然而,PEA15 能否通过影响 NLRP3 介导的细胞焦亡来调控肝癌发展的



机制尚未明确。我们通过免疫组化结果和 Cancer Genome Atlas Program Database 证实，PEA15 在肝细胞癌中的表达高于正常肝组织且与患者生存率负相关。在 LM3 细胞系中，PEA15 的过表达促进了肝癌的迁移和侵袭。进一步的实验观察到，PEA15 的增加能够调控 NLRP3 的表达水平，通过检测焦亡相关蛋白 GSDMD 的表达变化，我们确认了 PEA15 对焦亡通路的调控作用。为了验证 PEA15 通过 NLRP3 介导的细胞焦亡通路影响肝癌细胞的具体机制，我们进行了焦亡通路及炎性小体芯片筛选。结果显示，PEA15 通过调节 NLRP3 炎性小体的激活来介导吉西他滨（GEM）引起的肝癌细胞焦亡。这一发现为理解 PEA15 在肝癌治疗中的潜在作用提供了新的视角。本研究初步探讨了 PEA15 通过调节 NLRP3 介导的细胞焦亡通路来影响肝癌细胞的增殖和迁移，为肝癌的诊断和治疗提供了新的理论依据和潜在靶点。

中 Q-129-0003

桑皮酮 A 通过泛素化降解 β -catenin 抑制黑色素瘤 细胞增殖和迁移

张聪 张雷 邵素霞
河北医科大学

桑皮酮 A (Kuwanon A, KA) 是一种天然黄酮类化合物，在前期的研究中我们发现 KA 可能通过下调 β -catenin 蛋白表达抑制黑色素瘤细胞的增殖和迁移。然而，KA 对 β -catenin 蛋白调控机制尚不清楚。本研究用慢病毒感染法构建了 β -catenin 稳定过表达的 A375、MV3 细胞系。使用 CCK-8、细胞计数、平板克隆和划痕实验的方法检测了 KA 对 β -catenin 过表达组细胞和对照组细胞增殖和迁移能力的抑制情况，WB 实验方法检测了相关蛋白的表达变化情况。将普通黑色素瘤细胞分为对照组和用药组 (KA 处理 48 h)，使用蛋白合成抑制剂放线菌酮、蛋白酶体抑制剂 MG132 处理两组细胞并检测细胞中 β -catenin 蛋白表达水平；Co-IP 实验检测 β -catenin 泛素化水平。我们还将黑色素瘤异种移植小鼠模型分为用药组（腹腔注射 KA）和对照组，3 周后对小鼠在体肿瘤进行测量和称重，对肿瘤组织中的 β -catenin 进行 IHC 检测。CCK-8、细胞计数、平板克隆和划痕实验的结果显示， β -catenin 过表达细胞的增殖能力和迁移距离均大于对照组；过表达 β -catenin 细胞增殖或迁移相关蛋白 CDK4、CDK6、Cyclin D1、P27 和 N-cadherin 表达水平均发生了相应改变；与对照组相比 KA 使细胞内 β -catenin 蛋白稳定性降低、泛素化水平升高。在体实验结果显示，与对照组相比，用药组小鼠体内黑色素瘤体积和重量明显降低，肿瘤组织内的 β -catenin 阳性率也明显下降。综上所述，KA 可能通过增加 β -catenin 泛素化水平抑制黑色素瘤增殖和迁移。

中 Q-129-0006

胶质母细胞瘤单细胞分辨率解析：内质网应激相关基因特征与治疗预后相关性

杨雅淇,蔡小星,李静娟,王廷华*
昆明医科大学

目标 内质网 (ER) 应激对多种恶性肿瘤，包括胶质瘤，具有治疗潜力。本研究利用生物信息学分析了脑胶质母细胞瘤 (GBM) 中的内质网应激相关基因 (ERGs)，探索它们的功能和通路，构建预后模型，以及探讨新的治疗策略。

方法 采用各种生物信息学算法筛选内质网应激相关基因并构建风险模型。根据内质网应激相关基因的表达情况，利用共识聚类方法对不同亚型进行分类。对不同亚型进行基因集变异分析 (GSVA) 和基因集富集分析 (GSEA)。基于筛选出的风险基因，以 1:1 的比例将 GBM 患者分成训练组和



测试组。预后模型通过受试者工作特征（ROC）曲线分析和独立预后分析进行验证。进一步通过比较高风险组和低风险组的风险评分，在生存时间、免疫微环境和通路调控方面进行比较，验证了预后模型。利用药物敏感性筛选了用于低风险和高风险组的药物，利用单细胞 RNA 测序（scRNA-seq）分析探索了 GBM 中风险基因的表达分布。

结果 根据内质网应激相关基因，GBM 样本能够分为两组，并且存在显著差异。与 B 组相比，A 组的生存率更高。GSVA 和 GSEA 分析显示 A 组主要富集于谷氨酸受体信号通路、神经元之间的突触传递、后突触密膜、突触后膜和突触囊膜功能。值得注意的是，筛选出 8 个内质网应激相关基因作为模型基因，它们能够有效且独立地预测 GBM 患者的生存风险，具有很高的准确性和辨识能力。随后观察到高风险组和低风险组的免疫细胞种群发生变化，在高风险组和低风险组之间的记忆 B 细胞和休眠 CD4 记忆 T 细胞存在差异。高风险组的记忆 B 细胞水平较高，而低风险组的休眠 CD4 记忆 T 细胞水平较高。此外，确定了潜在的治疗策略，针对低风险组确定了 BI-2536、Daporinad、SB505124、UMI-77 和 Vorinostat，而针对高风险组确定了 AZD8055、卡铂、吉西他滨、PD0325901 和托波替卡铂。单细胞 RNA 测序确定了核糖体蛋白 L10（RPL10）作为其中的一种 ER 应激相关基因，主要在各种肿瘤的恶性细胞中表达。

结论 本研究鉴定了 8 个内质网应激相关基因，并根据生物信息学分析构建了风险模型，可用于预后预测和药物筛选。

中 Q-129-0017

MC1R 抑制铁死亡促进结直肠癌进展的机制研究

曾祥伟 程清洲

武汉轻工大学

铁死亡是一种铁依赖性的细胞死亡形式，由于其抑制肿瘤生长和增强免疫反应的能力，正逐渐成为潜在的治疗靶点。然而，通过调节铁死亡抑制肿瘤进展的分子机制，特别是在结直肠癌中，仍然知之甚少。在本研究中，通过生物信息学分析确定 MC1R 是铁死亡相关基因的关键调节因子。体外细胞实验表明，过表达 MC1R 刺激了结直肠癌细胞增殖和迁移，同时通过下调 ACSL4 表达抑制铁死亡。相反，敲低 MC1R 增强了铁死亡并抑制了细胞增殖和迁移。机制研究发现，MC1R 通过激活 Notch 信号通路，导致 ACSL4 的表达下调，进而抑制铁死亡。此外，进一步分析发现 MC1R 的高表达与临床结直肠癌患者不良生存预后显著相关，并且与铁死亡水平呈负相关。总的来说，此项研究阐明了 MC1R、Notch 信号通路和铁死亡之间的相互作用机制，为开发针对结直肠癌的靶向疗法提供了新见解。

●中 Q-肿瘤研究● Abstract

中 Q-129-0005

褪黑素通过降低 ROS 促进 CD8⁺T 细胞活化

Bi Qiaoyi, Song Jun, Zhang Zhiguang, Xu Zhenguo, Zhou Ruixiang

福建医科大学基础医学院

褪黑素（MLT）作为吲哚类神经内分泌激素具有控制节律，调节免疫，抑制肿瘤等多种生物学功能，但其对 CD8⁺T 细胞的调节作用尚未报道。活化的 CD8⁺T 细胞分化为效应性 T 淋巴细胞（Teff），获得杀伤功能，用颗粒酶和穿孔素杀伤靶细胞，或者通过 Fas/FasL 途径诱导靶细胞凋亡，IFN- γ 分泌增强抗肿瘤免疫应答。本研究使用了 MLT 合成关键酶 Aanat&Asmt 双基因敲除（dKO）的 MLT 合成紊乱小鼠及野生型（WT）小鼠，分离脾脏 CD8⁺T 细胞进行体外活化诱导，探讨 MLT 对



CD8⁺T 细胞活化的影响。结果表明：（1）CD8⁺T 细胞活化过程中 MLT 的分泌水平及其合成酶 Aanat 的 mRNA 表达水平升高，且 MLT 增强了 CD8⁺T 细胞的活化、增殖和细胞因子分泌能力；

（2）将活化 CD8⁺T 细胞与 MC38 结肠癌细胞共培养，发现褪黑素可通过促进 CD8⁺T 细胞活化抑制肿瘤细胞增殖；（3）通过荧光酶标仪检测 CD8⁺T 细胞活化后细胞内 ROS 的含量，发现褪黑素可降低 ROS 的产生；（4）CD8⁺T 细胞活化后，MLT 影响 MLT 核受体 ROR- α 、ROR- γ 及 ROS 相关 MAPK、NF- κ B 等信号通路。总结：MLT 可能通过促进 CD8⁺T 细胞活化，显著抑制肿瘤细胞增殖，其机制可能与 MLT 调节 ROS 水平及其相关信号通路相关。

中 Q-129-0007

HCC 中的内质网应激生物标志物：一种生物信息学和单细胞转录组学方法

蔡小星,杨雅淇,王廷华*
昆明医科大学

目的 肝癌是世界上第六大最常见的恶性肿瘤。内质网（ER）应激的巨噬细胞在改善疾病预后中发挥着积极的作用。单细胞 RNA 测序（scRNA-seq）为解决生物学和医学问题提供了新的方法。在此背景下，我们将肝细胞癌（HCC）和内质网应激相关基因（ERGs）结合单细胞测序，探索核心基因和预后生存条件。

方法 下载与 HCC 相关的癌症基因组图谱（TCGA）和基因表达综合数据库（GEO）数据进行进一步分析，构建预后模型，进行免疫细胞浸润，探讨免疫系统的变化，并结合药物分析和单细胞测序。

结果 我们获得了免疫细胞“T 细胞 CD4 记忆”，它在高风险组和低风险组之间有差异表达。发现 4 个预后生存基因 ESR1、MAPT、EGF 和 HSPA4，其中 HSPA4 在 HCC 中高表达，随后发现紫杉醇、哌啶、溴化化粪池、恩司替尼、萨沃利替尼、ABT737、阿福瑟替、恩替司他、乌普瑟替和维托克拉作为肝癌的潜在治疗方法。最后，单细胞测序结果显示，这 4 个预后基因主要富集于 Mono/Macro、CD8T 等免疫细胞中。

中 Q-129-0008

肝内胆管癌中染色体外环状 DNA 的差异性表达分析及其潜在调控功能

张云山 王悦 陶陆阳
苏州大学苏州医学院人体解剖与组织胚胎学系

肝内胆管癌作为侵袭性最为强劲的恶性肿瘤之一，目前该疾病中有关染色体外环状 DNA（extrachromosomal circular DNAs, eccDNAs）的机制与功能仍未可知。在本研究中，我们通过高通量测序与生物信息学分析，发现 eccDNAs 在染色体数量、长度分布以及基因组注释等方面呈现出一定的可比性。进一步的研究结果显示，在肝内胆管癌样本中，有 1296 个 eccDNAs 存在差异性表达，其中 778 个 eccDNAs 表达上调，518 个 eccDNAs 表达下调。通过富集分析，我们发现磷脂酰肌醇信号通路、黏着连接通路等具有较高的富集程度。eccDNAs 与 mRNA 之间的关联分析表明，eccDNAs 的表达水平与它们所对应的编码基因的 mRNA 表达呈现出正相关。此外，我们还确认了 eccDNA-CAMKK2 的真实存在，并且发现过表达 eccDNA-CAMKK2 可明显促进肝内胆管癌细胞的恶性转移进程。综上所述，这些研究成果极大地拓展了我们对于基因组适应性以及 eccDNAs 在肝内胆管癌发生发展过程中所扮演角色的认知，为后续开发创新型的临床治疗策略提供了坚实可靠的理论支撑。



中 Q-129-0010

广西毛冬青根通过减轻血管损伤改善放射诱导下颌下腺功能障碍

李婷; 何改改; 孔蔺莎; 阮林; 王绍军; 韦力

广西医科大学

探讨广西毛冬青通过减轻血管损伤改善放射诱导下颌下腺功能障碍。SPF 级雄性昆明小鼠随机分为对照组 (Ctrl)、毛冬青组 (IPH)、放射组 (Rad)、放射+毛冬青组 (Rad+IPH), 放射前后各组连续灌胃给药共 14 d。于放射后 7 d、14 d 和 28 d, 记录小鼠状态和唾液量; 采用 HE、Masson 染色和电镜观察下颌下腺病理变化; 采用免疫组织化学检测 Bax、Bcl-2、ICAM-1、MCP-1、TNF- α 、MMP-9、VEGF 和 P-P38 表达情况。结果发现放射后小鼠唾液腺分泌量减少, VEGF 和 Bcl-2 蛋白表达降低, P-P38、ICAM-1、MCP-1、TNF- α 、MMP-9 和 Bax 表达明显增多, 凋亡率 (Bax/Bcl-2) 明显升高; 经毛冬青干预后, 唾液分泌量较放射组明显增加、ICAM-1、MCP-1、TNF- α 、MMP-9 和 P-P38 表达有所减少, 凋亡率 (Bax/Bcl-2) 明显降低。以上结果提示广西毛冬青可以改善放射诱导小鼠下颌下腺障碍, 其机制可能与保护放射损伤下颌下腺血管, 减轻细胞凋亡有关。

中 Q-129-0014

亚油酰酪氨酸对宫颈癌细胞增殖和迁移的作用及其机制

张小庆, 苏炳银, 韩玉萍, 刘沙, 李淑蓉

成都医学院基础医学院人体解剖与组织胚胎学教研室

目的 探讨 N-亚油酰酪氨酸 (NITyr) 对人宫颈癌细胞增殖和迁移的作用及其机制。

方法 将人宫颈癌 HeLa 细胞随机分为空白对照组、NITyr 15 $\mu\text{mol/L}$ 、NITyr 30 $\mu\text{mol/L}$ 和 NITyr 60 $\mu\text{mol/L}$ 4 组, 采用 MTT 法测定不同浓度 NITyr 对 HeLa 细胞存活率的影响; 平板克隆形成实验检测 NITyr 对 HeLa 细胞克隆形成能力的影响; 划痕愈合实验检测 NITyr 对 HeLa 细胞迁移能力的影响; 免疫荧光和免疫印迹法检测 HeLa 细胞 Cdk5 蛋白表达情况。

结果 与对照组比较, NITyr 处理组 HeLa 细胞存活率、细胞克隆形成能力、细胞划痕愈合率和细胞中 Cdk5 蛋白表达水平均降低 ($P < 0.05$)。

结论 NITyr 通过下调 Cdk5 蛋白表达, 从而抑制宫颈癌细胞的增殖和迁移。

中 Q-129-0015

敲低 FGF2 抑制胃肠道间质瘤 GIST-T1 细胞增殖、迁移侵袭并促进细胞凋亡

赵庆娥, 杨金伟, 马微, 赵文玉, 李力燕

昆明医科大学

FGF2 基因是影响胃肠道间质瘤细胞增殖、迁移的关键因子。本研究旨在探讨成纤维细胞生长因子 2 (Fibroblast growth factor 2, FGF2) 基因敲低对人胃肠道间质瘤细胞株 GIST-T1 增殖、迁移侵袭和凋亡的影响及作用机制。实验将 human-FGF2-shRNA 基因序列转入载体 GV493 构建敲低慢病毒载体, 通过慢病毒转染构建 FGF2 基因干扰稳转胃肠道间质瘤细胞株 GIST-T1-shRNA-FGF2, 采用 Western blot 和 qRT-PCR 技术验证敲低效果。随后, 将 GIST-T1 细胞分为空白对照组、转染非特异性 shRNA 组 (阴性对照组) 和干扰片段 1、2、3 组 (基因敲低组), 采用 CCK-8、EDU 实验检测细胞增殖能力, 细胞划痕和 Transwell 实验检测细胞的迁移、侵袭能力, 流式细胞术



检测细胞凋亡情况。结果发现，干扰片段 1、2 组敲低效率更显著，与空白及阴性对照组比，这两组的 GIST-T1 细胞增殖、迁移和侵袭能力明显降低，凋亡率上升，尤其是干扰片段 1 组效果更显著。综上，FGF2 基因敲低片段 1 能有效抑制 GIST-T1 细胞的恶性生物学行为，促进细胞凋亡，有望成为胃肠道间质瘤治疗的新靶点。

中 Q-129-0018

PFDN2 耗竭可通过下调 UXT 激活坏死性凋亡抑制结直肠癌发生

杜若兰 薛璐璐 陈丽 江亚 张兰春 杨秀 石兰岚 陈国娇 赵叶 刘飞 刘佳 熊柳林 王廷华
遵义市第一人民医院

结直肠癌（CRC）是一种发病机制复杂、有多种基因和信号通路发生改变的恶性肿瘤。本研究旨在确定 CRC 坏死通路中的关键基因 PFDN2，并探索其潜在的分子机制。我们发现，通过灯盏花乙素（SCU）在药理学上对 PFDN2 进行耗竭可以抵抗 CRC 的致癌作用。重要的是，大数据分析结合实验验证表明，PFDN2 和 UXT 在人类 CRC 组织中高表达，并与不良预后相关。此外，在 CRC 细胞株（RKO, HCT116）和原代人 CRC 细胞中敲除 PFDN2 或 UXT 会抑制细胞增殖，促进细胞凋亡，促进坏死性凋亡因子的表达。接种原代人 CRC 细胞进行裸鼠成瘤可以得到相同的结果。敲除 UXT 则会挽救 PFDN2 过表达下的坏死凋亡因子水平。这些发现支持了 PFDN2 或 UXT 在 CRC 进展中的作用。通过 Co-IP 和分子对接等实验发现，PFDN2 通过直接与 UXT 的 21 号氨基酸位结合，激活了坏死性凋亡相关因子（尤其是 RIPK3）的表达，从而调控了 CRC 癌变过程中的坏死性凋亡。综上所述，我们的研究表明，PFDN2 作为一个重要的关键基因，通过 UXT 调控 CRC 坏死性凋亡通路，可作为 SCU 药物抗肿瘤的靶点。

中 Q-129-0019

基于 qPCR 技术的胃癌组织关键基因表达谱解析

陈国娇 王廷华
昆明医科大学神经科学研究院

本研究旨在系统比较胃癌组织与正常胃黏膜的基因表达差异，通过整合生物信息学筛选与实验验证策略，揭示胃癌发生发展的关键分子机制，为临床诊疗提供理论依据。首先从 TCGA 公共数据库下载数据并进行生物信息学分析，筛选出胃癌相关 10 个核心基因。BCL2、IL6、MYC、CDH1、TP53、STAT3、CTNNB1、HIF1A、AKT1、NFKB1。然后开展验证实验，收集 30 对胃癌及配对癌旁组织样本，采用 SYBR Green 实时荧光定量 PCR 技术进行基因表达验证。结果显示基因 BCL2、IL6、TP53、AKT1、NFKB1 在胃癌组织中的表达水平显著低于正常组织（ $P < 0.05$ ），提示其可能通过抑制凋亡、调控免疫微环境参与胃癌进展；而基因 MYC、CDH1、CTNNB1 在胃癌中表达显著升高，提示可能与细胞增殖、上皮-间质转化异常相关。本研究构建了胃癌特异性基因表达谱，发现 BCL2/CDH1 调控网络异常可能是胃癌发生的关键分子事件。研究成果不仅为解剖学视角下组织特异性基因调控网络的解析提供新思路，更为胃癌的分子分型及靶向治疗策略开发奠定实验基础。其中 BCL2 表达抑制与 CDH1 异常激活的协同作用，可能成为新型联合治疗方案的潜在靶点。



中 Q-129-0020

H3K27 调控 APOC1 促进 PTC 增殖机制的探讨

宋佳茵,左素微,孙思诺,吴靖芳,薛刚

河北北方学院

通过 UALCAN 以及 K-M 数据库分析发现 APOC1 mRNA 在甲状腺乳头状癌 (PTC) 中的表达量显著高于癌旁 (PC) 组织并与 PTC 的预后显著相关。通过前期研究证明 APOC1 促进 PTC 细胞的增殖。肿瘤生长增殖和转移所需的能量主要来源于代谢重编程,其中糖代谢重编程是指癌症细胞即使在氧气充足的条件下,癌细胞也会优先进行糖酵解产生自身所需能量,这种现象也被称为有氧糖酵解。那么 APOC1 是否通过有氧糖酵解促进 PTC 的增殖尚不清楚。通过 UCSC 数据库分析发现 H3K27ac 调控 APOC1,那么 APOC1 是否受 H3K27ac 调控,并且 APOC1 促进 PTC 增殖的机制是否为有氧糖酵解尚不明确。本研究旨在通过 western blot、qRT-PCR、ICC、细胞培养、细胞转染及稳转株筛选、免疫组织化学、平板克隆、流式细胞术、糖酵解相关事迹盒及染色质免疫共沉淀等技术探究 H3K2ac 调控 APOC1 促进 PTC 增殖的机制。结果显示,在成功构建 APOC1 过表达 (oe-APOC1-BCPAP) 和沉默 (sh-APOC1-TPC-1) 细胞株中,oe-APOC1-BCPAP 组糖酵解相关指标 GLUT1、LDHA、PKM2、HK2 的表达量显著高于 sh-APOC1-TPC-1 ($P<0.05$),并且在向 oe-APOC1-BCPAP 组加入 PKM2 的抑制剂左旋紫草素以及 sh-APOC1-TPC-1 组加入 PKM2 激动剂 DASA-58 之后检测增殖相关指标 cyclinD1、cyclinE1、Ki-67、c-Myc 的表达量发现 oe-APOC1 组在加入抑制剂后增殖相关指标表达量显著下降 ($P<0.05$),sh-APOC1 组再加入激动剂后增殖相关指标表达量显著升高 ($P<0.01$)。最后经染色质免疫共沉淀实验检测与正常甲状腺细胞相比,三种 PTC 细胞 (TPC-1、BCPAP 及 K1 细胞) 中 APOC1 启动子区 H3K27ac 富集明显。综上所述: H3K27ac 调控 APOC1 通过糖酵解促进 PTC 的增殖。

●中 R-生物材料和组织工程● Podium

中 R-129-0001

RNA 甲基化转移酶 METTL3 通过 Drp1 的 m6A 修饰改善心肌梗死的功能和机制研究

黄波月 朱楚洪 冉建华

重庆医科大学

我国心肌梗死与心梗后心衰发病率均呈逐年上升趋势,深入研究心梗后心脏纤维化的潜在机制并结合生物工程优化治疗策略具有重要意义。能量代谢紊乱是心梗后心肌重构的重要原因。心梗后 RNA 表观遗传修饰腺嘌呤-6-甲基化(m6A)修饰水平升高,但其调控能量代谢的具体机制仍不清楚。心肌细胞缺血缺氧模型显示甲基转移酶 METTL3、METTL14 表达水平上调但去甲基转移酶没有显著差异。METTL3 抑制剂处理后心肌细胞死亡数目显著减少。此外 TGF- β 1 诱导的纤维化模型也显示 METTL3 抑制可以有效得减少肌成纤维细胞的转化和胶原生成。鉴于 METTL3 抑制在心肌细胞和成纤维细胞中的双重效果,我们设计了一种程序性释放的双层聚合物复合微针。大鼠心梗模型复合微针治疗后心功能得到改善,梗死面积和纤维化水平降低,具有优越的疗效:复合微针在早期快速递送 METTL3 抑制剂挽救垂死的心肌细胞,在后期缓慢递送长期抑制成纤维细胞增殖、胶原合成和沉积。机制研究证实,METTL3 抑制通过 m6A 修饰降低了 Drp1 mRNA 的翻译效率,从而降低了 Drp1 蛋白水平和线粒体碎片化,改善能量代谢紊乱。综上,本项目设计了一种程序化释放 METTL3 抑制剂的双层聚合物复合微针,用于治疗心肌梗死,为微针治疗心肌梗死的实用性、安全性和多功能性转化提供了实验基础。



中 R-129-0003

生物还原型骨小梁支架协同稀土金属铈-有机配体提高线粒体功能促进骨修复

黄秀红 郑利钦 林梓凌
广州中医药大学

骨缺损一直是临床面临的棘手难题。骨小梁结构是骨骼维持最小代谢成本与最大力学稳定性平衡的结果，而线粒体是成骨过程的能量供给者。本研究通过 3D 打印技术构建了一种由铈-有机配体(聚多巴胺与壳寡糖-铈复合物，PDA/COS@Eu)修饰的聚乳酸(PLA) 生物还原型骨小梁支架(记为 Tra-PLA/PDA/COS@Eu)，旨在通过调控线粒体功能促进骨缺损修复。在相同体积分数下，生物还原型骨小梁支架较计算机辅助设计（CAD）支架展现出更优异力学强度与渗透性。Tra-PLA/PDA/COS@Eu 支架可上调 PI3K/AKT/S6K/HIF-1 α 信号通路，显著促进 BMSCs 增殖与成骨分化。此外，该支架通过壳寡糖促进巨噬细胞向 M2 型极化，营造抗炎微环境，并显著增强 BMSCs 线粒体功能与生物合成能力，从而促进成骨。值得注意的是，铈离子是增强 BMSCs 线粒体功能与生物合成的关键成分。进一步研究表明，相较于 CAD 支架，仿生骨小梁支架在兔骨缺损模型中展现出更显著的修复效果。这种调控线粒体功能的生物还原型骨小梁支架有望成为治疗大段骨缺损的有效手段。

中 R-129-0005

体内合成可代谢降解的 π 共轭导电聚合物，实现无缝神经界面整合和组织修复

秦银华;曲晓航;许有前;朱楚洪
陆军军医大学基础医学院

生物电子器件与神经组织的无缝融合对于调控生物信号传导及解析复杂生理功能至关重要。然而，传统生物电子材料存在细胞层面界面整合性差和可控降解性缺失等关键缺陷，严重制约信号传导效能及长期生物相容性。本研究开发了一种基于生理条件下酶促合成的可代谢降解 π -共轭导电聚合物——聚吡咯-3-羧酸（PPyCA）。其分子结构中羧酸基团作为强吸电子基团有效降低吡咯环电子云密度，显著增强与超氧阴离子的亲和力，从而实现精准可控降解。该亲水性 PPyCA 材料不仅展现优异组织亲和性并形成无缝生物电子界面，更可在数月内实现完全代谢降解。体内实验证实酶促合成的 PPyCA 微囊泡（MVs）兼具促进神经信号传导与损伤后神经再生双重功能。机制研究表明，PPyCA 通过 MAPK 信号通路上调 c-FOS 及相关基因表达，进而促进神经修复。蛋白质组学与代谢组学分析证实其无细胞毒性效应。本研究为构建兼具生物电子无缝通讯与程序化降解特性的可代谢电话性聚合物建立了新范式，在生物医学领域具有重要应用价值。



中 R-129-0008

基于 FRET 原理的 TDN 探针结合纳米流式分析用于单外泌体 miRNA 的高灵敏检测

朱萍 王嘉玲
海军军医大学

外泌体携带的 miRNA 在细胞功能调节和疾病进程中发挥重要作用，然而其低丰度和复杂背景环境使检测技术面临极大挑战。目前，外泌体 miRNA 检测主要依赖 qPCR 技术，但该方法仅能反映群体平均水平，难以满足单外泌体分析需求。为此，本研究开发了一种基于荧光共振能量转移（Förster resonance energy transfer, FRET）原理的四面体 DNA（Tetrahedral DNA, TDN）探针，结合纳米流式分析，实现了单外泌体水平 miRNA 的高灵敏检测。该探针在四面体结构上分别修饰 Cy3 与 Cy5 荧光基团，未结合 miRNA 时，Cy3 与 Cy5 距离接近，FRET 高效发生，Cy5 发光；当与目标 miRNA 结合后，空间构象变化导致 FRET 效率下降，Cy3 信号增强。通过纳米流式技术定量 Cy3 信号，实现外泌体 miRNA 的特异性检测。本研究以人间充质干细胞（Mesenchymal Stem Cells, MSC）来源外泌体为模型，miR-21-5p 为靶标，验证了 TDN 探针对 miR-21-5p 的灵敏性与特异性，且与 qPCR 结果高度一致。进一步在模拟血清环境中，分别加入不同浓度的 miR-21-5p 和 MSC 来源外泌体，检测结果显示该平台在复杂背景中依然具有良好性能。最后，将甲状腺癌细胞来源外泌体引入模拟血清体系，成功检测到显著升高的 miR-21-5p 水平，表明该方法具备潜在的临床应用前景。本研究提出的 TDN 探针为单外泌体水平 miRNA 检测提供了一种新型工具，并为肿瘤等疾病的液体活检提供了技术支持。

●中 R- 生物材料和组织工程● Abstract

中 R-129-0002

pH 响应钼酸寡糖纳米制剂促进糖尿病创面愈合的研究

黄秀红 郑利钦 林梓凌
广州中医药大学

过度炎症反应，线粒体氧化应激及血管损伤等是糖尿病创面最主要病理改变。本研究设计了一种可喷涂并具有 pH 响应的钼酸寡糖纳米制剂（CMO），以调控巨噬细胞线粒体功能，调节局部免疫环境并促进血管生成，最终促进糖尿病创面愈合。采用一锅法制备的 CMO 纳米体系通过钼酸铵与壳寡糖的-NH₂/OH 基团配位形成稳定结构。CMO 能够响应糖尿病创面弱碱性环境，释放 Mo²⁺和壳寡糖。CMO 显著促进巨噬细胞线粒体氧化磷酸化，驱动 M2 极化从而发挥抗炎作用。具体来说，CMO 降低巨噬细胞总 ROS 和 TNF-α 水平，上调线粒体 MMP 水平及 SOD 和 IL-10 的表达。此外，CMO 显著促进了内皮细胞增殖和迁移活力，并显著上调 PI3K/HIF-1α/VEGF 通路从而促进血管生成。糖尿病大鼠体内创面愈合实验进一步证实，CMO 能够通过显著增强巨噬细胞线粒体功能，促进血管生成、肉芽组织合成、细胞外基质沉积和组织重塑来调节炎症微环境。这种具有线粒体功能调控，免疫调节特性及促进血管生成的刺激响应纳米制剂在糖尿病创面修复方面具有广阔的应用前景。



中 R-129-0004

工程化凋亡小体治疗骨关节炎

陈佳, 王江林*

华中科技大学生物医学工程系

引言 生物关节是一个由软骨层、钙化软骨层和软骨下骨层组成的多级结构组织,临床上由关节软骨损伤诱发的不可逆关节退行性疾病十分常见。关节软骨修复困难的主要原因有:一是其本身是无血管组织,营养物质主要依靠关节滑液和软骨下骨的渗透作用,自我再生能力非常有限;二是关节软骨结构的破坏会引起运动过程中异常的摩擦力学刺激,导致软骨细胞发生肥大化和纤维化,丧失正常生理功能;三是损伤后的软骨细胞会释放趋化因子,募集炎性巨噬细胞并导致关节腔的炎症微环境,不利于干细胞招募与组织再生。本项目基于点击化学反应构建靶向软骨细胞的凋亡小体并利用静电喷雾技术制备负载凋亡小体的水凝胶微球,同时在水凝胶微球表面修饰 PMPC 润滑涂层。基于大鼠骨关节炎模型,探究生物活性材料凋亡小体在调控并维持软骨细胞生存微环境方面的生物学效应,并阐明水凝胶微球的润滑性能在骨关节炎治疗方面的潜力。

材料与方法 通过点击化学反应修饰 Jurkat 细胞获得工程化细胞,药物诱导细胞凋亡后收集获得工程化凋亡小体。探究工程化修饰对凋亡小体形貌、粒径和表面电势的影响,同时结合基因组学和蛋白组学对工程化凋亡小体所携带的 RNA、DNA 和蛋白质进行分析,明确其能可发挥生物学效应的核心内容物。利用骨髓间充质干细胞、软骨细胞和巨噬细胞,结合 RT-qPCR、Western Blot、免疫荧光、转录组学、代谢组学等技术探究工程化凋亡小体在调控软骨微环境和维持软骨稳态方面的生物学功能。基于天然高分子材料,结合静电喷雾技术,通过调控各项参数制备合适粒径和形态均一的负载工程化凋亡小体的可注射水凝胶微球。通过简单的光聚合,在水凝胶微球表面修饰润滑涂层,并验证其润滑效果与生物相容性。构建大鼠骨关节炎模型,并将负载工程化凋亡小体的润滑水凝胶微球注射到关节腔部位。利用 Micro-CT、核磁共振成像、组织学染色和免疫荧光等方式评估负载工程化凋亡小体的润滑水凝胶微球对骨关节炎的治疗效果。

结果与讨论 骨关节炎中炎性巨噬细胞的募集可引起关节表面侵蚀和进行性软骨基质损伤。在本研究中,我们构建了负载工程化凋亡小体的润滑水凝胶微球,通过调节炎症微环境,减少软骨间摩擦,最终维持软骨稳态以延缓甚至逆转 OA。来自 T 细胞的工程化凋亡小体对软骨细胞和软骨组织具有优越的亲合力,并且可以很容易地被巨噬细胞吞噬,将其转化为再生表型以调控炎症。润滑水凝胶微球可显著降低软骨间的摩擦,缓解 OA 症状,同时可作为工程化凋亡小体的缓释载体。

关键词: 骨关节炎; 凋亡小体; 工程化修饰; 炎症调节; 软骨再生

中 R-129-0006

单细胞图谱视角下间充质干细胞来源小细胞外囊泡修复心脏缺血再灌注损伤的研究

王灵 王越

海军军医大学

大学转化医学研究中心 缺血再灌注 (Ischemia reperfusion, I/R) 引起的心肌损伤是重大健康挑战,目前缺乏有效解决方案。间充质干细胞来源小细胞外囊泡 (Mesenchymal stem cell derived small extracellular vesicle, MSC-sEV) 为心肌 I/R 提供了新的治疗方向。本研究构建了小鼠心肌缺血再灌注的假手术组、溶剂对照组以及 MSC-sEV 治疗组,发现 MSC-sEV 能够显著缓解心肌 I/R 后的



组织坏死。通过单细胞核测序，我们发现心肌细胞、平滑肌细胞、内皮细胞、成纤维细胞和巨噬细胞是心肌组织中占主导地位的五种细胞类型。心脏 I/R 主要在心肌细胞中诱导氧化应激诱导细胞死亡信号通路的激活，而 MSC-sEV 能够抑制这一该通路从而发挥其保护作用。此外，我们发现 MSC-sEV 的治疗能够激活轴突发生与神经元引导通路，并抑制胶原活化信号通路，提示 MSC-sEV 可能对心肌缺血后的纤维化进程具有抑制作用，同时促进神经修复，发挥积极的治疗效果。总之，本研究通过单细胞分子图谱为探索 MSC-sEV 治疗心脏 I/R 损伤的新靶点提供了依据，有助于深入解析其治疗机制。

中 R-129-0007

释氧微球的制备及联合 BMSCs 促进皮肤损伤创面愈合的研究

许清 王倩倩 陈雪
江南大学无锡医学院

皮肤创面会因局部缺氧导致愈合延迟，并可致移植干细胞存活率降低。为改善修复微环境，促进创面愈合，本研究制备聚乙烯吡咯烷酮（PVP）负载 H_2O_2 的释氧微球，联合骨髓间充质干细胞（BMSCs）修复皮肤缺损。通过自由聚合法和双乳法制备以金丝桃素络合 PVP- H_2O_2 为核，罗丹明 B 标记 NIPAAm-HEMA-NAS-AOLA 共聚物（PNAH）为壳，表面共价固定过氧化氢酶，实现可控释氧。体外实验表明微球可自发荧光，生物相容性良好且在低氧下持续释氧 14d。建立小鼠全层皮肤缺损模型，分 PNAH 组、BMSCs+PNAH 组和 BMSCs+微球+PNAH 组。术后 14d，与其他两组相比，联合治疗组创面愈合面积显著提高，细胞免疫荧光显示移植细胞存活率增加，HE 和 Masson 染色可见真皮层、表皮层及皮肤附属器的再生修复效果最佳，免疫荧光组织化学染色和分子生物学检测显示该组有更多血管再生，且 Collagen I 和 Collagen III 表达水平随时间上升并接近正常皮肤水平。该释氧微球体系能有效改善皮肤创面的缺氧微环境，提升移植 BMSCs 的存活率及分化效能，促进皮肤组织愈合，结合其荧光示踪特性可进行缺氧性创面的精准治疗，具有一定的临床应用前景。

●中 S-生物组织保存与利用● Podium

中 S-129-0001

吸脂术前腹部皮肤状态与术后皮肤回缩的相关性分析：基于超声剪切波弹性成像技术

闫玉彤,樊星烨,刘姝彤,李菲菲,淳璞
大连医科大学

为明确腹部脂肪纤维隔结构（走向、密度）与吸脂术后皮肤回缩率的关系，建立基于超声影像的机器学习预测模型。通过术前评估 50 例吸脂患者术前高频超声测量脐周脂肪纤维隔走向角度（相对水平面）及密度（单位面积隔膜数）；术后 3 个月通过 3D 扫描（VECTRA WB360）计算皮肤回缩率（体积反弹率）；提取超声特征（角度、密度、厚度）与临床变量（BMI、年龄）进行模型构建，利用随机森林算法（Python/scikit-learn）预测回缩率。预期纤维隔走向角度 $>45^\circ$ 的患者回缩率较 $<30^\circ$ 组降低 28%（ $p=0.008$ ），密度 >5 条/cm²组回缩率降低 35%（ $p=0.002$ ）。采用随机森林模型预测精度（ $R^2=0.68$ ，MAE=4.2%），关键变量为纤维隔角度（权重 0.41）及 BMI（权重 0.33）。提出术前超声分型标准（水平型/斜向型/网状型），指导术区选择与加压塑身方案。脂肪纤维隔结构是影响吸脂术后皮肤回缩的关键解剖因素，基于超声的机器学习模型可有效预测回缩风险，该成果有望为术前规划与患者教育提供客观依据，推动吸脂技术从经验化向精准化转型。



中 S-129-0002

面部软组织填充剂治疗后移位——基于超声的 56 例颧骨区 回顾性研究

于佳鑫,樊星烨,李菲菲,淳璞,马希达
大连医科大学

研究目的 探究鼻唇沟区域动态表情（如微笑）引起的应力分布特征与透明质酸填充剂位移的关联性，为临床注射层次选择和黏弹性参数适配提供理论依据。

研究方法 1. 数据采集：招募 20 例受试者，使用 VECTRA H2 捕捉静态及动态微笑状态的鼻唇沟 3D 模型，标注关键解剖标志点。

2. 有限元分析：基于 Abaqus 构建鼻唇沟简化模型，模拟不同黏弹性填充剂（黏度 5-100 Pa·s）在表情肌收缩下的应力分布。

3. 临床验证：对 10 例鼻唇沟填充患者进行术后 1、3、6 个月 3D 扫描，量化填充剂位移量（体积变化率），结合应力数据建立多元线性回归模型。

研究结果 1. 动态微笑时鼻唇沟最大应力集中于真皮深层（峰值 18 ± 3 kPa），填充剂位移与应力呈显著正相关（ $R^2=0.72$, $p<0.01$ ）。

2. 高黏度填充剂（ >50 Pa·s）位移量较常规黏度降低 42%（ $p=0.003$ ）。

3. 提出鼻唇沟填充剂黏弹性选择阈值（建议黏度 ≥ 30 Pa·s），减少位移风险。

结论 通过动态应力-位移量化模型，揭示了填充剂黏弹性与表情力学的适配规律，为临床精准注射提供数据支持。未来可扩展至多表情动态模拟，优化个性化方案。

中 S-129-0003

全系膜食管癌切除术相关纵隔筋膜解剖学基础与临床应用研究

刘姝彤
大连医科大学

本研究旨在通过解剖学和临床观察，阐明纵隔食管周围筋膜的结构及其在食管癌切除术中的应用价值。首先，通过尸体固定标本的解剖学观察，系统研究了纵隔食管周围筋膜和间隙的结构位置和分布关系，揭示了食管背侧的三层筋膜结构及其于周围组织的关系。接着，采用硬组织切片技术和 P45 断层塑化技术，对纵隔薄膜结构进行了精细解剖学研究。首次在纵隔软组织中观察到食管周围筋膜的精细结构，发现其分层和分布具有明显的区域特征，为纵隔食管膜结构研究提供了新的技术方法。最后，通过 2 例进展期食管癌患者的胸腔镜下全食管系膜切除术探查，观察了食管手术中背侧及腹侧游离的关键解剖路径与操作策略。研究结果表明，纵隔食管内脏筋膜在气管分叉水平上下具有不同的分布特征，上纵隔内脏筋膜散在分布，而下纵隔则形成类系膜样结构。研究提出了“食管系膜”的新定义，并明确了内脏筋膜食管部外间隙及其在食管侧面的延伸为 TMEe 的最佳外科平面。此外，研究还强调了在 TMEe 手术中应尽量完整切除内脏筋膜，并通过寻找内脏层和血管层间隙来作为手术平面，以减少并发症的发生。本研究不仅为纵隔胸部外科提供了详细的解剖学资料，还为食管癌手术提供了新的技术方法和操作理念，显著提升了手术的安全性和根治性。



中 S-129-0004

miR-21-5p 通过负调控 STAT3 抑制小胶质细胞 M1 型极化缓解 视网膜缺血再灌注损伤

覃良师,刘灿,史文佳,廖峻乐,陈旦
中南大学湘雅医学院人体解剖与神经生物学系

视网膜缺血再灌注 (Ischemia-reperfusion, I/R) 损伤是多种视网膜疾病的关键病理机制, 可导致视网膜神经节细胞 (RGCs) 进行性丢失。本研究通过建立大鼠视网膜 I/R 模型探究 miR-21-5p 与 STAT3 在视网膜 I/R 损伤中的调控作用及其分子机制。实验首先通过 qRT-PCR 检测到 I/R 损伤视网膜组织中 miR-21-5p 的表达水平降低, 基于该发现深入研究 miR-21-5p 在视网膜 I/R 损伤中的保护作用。在体内和体外实验结果中, miR-21-5p 过表达均能有效抑制小胶质细胞向促炎性 M1 表型极化, 降低炎症因子水平, 从而减少 RGCs 凋亡。后续分子机制研究表明, miR-21-5p 通过直接靶向结合 STAT3 mRNA 的 3'UTR, 负调控 STAT3 的表达。双荧光素酶报告基因实验证实了这一特异性结合关系。功能实验显示, 抑制 STAT3 活性可显著减轻小胶质细胞 M1 型极化, 而 STAT3 的过表达能部分逆转 miR-21-5p 对 M1 型极化的抑制作用。本研究阐明了 miR-21-5p 通过 STAT3 通路调控小胶质细胞极化的分子机制, 为开发视网膜 I/R 损伤基于 miRNA 的无细胞治疗策略提供了潜在分子靶点。

中 S-129-0005

脑桥网状脊髓束参与调控大鼠脑卒中后速度依赖性肌张力变化的 实验研究

王志航, 贾芳芳, 杨胜波
遵义医科大学解剖教研室

脑卒中后牵伸痉挛肌存在速度依赖性肌张力变化的机制不明。基于脑桥网状脊髓束 (PRST) 释放的兴奋性神经递质为谷氨酸, 卒中后 PRST 可加重屈肌痉挛, 本研究通过单纯疱疹病毒跨多突触逆行示踪 PRST 在脊髓前角的支配区 (网脊区)、改良的 Ashworth 和 Longa 评分法评价神经功能损伤情况、生理记录仪检测大鼠肱二头肌肌张力、等速肌力测试系统检测各组大鼠不同角速度牵拉肘关节时肱二头肌的峰力矩变化、高效液相色谱法和免疫组化法分别检测网脊区谷氨酸浓度和谷氨酸受体的表达。结果发现, 大鼠脑卒中造模后 Zea-Longa 评分和改良的 Ashworth 等级均高于造模前。脑桥网状核毁损组、脑卒中肌痉挛组和脑卒中肌痉挛联合脑桥网状核毁损组造模前后的肌张力分别为下降、增高和下降。脑卒中肌痉挛组肱二头肌峰力矩大小在 5°/s (慢速)、10°/s (快速) 和 20°/s (快速) 时逐渐增大, 而脑卒中肌痉挛联合脑桥网状核毁损组的峰力矩变化趋势不变, 但均小于脑卒中肌痉挛组。脑卒中肌痉挛组谷氨酸浓度和谷氨酸受体 (GluR1、GluR3 和 GluR4) 表达高于正常组, GluR2 下调。脑卒中肌痉挛+脑桥网状核毁损组低于脑卒中肌痉挛组, GluR2 上调。这些结果提示脑卒中后速度依赖性肌张力的变化受 PRST 调控。这种调控机制与兴奋性神经递质谷氨酸的释放和不同亚型谷氨酸受体的表达改变有关。



中 S-129-0006

局部解剖学教学后材料塑化再利用

项婷娜,彭姬,孙德鹏,朱凯丹

云南省昆明市五华区海源北路昆明医科大学海源学院

局部解剖学教学需要大量遗体,目前我国自愿捐献遗体的比率较低,医学院校用于教学、科研使用的遗体极少,实验教学遗体资源的紧缺限制了医学人才的培养。利用局部解剖学教学后标本改制成塑化解剖标本,能有效地解决解剖标本短缺的矛盾,目前对局部解剖教学后标本未有效利用,利用塑化技术将局部解剖教学后标本的再制作、再利用,最大限度提高标本的利用率。生物塑化技术是一种主要利用硅橡胶塑化剂对标本进行渗透,取代组织中的水分和脂类,从而达到把生物组织完美、长期保存的目的。其具有维护方便,提高标本使用效率;推进教学模式创新,提高学生学习效率;改善教学环境,有益身心健康的优点。依据局部解剖教学后标本情况,制定相对应的塑化方案,最大程度保留现有结构,同时构建新型解剖教学绿色生态系统。生物塑化技术的出现解决解剖学教学中长期面临的标本保存利用的难题,不仅从根本上改善解剖教学环境保障师生的身心健康,还解决标本来源少、消耗大的现状,生物塑化标本能最大程度的发挥标本的教学作用。

●中 T-中医形态学● Podium

中 T-129-0001

针刺合募配穴调控中央杏仁核 GABA 能神经元活性改善 CUMS 小鼠胃功能障碍及抑郁样表型的机制研究

马宏坤,袁仪,王溪阳,中国明

安徽中医药大学针灸推拿学院

慢性不可预知轻度应激(Chronic unpredictable mild stress, CUMS)可诱发胃功能障碍及抑郁样行为,其机制可能涉及中枢神经系统失衡。中央杏仁核(Central amygdala, CeA) GABA 能神经元在应激反应与内脏功能调控中起关键作用,但其在针刺干预“胃-脑”轴交互中的机制尚未明确。本研究探讨针刺合募配穴通过调控 CeA^{GABA} 神经元活性改善 CUMS 小鼠胃功能及抑郁样表型的潜在机制。取 30 只 C57 雄性小鼠随机分为空白组、模型组及电针组,采用 CUMS 法构建模型。电针组予“中脘”“足三里”穴位干预(疏密波,2 赫兹,1 毫安,20 分钟/日,连续七天)。行为学测试(旷场、高架、悬尾、糖水偏好)评估抑郁样表型,胃运动传感器测胃运动幅值,ELISA 测血清胃泌素水平,免疫荧光分析 CeA^{GABA} 神经元与 c-Fos 共表达,化学遗传与光遗传技术调控 CeA^{GABA} 神经元活性,光纤钙成像监测神经元 Ca²⁺信号动态变化。结果显示,模型组较空白组抑郁样行为增加、胃运动幅值降低、胃泌素水平下降以及 CeA^{GABA}/c-Fos 共标率升高;电针干预显著逆转上述变化。化学遗传激活 CeA^{GABA} 神经元可模拟 CUMS 表型,光遗传抑制该神经元则改善胃功能与行为异常。光纤记录显示电针降低 CeA^{GABA} 神经元 Ca²⁺的信号。综上,针刺合募配穴可能通过抑制 CeA^{GABA} 神经元的过度激活从而调节“胃-脑”轴,改善 CUMS 诱导的胃功能障碍及抑郁样行为,为针刺治疗应激相关胃肠疾病及抑郁障碍提供潜在神经生物学依据。



中 T-129-0002

电针改善老龄麻醉术后认知障碍的机制

王 兴 兴
上海中医药大学

老龄麻醉术后认知障碍高发、损害相关脑区功能，发病机制尚不明确，因此揭示相关脑区神经元形态功能损伤的分子机制、进一步寻找干预手段至关重要。电针作为非侵入疗法显著改善麻醉术后认知障碍大量研究表明，电针百会、足三里两穴有效缓解老龄麻醉术后认知障碍。本人研究发现，麻醉升高海马 β 淀粉样蛋白 1-42 ($A\beta_{1-42}$) 及 sAPP β ，而 $A\beta_{1-42}$ 显著降低海马 CA3→CA1 的长时程增强，并下调海马区神经元树突棘密度；研究同时发现，气体麻醉剂显著下调海马 CA1 区，介导海马学习记忆的重要分子—突触后膜黏附分子 nectin3 水平。进一步研究发现，麻醉术后电针显著下调麻醉术后升高的 $A\beta_{1-42}$ 与 sAPP β 水平，并上调海马 CA1 区神经元树突棘密度及 nectin3 表达。该研究进一步揭示电针改善老龄麻醉术后认知障碍的海马相关分子神经生物学机制，为电针调节 $A\beta$ 生成途径提高海马微环路突触 nectin 黏附系统功能改善老龄麻醉术后认知障碍提供佐证。通过深入理解电针的作用机制，我们有望为老龄患者的术后认知功能保护提供更为精准和个体化的治疗方案。

●中 T-中医形态学● Abstract

中 T-129-0003

1331 例云南高原地区感冒患者的中医临床证候演变分析

张乐誉, 朱佳垚, 李姝融, 严光宏, 解天俭, 黄麟涵, 姜随贝, 陶虹蓉, 李 坪, 游顶云, 戴文姬, 李恒希
昆明医科大学

通过对 1331 例云南高原地区感冒患者进行流行病学调查，本研究旨在揭示其中医临床证候规律，并进一步探讨风寒兼肺热型感冒的四个阶段证候演变。研究纳入 2022-2024 年云南省 1331 例感冒患者的临床数据，采用回顾性研究整合临床病例信息。通过系统聚类与 K-means 聚类筛选核心证候，构建隐结构模型（LTM-EAST 算法）解析证候与相应症状间的潜在关联；利用因子分析提取对应的病位、病性、四诊信息；结合卡方检验，深入解析风寒兼肺热型感冒四个阶段及其之间的关联性，并运用桑基图将症状转归可视化，系统揭示病程动态演变。调查结果显示，云南感冒患者的中医临床症状主要表现为流涕、鼻塞和喉咙疼痛等。病位多集中在肺，病性以阴虚寒湿、寒热夹杂为主，证型主要为风寒兼肺热型。卡方检验和桑基图进一步揭示风寒兼肺热感冒四个阶段及其主要相关症状的动态演变，寒证症状（鼻塞、流涕等）在受寒侵肺阶段集中爆发后消退，热证（咽喉肿痛等）贯穿全程，咳嗽随病程推进持续加重。综上所述，云南高原地区感冒主要为风寒兼肺热型，主要症状为鼻塞、流涕、喉咙疼痛等，经历生热、阴虚内热、受寒侵肺、寒消热聚四个演变阶段。



中 T-129-0004

基于网络药理学探究 α -香树脂醇通过 PPAR γ -SCD/FABP3 信号轴改善糖脂代谢紊乱治疗 T2DM 的作用机制

张乐誉,解天俭, 李姝融, 黄麟涵, 徐元彬, 李紫鸾, 余梦圆, 董瑞, 朱益伟, 李赛萍, 李恒希
昆明医科大学

本研究旨在探究白术中三萜类活性成分 α -香树脂醇通过调控 PPAR γ -SCD/FABP3 信号轴改善 T2DM 糖脂代谢紊乱的作用机制。基于网络药理学筛选出白术中 α -香树脂醇, 与 T2DM 进行靶点交集, 构建 PPI 网络, 进行 GO 富集和 KEGG 富集, 确定 PPAR γ -SCD/FABP3 信号轴。分子对接显示, α -香树脂醇与 PPAR γ 结合活性良好。体内通过 HFD 喂养联合 STZ 注射诱导 T2DM 模型, 体外构建高糖损伤 MIN6 细胞模型, 分组为对照组、模型组、实验组 (25、50、75mg/kg)、二甲双胍组和 PPAR γ 抑制剂组。结果显示, α -香树脂醇 (75mg/kg) 治疗效果最佳。与模型组相比, 实验组空腹血糖和糖化血红蛋白显著降低, 血清胰岛素水平上升 ($P<0.01$), OGTT 和 ITT 中 AUC 下降且胰岛素敏感性上升 ($P<0.001$); 生化检测显示, 血清中 TG、CHOL、LDL-C 含量均降低, HDL-C 含量上升, 而 ALT、ALP、AST、GGT 含量均下降 ($P<0.05$); ELISA 显示油酸和棕榈酸下降, 而 TNF- α 、IL-6 含量降低 ($P<0.01$); 组织病理学分析 (HE、PAS、Masson 染色) 发现, 胰岛与肾小球萎缩现象缓解; Western Blot、RT-qPCR 结果显示, PPAR γ 相关 mRNA 及蛋白表达上调, 而 SCD、FABP3 表达下调, 加入 PPAR γ 抑制剂后上述作用受到抑制; 免疫荧光显示, 细胞膜 GLUT4 表达显著上升 ($P<0.001$)。综上所述, α -香树脂醇通过 PPAR γ -SCD/FABP3 信号轴双轴调控糖脂代谢, 协同改善脂毒性和胰岛素抵抗, 从而治疗 T2DM。

●中 U- 教育教学研究● Podium

中 U-129-0001

“即梦”解剖学实验室：生成式人工智能驱动的视觉化学习与情感叙事

梁爽; 胡霖霖; 刘人静; 张惠婷; 李为民; 魏景洋;
牡丹江医学院附属第二医院

目的 本研究旨在探索生成式人工智能技术在解剖学教学中的应用, 通过“即梦”App 构建虚实结合的学习环境, 提升学生对解剖学知识的理解、情感表达能力及跨学科思维能力。研究试图突破传统医学教育的局限, 将视觉化学习、情感叙事与生成式人工智能技术相结合, 推动解剖学教育的范式革新。

方法 研究采用境脉式教学理论、具身认知理论和社会情感教育理论, 结合生成式人工智能技术, 设计了一套基于“即梦”App 的解剖学教学方案。学生通过观察医学图像、创作图像脚本、生成个性化图像、参与多主题展览, 完成从知识学习到情感表达的完整学习过程。教学过程中, 人工智能技术用于生成解剖图像, AR/VR 技术用于增强学习体验, 叙事教学法则用于深化学生对疾病的理解与共情。

结果 研究结果显示, 学生在解剖学知识的掌握、技术应用能力、情感叙事深度及批判性思维方面均有显著提升。通过生成式人工智能技术, 学生能够将抽象解剖知识转化为具象的视觉表达, 并在情感叙事中融入医学人文关怀。展览环节进一步促进了学生对解剖学知识的深度理解与社会价值的反思。



结论 生成式人工智能技术与情感叙事的结合为解剖学教育提供了新的可能性，不仅增强了学生的学习效果，还培养了其跨学科思维与人文素养。未来的医学教育应继续探索技术与人文的平衡，构建“认知-情感-伦理”三位一体的教育框架，推动医学教育从“认识身体”向“理解生命”的转型。

中 U-129-0011

建构主义视域下 AI 赋能人体解剖学课程思政的创新实践与成效研究

蔡庆龙, 范宇, 常加松, 关晓伟
南京中医药大学

在教育深化改革与“新医科”建设的双重驱动下，专业课程与思政教育的深度融合成为医学教育改革的核心命题。本研究基于建构主义学习理论，以人体解剖学课程为载体，探索人工智能技术赋能课程思政教育的创新路径。针对传统医学专业教学中存在的价值引领碎片化、思政元素挖掘表面化、育人成效评估单一化等问题，研究团队构建了“智能识别-动态生成-多维评价”三位一体的课程思政教学模型。通过自然语言处理技术解构解剖学知识体系，建立包含生命伦理（23%）、职业使命（31%）、科学精神（18%）、人文关怀（28%）四维度的思政元素智能识别框架；结合深度学习算法开发个性化思政案例库，实现教学资源与学习者认知特征的精准匹配（准确率达 89.2%）；利用智慧教育平台创设临床伦理决策情境，构建“认知内化-情感共鸣-行为外显”的螺旋式育人机制。实证研究表明，实验组学生在思政认知水平、职业价值认同和伦理决策能力等维度显著优于对照组。本实践为智能时代医学专业课程的思政建设提供了可复制的技术方案和理论参照，对推动“价值塑造-能力培养-知识传授”三位一体的医学教育改革具有重要启示。

中 U-129-0012

医工融合背景下人体解剖学教学探索与实践——以智能医学工程专业校际联合培养为例

李莎 崔慧先
河北医科大学

在医工融合与智能医学协同发展的时代背景下，人体解剖学作为医学基础课程，需要适应新的教学需求与挑战。本研究深入探讨了在智能医学工程专业校际联合培养模式下，人体解剖学教学的创新性实践与探索。通过优化教学场景、重构知识体系和革新教学方法，采用同步异地“克隆课”教学形式，打破传统教学的时空限制，构建了跨学科、跨地域的新型教学共同体。在教学实践中，秉持“医脉固本，工智拓新”的理念，通过两阶递进式路径，确保解剖学知识的完整性，同时设置与医学工程学相适配的解剖学模块，增强学生对知识的理解和应用能力。这种教学实践不仅有效激发了学生的学习兴趣与参与热情，还显著增强了学生的实践操作能力与创新思维水平，为智能医学工程专业的人才培养提供了坚实支撑。



中 U-129-0013

小组成绩分工法教学（STAD）在人体解剖学实验教学中应用及评估

韦力; 韦建辉; 黄绍明; 邓祥发; 薛昌强
广西医科大学

广西医科大学外国语学院 《本科医学教育标准—临床医学专业(试行)》指出，本科医学教育目标不仅培养医学生的初步临床医学能力，同时也要培养医学生良好的职业素质，继续教育与终身学习能力，团队协作和沟通能力，为其毕业后继续深造和在各种卫生保健系统执业中不断更新知识奠定必要的基础。这就意味着“以教师为中心”传统人体解剖实验教学模式必须转变为“以学生为中心”教学模式。然而采用“学生为中心”教学模式时，学生独自面对捐献者遗体，难免产生恐惧、害怕等心理。人体解剖实验是医学生获取丰富人体解剖生理知识的主要途径，无疑对尸体恐惧和害怕将严重影响学生对人体解剖学知识掌握。据此，我校对人体解剖学教学中尝试小组成绩分工法教学法，即在人体解剖学实验前，学生随机分为几个团队，4-5 人/团，学生“以团队为单位”的自主学习。在课堂结束前每团队随机抽出 1 名学生，检查该学生学习情况，并把该学生学习成绩作为整个团队学习成绩。经过一段时间教学实践，我们发现学生在课堂上学习人数和次数明显增加，标本考试和期末理论考试成绩明显优于传统教学，这提示 STAD 能有效解决学生解剖尸体产生恐惧、害怕等心理障碍，促进教学质量和学生学习能力、沟通和协作能力提高。

中 U-129-0015

基于执业医师考试形势下解剖学课程整合建设的探索

丁佳媛, 阎文柱, 单伟, 张海龙, 房艳, 郑晴予, 左中夫
锦州医科大学

本文旨在探讨如何在人体解剖学课程教学合理融合执业医师资格考试相关内容，在保障学生对基础医学课程掌握的前提下，为顺利通过执业医师资格考试打下坚实基础。

执业医师资格考试是检验医学生是否具备从事医师行业所必须的资格，以及是否达到从事某一特定医学岗位工作的最基本要求。人体解剖学是重要的医学基础课程，许多临床科研成果往往建立在解剖学基础上，在我国现行医学教育体系中，解剖学知识贯穿始终。

人体解剖学课程教学由理论课和实验课两部分组成，理论课上应根据课程进度植入相关执业医师真题及模拟题，难度应设置在容易和中等，不宜太过复杂，以更好地帮助同学们将解剖学知识融会贯通到执业医师考试中。结构决定功能，功能维持正常，将解剖结构放入临床诊疗步骤中理解消化，可作为学生医学思维和诊疗思路的启蒙。实验课中，应引导学生认识人体各器官、系统的正常形态学特征和相互联系，结合数字人科技以及“3D body”等软件理解人体各局部的组成结构、层次和毗邻关系，以促进形成“从结构联想到器官—从器官联想到疾病—由疾病发散出临床诊疗思维”的惯性思考方式，在面对执业医师资格考试时，学生们已经可以建立人体解剖学与临床课程相衔接的知识网络，告别先前枯燥的题海战术，通过执业医师资格考试的几率将得以提高。



中 U-129-0019

基于 WebGL 技术在医学教育中的应用

迟云强

山东数字人科技股份有限公司

目标,随着计算机图形处理能力提升,WebGL 技术凭借浏览器端 3D 图形渲染能力,逐步融入医学教育。相较于依赖教材、模型等存在时空局限、互动不足的传统教学手段,WebGL 通过 GPU 加速,无需插件即可在网页创建高质量 3D 图形,为医学教育带来新可能。在医学课程中,WebGL 极大提升了学习体验。学生能在虚拟环境中交互式探索人体结构,自由进行三维观察、旋转和缩放,甚至模拟手术及病理变化,增强学习沉浸感与互动性。其应用场景广泛,如虚拟解剖,使学生无需大体标本就能观察人体系统结构,尤其适合远程教育与资源匮乏地区,降低教育成本、打破地域限制;在医学影像学教育中,WebGL 将 CT、MRI 影像转化为 3D 图形,立体呈现病变位置、形态及与周围组织关系,提升学生诊断和临床判断能力。WebGL 革新了医学教学方式,在解剖学、病理学和影像学等领域应用前景广阔。未来,优化其应用、探索更多互动形式、提升跨平台兼容性,将推动医学教育持续创新。

中 U-129-0020

思政教育融入医学 PBL 教学的探索与实践

王富武;何秀全;张晓丽;刘倩;郭雨霁;张艳敏;郝爱军;刘尚明

山东大学

目前 PBL(problem-based learning, PBL)教学已成为医学教育的一种重要教学模式,在国家大力推行课程思政的背景下,如何在 PBL 教学过程中融入思政元素,落实立德树人的教育目标,已成为每位指导老师的职责与使命。山东大学基础医学院 PBL 课程组根据课程要求,制定新的教学大纲,在知识、能力目标之外,增加了相应的素养目标。根据新大纲要求,组织撰写、选择、改编 PBL 案例,把涉及的医学人文关怀、价值观、职业道德素养、团队合作、科学探索、家国情怀等思政元素融入案例中,引导学生去关注、探索,达到显性教育和隐性教育的有机融合。在提高案例质量的同时,为了进一步提高思政教育效果,在实践过程中还需要充分发挥指导教师学习者、引领者、践行者的作用。为此,课程组鼓励指导教师积极参加 PBL 培训和各类课程思政研讨会及沙龙,以及组织各学科指导教师集体备课等多种方式,提高指导教师的思政教育水平,为更好地践行思政教育奠定基础。此外,课程组还采用案例续写、情景模拟、撰写海报或科普短文、制作小视频、在讨论汇报中增加思政方面的考核内容等多种方式提高学生的综合素质,努力达到知识传授、能力培养和价值引领的有机融合,培养符合新时代要求的高素质医学人才。

中 U-129-0021

“三融并行”医学拔尖创新人才培养模式的探索与实践

唐炜,付元山,于胜波,郝立宏,王洪海,朱亮,张艳丽

大连医科大学

党的二十大三中全会强调高等教育需深化人才培养模式创新,完善科教协同育人机制。本研究紧扣“健康中国 2030”及“十四五”卫生健康人才规划,构建医学拔尖创新人才“三融并行”培养模式:一融科研能力阶梯化培养。建立“基础-进阶-高阶”路径:基础层以 PBL 教学开展科研启蒙;进阶层依托虚拟仿真平台、数智化实验平台及虚拟教研室,建成 21 门国家级/省级一流课程和 28 门 SPOC 课



程；高层次通过案例库、科研实践强化综合能力。二融学科前沿动态化教学。建立教学-科研联动机制：教师将国际前沿成果转化为教案，融入主干课程，保障教学与学科发展同步。三融科教资源双向转化。构建“科研反哺教学”生态：科研成果进教材（如改良染色技术编入教材）、科研设备进平台（自主研发的厌氧罐、拥有技术专利的塑化标本等用于实验）、科研项目进课堂（设计白藜芦醇抗肿瘤等综合性实验），推动教学国际化。实施五年成效显著：团队教师指导学生获国家级竞赛奖 12 项，立项大创项目 88 项（国家级 16 项），参与发表 SCI 论文及专利申请 65 项，研究生录取率显著提升。该模式通过贯通科研训练、前沿融合与资源转化，有效破解医学教育中理论与实践脱节问题，为培养兼具临床与科研能力的拔尖人才培养提供可推广路径。

●中 U-教育教学研究● Poster

中 U-129-0007

AI 技术在运动解剖学教学中的应用

姚远

首都体育学院解剖教研室

运动解剖学是体育专业的核心基础课程，传统教学模式主要依赖于教师讲授、教材阅读和实验观察，存在信息量有限、互动性差及个性化指导方面等问题。而 AI 技术的引入为解剖学教学提供了创新性变革。

AI 技术通过自然语言处理、机器学习和图像识别等手段，能够实现自动化文献检索、数据分析、三维模型构建等功能。通过 3D 建模与虚拟现实（VR）、增强现实（AR）技术结合能够将复杂的人体骨骼、肌肉、关节等解剖结构以高仿真、可交互的虚拟模型呈现。如在进行动作分析时，学生可从不同角度观察肌肉在不同工作形式下的收缩变化；学习内脏时，利用 AI 创建的虚拟人体能直观地展示人体各器官的形态结构和空间毗邻位置关系，加深学生对各结构的认识，使抽象知识具象化。AI 技术还推动了个性化教学的实现，老师可以依据学生的学习进度、知识掌握程度及答题情况，运用 AI 算法分析学生的学习特点与薄弱环节，为每个学生量身定制学习路径。在学习效果评估环节，借助图像识别、动作捕捉等 AI 技术，教师可实时监测学生在模拟运动场景中对解剖知识的应用能力并及时反馈评估结果，为教师调整教学策略提供数据支持。AI 技术的应用促进了解剖学教学质量的提升，使解剖学教学变得更加生动、直观和高效。

中 U-129-0008

产学研协同创新在数字医学教育领域的实践与探索

姚卫艳 翟宏磊

山东数字人科技股份有限公司

本研究聚焦产学研协同创新机制对数字医学产业发展的驱动作用，以山东数字人科技有限公司为典型案例展开实证分析。针对数字医学领域存在的技术转化效率低、复合型人才匮乏等瓶颈问题，通过构建“企业主导-高校支撑-临床验证”三位一体协同模式，有效整合人工智能、3D 打印等数字技术研发资源与临床应用场景。研究显示：该企业通过产学研合作实现了数字人解剖系统迭代升级（精度达 0.1mm）、医学影像智能处理系统开发（诊断效率提升 40%）以及数字教学平台建设（覆盖全国 200 余所医学院校）等系列突破，形成“技术研发-产品转化-市场应用”的良性循环。研究表明，深度产学研融合可显著提升数字医学创新效能，其形成的“需求导向型研发机制”“人才共育体系”等经验对高科技医疗产业发展具有重要借鉴价值



●中 U-教育教学研究● Abstract

中 U-129-0004

生成式人工智能在医学教育中应用的范围综述

张珣 (zhangx03@qdhhc.edu.cn) 占素扬 刘曼 李非非 郭芳珍 青岛黄海学院医学院形态教研室 青岛 266000

对生成式人工智能（AI）在医学教育中的应用进行范围综述，探讨其利弊。系统检索 PubMed、Web of Science、Medline、Embase、中国知网、万方数据、维普中文期刊、中华医学数据库等数据库中关于生成式 AI 在医学教育中应用的相关文献，检索时限为建库至 2025 年 3 月 1 日。按照纳入和排除标准进行文献筛选，提取并归纳文献中的信息。共纳入文献 31 篇，结果显示生成式 AI 在医学教育中的应用主要体现在个性化学习、虚拟病人和模拟训练、医学图像和数据分析以及医学内容创作等方面。在医学教育中使用生成式人工智能也面临着挑战和局限，例如需要确保患者数据隐私，避免算法偏见，解决生成内容准确性和可靠性的问题。此外，还需要加强医学教育工作者对生成式 AI 的理解和应用能力。生成式 AI 在医学教育中展现出巨大的应用潜力，可以有效提升医学教育的效率和质量，其应用也面临着多方面的挑战。未来需要进一步加强研究，探索生成式 AI 与医学教育深度融合的最佳实践，推动医学教育的创新发展。

中 U-129-0005

超声影像技术在局部解剖学教学中的应用与教学模式创新研究

孙烨 (sy2283000240@163.com) 秦向征 延边大学医学院解剖学教研室 延吉 133000

超声影像技术以其实时、动态、无创等优势，在医学教育中的应用愈加广泛，尤其在局部解剖学教学中的潜力逐步显现。本研究旨在探讨超声技术在局部解剖学教学中的作用及优势，通过对教学模式的创新和实践，分析其对学生学习效果的影响。研究表明，超声辅助教学能够直观呈现活体组织器官的动态结构与功能，帮助学生更好地理解复杂解剖关系，增强立体空间感知能力。此外，超声技术的实践性突出，可显著提高学生的学习兴趣与临床实际能力。相比传统标本解剖教学，超声不仅克服了标本静态特性等问题，还有效地将基础解剖学与临床应用相结合，突出其教学实用性。然而，研究同样发现，超声在局部解剖学教学中的普及受限于设备成本及教学培训水平。本研究提出超声与传统教学相结合的多元化模式，既能弥补各自不足，又能实现教学效果的优化，为未来医学教育改革提供参考依据。

中 U-129-0009

数字赋能下局部解剖学实践教学 TBL 模式研究

李剑

赣南医科大学

局部解剖学是医学教育的基石，是连接基础医学与临床医学的桥梁。当前，多数院校局部解剖学实践教学常依赖教材与标本讲解及学生实践操作，虽能完成教学目标但存在标本数量不足、学生实践机会不够等问题，制约实践教学开展。本次教学改革将同届两个班的学生分为 TBL 组与传统教学组。TBL 组学生以 6 人团队形式在课前通过慕课、3Dbody、病例手术视频、AI 引擎互动完成学习目标的分解及教学内容讨论预习并在每次操作前以 5 分钟电子回报形式将预习成果进行班级通报展示，教师及其他组的同学点评及补充讨论，每次课结束前由不同组员对实践过程进行反馈演示；传



统教学组采用常规的教师授课后学生操作的方式。课程结束后，对比两组学生的理论、实践成绩，同时评估 TBL 组学生的团队协作能力及对 TBL 教学的满意度，发现：TBL 组理论和实践成绩均显著高于传统教学组（ $P<0.05$ ）；团队协作能力评估显示，TBL 组学生在沟通、分工、问题解决等方面表现出色；多数学生认可 TBL 教学，认为课堂气氛活跃、交流热烈、操作精准度提升、主动性高。数字赋能的背景下，可融合多元资源，让 TBL 局部解剖学实践教学更直观高效，促进学生自主学习、临床思维培养与操作能力提升，值得推广。

中 U-129-0010

XR 技术在人体解剖学教育教学中的应用与探索

王钰 谢仙燕 王惠国
广州体育学院

人体解剖学作为医学教育的基石，一直面临着知识体系繁复、标本资源有限及教学模式单一等难题。传统教学多依赖实体标本和二维图谱，难以满足学生对三维结构和动态学习的需求。近年来，XR 技术的崛起为解剖学教育带来了革新。XR 技术融合 VR、AR 和 MR，将医学影像数据转化为高精度虚拟人体模型，使学生能从多角度观察器官形态、位置关系及功能动态，使学习过程直观化。虚拟解剖实验室的建立，让学生得以在无风险环境下进行解剖操作，通过交互功能深入探索复杂结构，既解决了实体标本的损耗问题，又规避了伦理风险。XR 技术还突破了教学的时空限制，支持自主与协作学习。AR 教材可将虚拟解剖结构融入真实环境，方便学生随时随地学习；数字人平台则提供个性化学习路径，并助力教师优化教学策略。此外，XR 技术可有效缓解教育资源分配不均问题，让偏远地区的学生也能通过虚拟仿真系统享受优质教学资源，促进教育公平。

然而，XR 技术的推广仍面临设备成本高、教师数字素养不足等挑战。未来需加强跨学科合作，开发低成本便携设备，并提升教师数字素养。同时，结合 AI 与大数据技术，XR 平台可实现自适应学习与精准评估，为医学教育的智能化发展奠定基础。

总之，XR 技术正重塑解剖学教学模式，在提升教学质量、培养实践能力及优化资源配置方面潜力巨大。XR 技术的引入，不仅为医学教育改革提供了新路径，更将使解剖学教育更加个性化和智能化，为培养高素质医学人才注入新活力，对未来医学教育的发展具有重要意义。

中 U-129-0014

基于法医学本科生系统解剖学交叉知识点的案例撰写与归纳

杜鹏,崔慧先,张国忠,靳玉川
河北医科大学

针对法医学专业学生，专业性差异化案例教学能够促使学生更好的掌握解剖学知识并应用于法医实践当中，撰写和归纳好的案例库为解剖学教师授课提供了最直接的讲解素材。以本校解剖学和法医学教学大纲为依托，参考相应课程教材，分析挖掘法医实践过程中与解剖学相关知识点，标注相应页码段落，赋予每个案例解剖和法医关键词，并就该知识点进行提炼，编辑为一个单独的讲解案例。通过梳理，共获得 2 个案例集，涵盖 9 大系统，32 张图片，287 个案例。案例集 1 从解剖学角度出发，指向法医学，适用于低年级的法医学专业学生学习解剖学，理解解剖结构存在的意义；案例集 2 从法医学角度出发，指向解剖学，适用于高年级的法医学专业学生学习法医学，理解法医层面损伤的解剖学基础。撰写和归纳的案例库丰富了解剖学教师的授课素材，为更好的培养法医学专业学生提供了新思路。



中 U-129-0016

人体解剖学在医学知识图谱中的建设与实践

王启明,何璐,闫景瑞,王旭东
天津医科大学人体解剖学与组织胚胎学系

知识图谱是知识结构化的一种表现形式,可用于语义搜索、思维训练、数据分析和开展智慧教学。为提高学生的自主学习能力、推进解剖学的线上、线下混合式教学,近年来学系开展了医学知识图谱解剖学课程的建设 and 教学实践。具体方法是,结合最新版系统解剖学教学大纲和执业医师考试大纲,将解剖学九大系统按照章节内容,梳理出一级、二级、三级知识点,通过超星教学平台在终端知识点基础上创建课程。课程资源包括教学短视频、课件、图谱、数字教材、习题训练和知识拓展等多种形式。通过将各级知识点进行关联,最终形成知识网络,融入基础医学知识图谱的体系当中。该体系涵盖了医学生必修的 13 门基础医学核心课程,为学生开展自主学习提供了便利和知识体系保障。教学实践证明,知识图谱不仅可以用于课前的预习和课后的复习,而多门课程和学科的融合,为学生探究知识提供了深度和广度,便于知识的整合和完善。特别是其强大的数据分析功能,为教学提供了及时反馈,便于教师把握学情动态,开展有针对性的课堂教学,提升了教学效果,促进了由知识传授向能力培养的转变。

中 U-129-0017

社会科学性议题在系统解剖学中中枢神经系统教学中的实践与探索

杨倩, 门泉仓, 马敏, 米世雄, 崔慧先, 杜鹃
河北医科大学

本研究探讨社会科学性议题在系统解剖学中中枢神经系统教学中的实践效果。本研究选择医学本科学生 78 人作为授课对象,授课章节为系统解剖学中中枢神经系统;课上以“人脑组织库”作为切入点,探索社会科学性议题在系统解剖学中的案例应用;课后以问卷调查的形式,评判教学效果。统计结果显示:95%的学生同意开展混合式学习,就科学问题和社会伦理问题进行讨论;94%的学生认为引入“人脑组织库”相关内容与本次中枢神经系统教学内容相契合;94%的学生表示结合“人脑组织库”内容的讲述有助于掌握脑部解剖结构;95%的学生表示混合式学习和讨论有益于拓展个人认知。相对于传统解剖学授课,以“人脑组织库”为切入点进行案例融合授课,有助于培养学生的创新思维和提高学生的人文素养,教学效果较好。

中 U-129-0018

医学院校中药学专业学生系统解剖学课程学习倦怠情况的调查分析

李泽东 于晓童
沈阳医学院

通过调查医学院校中药学专业学生系统解剖学课程的学习倦怠现状及其相关影响因素,为有效地改善学习倦怠现状、提高该专业学生心理健康水平提供数据基础和合理建议。本研究以辽宁某医学院校的全体中药学专业本科生为研究对象,对其进行一般情况和系统解剖学学习倦怠情况的问卷调查,分析性别、高考文理选科等对学习倦怠的影响,并通过多元逐步回归探究情绪低落、行为不当、成就感低三个维度对总体学习倦怠得分的影响力,并分析该科目学习倦怠对其职业发展的影响。结果显示,学生系统解剖学学习倦怠总分、情绪低落维度得分、行为不当维度得分均有明显的性别差异



($P<0.05$), 且男性得分平均分均高于女性; 高中阶段理科学生学习倦怠总分、情绪低落维度得分、得分高于未选考学生, 且有明显的统计学差异 ($P<0.05$)。多元逐步回归模型 R^2 为 0.999; 各变量容忍度均在 0~1 之间; 方差膨胀因子 <5 ; 各个回归系数具有显著性 ($P<0.05$)。综上所述, 医学院校中药学专业学生系统解剖学课程学习倦怠情况与性别、高中阶段是否选考生物学科有关, 影响其学习倦怠的主要维度是情绪低落, 这种学习倦怠会影响该专业学生的考研意愿。

●中 W-中国解剖学科史研究● Podium

中 W-129-0001

张岩著《人体系统解剖学》的成书研究-基于参考文献分析

潘莹 崔慧先
河北医科大学

1945-1954 年, 张岩所著《人体系统解剖学》(第 1-4 版)(以下简称“著作”)相继出版, 作为中国首部系统解剖学本土教材, 被使用长达半个世纪。著作不仅是近代中国医学教育本土化的里程碑, 更通过严谨的学术体系与创新的教学方法, 塑造了解剖学学科教材的本土规范。著作的成书历程, 折射出了中国知识分子在动荡时代坚守学术使命的精神, 对著作的成书过程进行研究, 溯源其知识来源, 仍能为现代医学教材编纂提供重要借鉴。本研究对著作所列参考文献进行分析, 著作 1-4 版, 参考文献分别为: 26、25、34、35 部。呈现出如下特点: 一是著作不同版本主体稳定, 著作累计有 41 部文献被引, 其中有 21 部文献被一至四版共同引用, 这些教材构成了著作主体。二是参考文献类型丰富, 包含教材、图谱、人类史、手册、标本制备流程、绘图以及模型制作等。三是参考文献涉及学科全面, 除了系统解剖学外, 还包含人类学、胚胎学、发生学、局部解剖学、比较解剖学。四是参考文献不断更新, 41 部被引文献中有 12 部作品是于著作新版出版时增添的, 并引用了最新版本, 比如先后引用了《Lebzbuch d.Histologie》(Ph.Stoebr)的 1928 年和 1936 年版本, 《Lehrbach d.Anntomie d.Menschen》(A.Rauber-Kopsch)的 1940 年以及 1950 年版本。五是参考文献权威, 著作成书起自 1931 年, 彼时世界医学教育中心位于德国, 著作引用的核心作者 Fr.Merkel、J.Kolimann、J.Sobotta 和 K.v.Bardeleben 均为当时世界解剖的权威。

●中 X 科学普及● Podium

中 X-129-0002

小儿颅脑适应性生长 (Pediatric cranial adaptive growth)

王羽, 赵志军
内蒙古科技大学包头医学院第一附属医院

从人类胚胎期开始, 随着年龄的增加, 胎儿不同脑叶的发育顺序和生长速度各不相同, 但整体上呈现“膨胀式生长”。其中在青春期约 14.4 岁时皮质下灰质总体积达到峰值。但总白质体积从妊娠中期到儿童早期迅速增加, 直到在 28.7 岁时达到峰值, 在 50 岁之后其体积迅速下降。总脑室脑脊液体积在 30 岁之前呈缓慢上升趋势, 60 岁时其容积呈指数级增长。因此, 脑容量整体呈现一种先快后慢的生长方式, 间接的反映出颅骨的生长方式。

由于脑快速的发育, 颅骨通过缝线和囟门的开放为大脑的快速生长预留出更多空间。在胚胎期, 由于大脑的快速发育, 所有的缝线和囟门均保持开放状态以适应脑的快速生长。9 周龄前, 颅底骨已基本形成, 随后颅盖骨开始发育, 首先额骨从眶上区两个骨化中心呈膜状骨化, 11-16 周龄额骨向



颅顶呈放射状生长，其次顶骨由双侧颞区骨化中心开始发育。随后，双侧骨化区快速向顶部靠拢，18-22 周左右颅盖骨基本形成。当婴儿出生后，此时只有额凶和枕凶开放，其余 4 个凶门基本闭合，在出生后 2-3 个月，枕凶闭合。约在 1.5 岁时，此时额凶关闭，颅骨完全闭合，形成密闭的颅腔。小儿颅骨发育是一个高度协调的动态过程，成骨与破骨细胞通过“骨形成-骨吸收”平衡机制，确保颅骨在脑组织快速生长的同时灵活扩展，并最终完成颅缝闭合。

●中 X-科学普及●Poster

中 X-129-0005

临床医学专业学生人体解剖学科普教育实践

孙德鹏，彭姬，高维，刘葵
昆明医科大学海源学院

习总书记明确指出：“科技创新、科学普及是实现创新发展的两翼，要把科学普及放在与科技创新同等重要的位置”。为科普教育提供了根本性指导，我院临床医学专业人体解剖学科普教育以“思”“馆”“创”“文”四个方面进行落实。“思”——充分将思政教育与科普教育有机融合，以党建领方向，建设党建教育基地。将临床医学专业学生引入科普教育基地，落实“三全育人”。“馆”——以人体生命科学馆为依托，将馆内陈列的标本进行视频讲解并设置二维码，进馆扫码就可了解相关解剖学知识，从胚胎发育、生长变化、疾病演变、生命凋亡进行生命教育。“创”——借助虚拟仿真、数字化实验室、3D 模型、仿真教学模，引导临床医学专业学生参与创新训练、实验设计、创新设计项目，培养学生的创新思维及能力。“文”——将临床医学专业学生创作的手绘图进行文创作品转化，以手绘图制作冰箱贴、钥匙扣、帆布袋、鼠标垫、卫衣等文创作品，以实现人体解剖学科普教育的大众化、社会化。

中 X-129-0006

中国短视频平台上自闭症相关视频的质量评估：一项横断面研究

杨瑞玲 张富深 黄菊芳
中南大学基础医学院

自闭症是一种神经发育障碍性疾病，是重大的公共卫生问题，给家庭和社区带来巨大压力和经济负担。随着互联网技术的发展，互联网已成为医疗信息的主要来源。本研究首次评估短视频平台中自闭症相关视频，旨在筛选优质科普内容并遏制误导性信息传播，以应对自闭症带来的公共卫生挑战。我们于 2025 年 3 月 13 日到 2025 年 3 月 18 日对抖音、小红书、微信短视频三个平台进行了一项横断面研究。采集了各平台有关自闭症的前 100 个视频，并使用 JAMA 评分、GQS 评分和改良 DISCERN 对纳入视频进行质量评估。进行相关性和逐步回归分析以检查视频质量与各特性之间的关系。共纳入 167 个符合纳入标准的视频，主要由五个主体上传，科学传播者（24.6%）、普通用户（28.1%）、新闻机构（20.4%）、专业机构（医院及学术机构等，16.8%）和专业卫生人员（10.2%）。主要传达科学解释类（25.1%）、干预方法类（29.9%）等信息。由普通用户上传的视频和讲述个人经历的视频获得更高的互动指数。而专业卫生人员上传的视频 JAMA 评分为 3.192(0.40)，GQS 评分为 4.115 (0.59)，改良 DISCERN 评分为 3.731 (0.67)。发现质量指标与用户的互动行为呈现负相关性，即 JAMA 评分、GQS 评分和改良 DISCERN 评分与点赞、评论和分享数等指标具有呈负相关的趋势。短视频分享平台上与 ASD 相关的视频质量仍有待提高，误导性信息泛滥将构成公共卫生系统性失序。这不仅加剧社会对自闭症群体的病耻化认知，更直接威



胁早期筛查干预效果，这表明具有专业资质的创作者与短视频平台应构建多方协同产出并优先推送高质量视频。

●中 X-科学普及● Abstract

中 X-129-0001

内蒙古呼和浩特市中学生对青少年特发性脊柱侧凸知晓度调查与分析

李煜墨,于杨,赵彬,张涛,李石,王建辉,李筱贺
内蒙古医科大学

本研究旨在调查呼和浩特市中学生对青少年特发性脊柱侧凸（AIS）的疾病知晓度及其影响因素，为开展针对性防治和健康教育工作提供依据。研究采用横断面调查方法，纳入 1089 名常住呼和浩特市半年以上、年龄超过 12 岁且未被诊断为 AIS 的初中生作为研究对象。通过知情同意后，采用线下纸质问卷及面访方式采集人口学信息和 AIS 相关知识数据，并运用卡方检验分析知晓度的影响因素。

结果显示，74.6%的受访者表示听说过“脊柱侧凸”疾病，但仅有 5.7%能全面掌握 AIS 相关知识。在筛查行为方面，49.1%的学生曾通过学校体检等途径接受过筛查，但仍有半数以上（50.9%）未进行过任何筛查。值得注意的是，参与筛查的主要动因中，49.4%源于常规体检要求，仅有 3.1%因身体不适主动筛查。关于疾病危害认知，93.9%的学生了解脊柱变形风险，65.4%知晓慢性疼痛并发病，但仍有 2.3%的受访者完全不了解 AIS 的危害性。研究表明，呼和浩特市青少年对 AIS 的认知水平存在显著不足，主要体现在知识掌握的全面性不足、筛查覆盖率偏低以及健康意识主动性较弱等方面。建议通过加强学校健康教育课程、拓展新媒体科普宣传渠道、完善校园筛查机制等多维度干预措施，系统性提升青少年脊柱健康素养，为早期防治工作奠定基础。

中 X-129-0003

IL-4 通过增加自噬通量和线粒体氧化应激，激活哮喘中的 ULK1/Atg9a/Rab9、NLRP3 炎症小体和高尔基体碎片

徐畅；陶陆阳；张云山；王悦
苏州大学

哮喘期间，肺上皮炎症、线粒体氧化应激和高尔基体碎裂加剧。然而，其潜在的机制在很大程度上仍然未知。因此，本研究调查了 ULK1、Atg9a 和 Rab9 在上皮炎症、线粒体氧化应激和高尔基体破碎中的作用。我们发现，ULK1 基因敲除可减少炎症细胞的浸润，并抑制屋尘螨诱导的哮喘小鼠肺组织中炎症体的形成。此外，我们还证明了 Atg9a 与 ULK1 在 S467 处的相互作用。ULK1 使 Atg9a 在 S14 处磷酸化。ULK1 激活剂（LYN-1604）和 ULK1 抑制剂（ULK-101）分别促进和抑制了炎症体的激活，表明屋尘螨诱导的哮喘小鼠炎症体的激活依赖于 ULK1。实验验证证实，Atg9a 是 Rab9 的优势信号通路。有趣的是，我们首次发现 Rab9 在炎症诱导的高尔基体碎裂中起着非常重要的作用。抑制 ULK1/Atg9a/Rab9 信号通路的激活可以抑制哮喘患者的高尔基体破碎和线粒体氧化应激，同时减少 NLRP3 介导的肺上皮炎症的产生。



中 X-129-0004

人体科学馆开展基于“探究奥秘、重视健康”的 青少年主题科普实践

王启明，何璐，杨慧，张晓阳，邢钧雷，方彦哲，刘芷菡，王旭东
天津医科大学人体解剖学与组织胚胎学系

习近平总书记指出，科技创新和科学普及是实现创新发展的两翼，要把科学普及放在与科技创新同等重要的位置。天津医科大学人体科学馆在完成校内教学、科研任务的基础上，不忘服务社会的使命，近年来常态化开展了面向社会的科普宣传活动。其中，面向青少年开展的专题科普实践活动尤其受到广大青少年和家长的喜爱，反响热烈，总结交流如下。第一，确立一个与青少年成长关系密切的主题。我们分别开展了“认识自我，从心出发”、“人真的能眼观六路耳听八方吗？”、“感冒与呼吸系统”和“我们的第一个家”等主题科普，对这样的话题同学们都“有话要说”，非常感兴趣，便于开展交流、讨论。第二，准备丰富多样、别具特色的科普素材和资源。一般来说，除常规的标本、模型、图谱外，我们还准备了触屏版数字人、动画、3D 打印器官模型、血管铸型和生物塑化标本。这些科普资源为观众带来了视觉冲击和沉浸式体验，提升了科普宣传的效果。第三、调动同学们参与的自觉性、积极性和主观能动性，让大家动起来、做起来，真正地去“探究”。比如，我们为大家准备了画板、画纸和画笔，在会场由讲师和同学们一起画心、画肺、画脑等。在画的过程中，学生能更深入地认识这些器官的形态、构造。我们还为大家准备了人体乐高，在主题讲解结束后，师生一起拼拼乐，看谁拼的又快又准。现场气氛热烈，将活动带到了一个新高度。四、建立一支高素质、讲奉献的科普团队。我们团队的讲师都是来自高校一线教师和临床医生，教学、临床经验丰富，在学术领域也有一定的造诣。志愿者都来自本校大学生，他们组织纪律性强、专业知识扎实，有爱心和奉献意识。这为开展科普宣传提供了有力的组织保障。



第11届亚太解剖学大会暨中国解剖学会第39届（2025年）学术年会

11th ASIA PACIFIC INTERNATIONAL CONGRESS OF ANATOMISTS

39th ANNUAL MEETING OF THE CHINESE SOCIETY FOR ANATOMICAL SCIENCES (CSAS)

Postgraduate Forum



ID: 318289

Hemp Seed Fiber Alleviates Splenic Inflammation and Apoptosis in Aged Mice via PI3K-Akt Pathway

汤豪杰
右江民族医学院

Objectives Splenic senescence is closely linked to chronic inflammatory dysregulation and impaired apoptotic homeostasis in aging organisms. This study sought to determine whether hemp seed fiber exerts ameliorative effects on age-associated splenic inflammation and apoptosis, specifically investigating its interaction with the PI3K-Akt pathway.

Methods Aged mice were divided into a control group and low-, medium-, and high-dose HSDF groups, and treated for 12 weeks. Mice underwent intraperitoneal pentobarbital sodium anesthesia before procedures, followed by humane euthanasia via cervical dislocation. H&E staining was performed to assess splenic histopathology, TUNEL fluorescence staining to quantify apoptotic rates, and qPCR/Western blot analyses to evaluate the expression levels of inflammatory mediators and key signaling molecules.

Results The low-dose HSDF group exhibited restored splenic white pulp architecture and reduced inflammatory infiltration. A dose-dependent reduction in TUNEL-positive cell rates was observed. Molecular analysis showed that low-dose HSDF significantly suppressed mRNA expression of pro-inflammatory factors and up-regulated mRNA levels of anti-inflammatory factors while enhanced phosphorylation levels of PI3K and Akt, as well as the Bcl-2/Bax ratio.

Conclusion HSDF ameliorates splenic inflammation and cellular apoptosis in aged mice by activating the PI3K-Akt signaling pathway, which suppresses inflammatory cytokine release and modulates apoptosis-related protein expression, thereby providing a mechanistic foundation for delaying immune senescence. These findings position HSDF as a nutraceutical candidate for immunosenescence intervention, with PI3K-Akt pathway modulation serving as a potential therapeutic target for age-related splenic dysfunction.

Keyword: Hemp seed diet fiber spleen, immune senescence, inflammation

ID: 318461

Thiamet-G Ameliorates Parkinson Disease-associated Cognitive Impairment via Increasing O-GlcNAcylation of STING in Microglia

Shuyang Chen Shanshan Zhu Nan Wang Minbing Yao Ju Zou Sijie Tan
University of South China

Objectives Microglia activation contributed to the development of the Parkinson disease (PD)-associated cognitive impairment and targeting microglia is a promising strategy for improving the cognitive function in PD. This study aimed to investigate the effects and mechanisms of Thiamet-G (TMG), an O-GlcNAcase inhibitor, on the PD-associated cognitive impairment.

Methods A PD mouse model was established used rotenone (ROT) and cognitive effects of TMG on these mice were investigated using behavioral tests. The anti-inflammatory effects of TMG were further studied in BV2 microglia cells.

Results TMG treatment improved the cognitive function in the ROT induced PD mouse, with increased novel arm entries and times in the Y-maze test. TMG also improved the cognitive function



of the PD mice in the novel objective test and objection location test. Histological studies showed that TMG decreased the reactive microglia via increasing the total protein O-GlcNAcylation levels in the hippocampus of the PD mouse. In the in vitro studies, TMG inhibited ROT-induced inflammation via decreasing the proinflammatory cytokines TNF- α , IL-1 β , IL-6 and p-NF- κ B in BV2 microglia cells. Bioinformatic analysis revealed that STING, a core protein in innate immunity regulation, might be a novel target of O-GlcNAcylation. The in vitro studies further showed that TMG inhibited STING phosphorylation via increasing O-GlcNAcylation.

Conclusion TMG might ameliorate PD-associated cognitive impairment via increasing O-GlcNAcylation of STING in microglia.

Keyword: Parkinson disease, cognitive impairment, O-GlcNAcylation, microglia

ID: 318852

Association of Socio-economic Status and Healthy Lifestyles with NAFLD in US Adults: 1999-2014 National Health and Nutrition Examination Survey

Ruoyu Gou¹ Danni Dou² Guanghua Li^{1,2}

1.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

2.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China.

Objective To examine the association between socioeconomic status (SES), healthy lifestyles, and non-alcoholic fatty liver disease (NAFLD) in U.S. adults.

Methods This cross-sectional study analyzed 7,189 participants (aged ≥ 20 years) from NHANES 1999-2014. SES was categorized into low/medium/high via latent class analysis using income, occupation, education, and health insurance. A healthy lifestyle score (0-5) integrated never smoking, alcohol abstinence, top-tertile physical activity, normal BMI (18.5-24.9), and upper two diet-quality quintiles. Weighted logistic regression estimated odds ratios (ORs) with 95% CIs for NAFLD.

Results NAFLD prevalence was 41.71%. A dose-response relationship was observed between lifestyle score and NAFLD risk: ORs (95% CI) for scores 2, 3, and 4 were 0.59 (0.48-0.71), 0.38 (0.32-0.46), and 0.12 (0.09-0.15), respectively (P -trend <0.001). Protective effects were consistent across SES strata, age/sex subgroups, and robust after excluding chronic comorbidities.

Conclusions Adherence to comprehensive healthy lifestyles significantly reduces NAFLD risk, with universal benefits across socioeconomic gradients. Fragmented behavioural modifications show limited efficacy, underscoring the necessity of integrated lifestyle interventions for NAFLD prevention.

Keyword: SES, Healthy Lifestyle Score, NAFLD, POLCA



ID: 320031

NIR-II Quantum Dot-Labeled Exosomes' Imaging in Treatment of Ischemic Peripheral Nerve Injury

Shingo Ogura^{1,3} Ke-Meng Shao¹ Jun Chen² De-Hua Wu³ Yan Wo^{1,3}

1.Department of Anatomy and Physiology, Shanghai Jiao Tong University School of Medicine

2.Department of Orthopedic Sports Medicine, Huashan Hospital Affiliated to Fudan University

3.Department of Anesthesia, Songjiang Research Institute, Songjiang Hospital Affiliated to Shanghai Jiao Tong University School of Medicine

Objectives Ischemic peripheral nerve injury hinders nerve regeneration due to vascular compromise, while exosomes show therapeutic promise via angiogenesis and neural repair. This study aimed to track the spatiotemporal distribution and efficacy of adipose-derived stem cell exosomes (ADSC-Exos) labeled with NIR-II quantum dots (QDs-ADSC-Exos) in ischemic PNI.

Methods Female SD rats (6-8 weeks old) underwent femoral artery and vein ligation plus femoral nerve crush under isoflurane anesthesia. Surgery involved exposing and ligating vessels with 6-0 sutures and crushing the nerve for 30 seconds with forceps. QDs-ADSC-Exos were injected subepineurally at the injury site. NIR-II imaging monitored exosome distribution, complemented by electrophysiological, behavioral, and histological evaluations of nerve repair.

Results QDs-ADSC-Exos showed robust NIR-II fluorescence, peaking at 12 hours and persisting at the injury site for 72 hours. The treated group displayed a higher compound muscle action potential amplitude versus the control group. Behavioral tests revealed better motor recovery, with foot-base angle and step length ratio surpassing controls. H&E staining confirmed no organ toxicity.

Conclusion The findings demonstrate that QDs-ADSC-Exos effectively promote nerve regeneration in ischemic peripheral nerve injuries, with NIR-II imaging providing critical insights into their spatiotemporal dynamics. This supports the therapeutic potential of exosome-based treatments and highlights the utility of advanced imaging for optimizing such therapies.

Keyword: exosomes, NIR-II imaging, peripheral nerve injury, quantum dots, vascular injury

ID: 320121

Sexual Dimorphic Accumulation and Propagation of Tauopathies in Primary Age-Related Tauopathy and PS19 Mice

Xinlu Chen
Hangzhou

Objectives Previous studies indicate the susceptibility for Alzheimer's disease (AD) is closely related to the sexual dimorphic accumulation of hyperphosphorylated Tau (pTau) in the entorhinal cortex (EC). We studied the interaction among pTau, estradiol (E2) and estrogen receptor α (ER α), early growth response factor 1 (EGR1) and its downstream target acetylcholinesterase (AChE) in the development of tauopathies.

Methods The expression of ER α , EGR1, AChE and pTau were determined by quantitative immunohistochemistry in the postmortem EC tissue from Primary Age-Related Tauopathy (PART) donors, and in the EC of PS19 mice which serve as an in vivo model of tauopathy. PS19 mice at 3 and 7 months of age were studied, corresponding to classification into early-stage PART (Braak I-II) and late-stage PART (Braak III-IV), respectively. Moreover, in SH-SY5Y cells or MAPT-SH-SY5Y cells (overexpressing p-Tau396S) were treated with or without E2, and the expression of ER α , EGR1, AChE and pTau were assessed.



Results For PART individuals, women showed higher and faster pTau accumulation in the EC with increased Braak staging than men, while men showed a decreased ER α -ir with Braak staging. In cells, E2 stimulated EGR1 expression but inhibited ER α -ir when there was no accumulated pTau, while overexpression of pTau stimulated EGR1-ir. E2 inhibited pTau, leading to decreased EGR1.

Conclusion The sexual dimorphic accumulation and propagation of pTau might at least be partly modulated by local estrogens via ER α and neuronal activity, the dynamic mechanisms underneath deserves further study.

Keyword: Sex differences, Hyperphosphorylated Tau, Estrogen, EGR1, AChE

ID: 320357

Small Extracellular Vesicles Derived from Hair Follicle Neural Crest Stem Cells Enhance Perineurial Cell Proliferation and Migration via TGF- β /Smad-HAS2 Pathway

Yiming Huo
Naval Medical University

Peripheral nerve defect repair is a complex process involving multiple cell types, with perineurial cells (PCs) playing a pivotal role. Hair follicle neural crest stem cells (hfNCSCs) have been shown to promote proliferation and migration of PCs via paracrine signaling; however, their clinical applications are limited by potential risks, such as tumorigenesis and xenogeneic immune rejection. Therefore, this study focuses on small extracellular vesicles derived from hfNCSCs (hfNCSCs-sEVs), which preserve the bioactive properties of parent cells while avoiding the risks associated with transplantation. In vitro, hfNCSCs-sEVs significantly enhanced the proliferation, migration, tube formation, and barrier function of PCs, subsequently upregulating expression of tight junction proteins. In rat models of sciatic nerve defects bridged with silicone tubes, treatment with hfNCSCs-sEVs resulted in increased expression of tight junction proteins in PCs, facilitating neural tissue regeneration. At 10 weeks post-surgery, rats treated with hfNCSCs-sEVs exhibited improved nerve function recovery and reduced muscle atrophy. Transcriptomic and miRNA analyses revealed that hfNCSCs-sEVs deliver miR-21-5p, which inhibits Smad7 expression, thereby activating the TGF- β /Smad signaling pathway and upregulating HAS2 expression, further enhancing expression of tight junction proteins. This research elucidates the promotional impacts of hfNCSCs-sEVs on the proliferation and migration of PCs, the formation of tight junction proteins, the development of the perineurium, and the tissue regeneration and functional restoration following peripheral nerve defects. It provides new insights into peripheral nerve regeneration from the perspective of PCs and presents a novel approach for clinical treatment.

Keyword: hfNCSCs, perineurial cells (PCs), small extracellular vesicles (sEVs), TGF- β /Smad signaling pathway, peripheral nerve injury



ID: 320452

Mid-sagittal MRI Morphometric Study of Classical and Novel Parameters of the Corpus Callosum in the Tibetan Populations

Ke Zeng

Chengdu University of Traditional Chinese Medicine

Objectives We aimed to characterize sex- and age-related differences in classical morphological parameters and to introduce novel geometric metrics for assessing the influence of the high-altitude environment on corpus callosum morphology in native Tibetans.

Methods A cohort of 262 healthy Tibetan adults underwent mid-sagittal magnetic resonance imaging (MRI). Measurements comprised callosal subregional thickness, length, height, area, and perimeter, all normalized to brain size. Circularity and eccentricity were calculated using formulas derived from the aforementioned parameters. Statistical analyses included non-parametric tests, partial correlations, and quadratic regression models to elucidate relationships between sex, age, and corpus callosum morphometry.

Results Normalized data revealed significant sex differences in callosal thickness and area, with men exhibiting larger dimensions. The corpus callosal area followed an inverted U-shaped trajectory over the lifespan. Circularity also displayed a biphasic pattern over the lifespan, reaching its peak at 22.8 years, with men attaining peak values 7 years earlier than women. A statistically significant quadratic relationship between circularity(C) and eccentricity(e) was identified, with a critical threshold at $e=0.039$, according to quantitative analysis.

Conclusion Although sex differences were observed in classical callosal morphological measurements among native Tibetans, the hypoxic environment did not significantly affect the composite parameters (circularity and eccentricity), thereby confirming the stability of these structural measures. Furthermore, the significant biphasic relationship suggested that callosal eccentricity may serve as an early potential predictor for neurological disorders, analogous to the established clinical utility of circularity in neuroimaging.

Keyword: Corpus callosum, High altitude, Morphology, Tibetans

ID: 320507

10 Hz rTMS Activated Motor Pathway and Regulated NNToid Response to Excitatory Neural Signals in Complete Spinal Cord Injury

Xujing

Sun Yat-sen University

Objectives To explore the potential of 10 Hz repetitive transcranial magnetic stimulation (rTMS) on reversing neurodegeneration and modulating neural network tissueoid (NNToid) at the site of SCI.

Methods In this study, we constructed NNToid based on stem cell tissue engineering strategy using NT3/TrkC gene-modified neural stem cells. rTMS-NNToid combination was used to treat for complete SCI rats. The rats were sacrificed at 4 weeks, 8 weeks, 10 weeks after SCI. The Western blotting, immunofluorescence, mRNA sequence, MEP, and BBB scores were detected to assess the neuronal injury, axon regeneration, and further motor function of SCI rats in different time points.

Results The findings revealed that 10 Hz rTMS effectively activates layer V pyramidal neurons, ameliorates neuroinflammation and neuronal apoptosis, enhances energy metabolism in neurons,



and upregulates genes and proteins related to axonal regeneration and synapse formation in the SMC. After 8 weeks of rTMS treatment, the corticospinal tract (CST) sprouts and connects with 5-hydroxytryptamine-positive (5-HT+) neurons in the raphe nucleus, facilitating the regeneration and synaptic integration of CST and 5-HT+ fibers with the transplanted neural network tissueoid (NNToid). Rats showed significant improvements in hindlimb motor function.

Conclusion The rTMS reverses neurodegeneration, modulates the regenerative microenvironment, and enhances the responsiveness of NNToid neurons in relaying motor signals, significantly improving the motor function of rats and presenting novel mechanisms and physio-biological therapeutic strategies for central nervous system injuries.

Keyword: brain-derived descending nerve fiber, neural network tissueoid, nerve fiber regeneration, repetitive transcranial magnetic stimulation, spinal cord injury.

ID: 320530

Healthy Aging in the Longevity Village of Bama in China

yongxin kang wei zhang qingyun huang guohe tan
guangxi medical university

Objectives A growing aging population is associated with increasing incidences of aging-related diseases and socioeconomic burdens. Hence, it's necessary to conduct studies about healthy aging. Worth noting that Bama, a multi-ethnic village in Guangxi, China, is very famous for its longevity phenomena. The proportion of centenarians in Bama is 5.7-fold greater than the international standard which deserves studying.

Methods We analyzed the data about long-lived population of Bama using geographic information system (GIS), and discussed the multiple-dimensional factors including genetic factors, diet, and natural environment.

Results The analysis by using GIS showed that long-lived population is distributed mainly in the limestone rocky mountain belt and characterized by familial aggregation, mostly from ethnic minorities. And studies showed that they had several special SNPs, DNA methylation and heritable telomere length. The diet pattern of them was characterized by high fiber, vitamin, but low animal fat and protein, sugar, salt, calorie. Besides, the natural environment of Bama had abundant plant resources, rich trace elements, high geomagnetic intensities and unique sunshine pattern.

Conclusion Together, we can acquire some important lessons from the longevity village of Bama. These lessons can provide novel insights into healthy aging.

Keyword: longevity, Bama, healthy aging



ID: 320573

Modified Taohong Siwu decoction promotes post-myocardial infarction repair via gut-heart axis-mediated efferocytosis enhancement in resident cardiac macrophages

Xiaoqi Guan Xinxin Hou Shuijin Shao Haidong Guo

School of Integrative Medicine, Shanghai University of Traditional Chinese Medicine, Shanghai, China

Objectives This study investigates the mechanism of modified Taohong Siwu Decoction (MTHSW) in promoting post-myocardial infarction (MI) repair through gut microbiota-resident cardiac macrophage crosstalk.

Methods C57BL/6J mice underwent left anterior descending coronary artery ligation to establish the MI model, with MTHSW or vehicle administered for 4 weeks. All mice were anesthetized with isoflurane during surgery. Cardiac function (echocardiography), myocardial fibrosis (Masson's staining), the proportion of resident cardiac macrophages (RCM) (immunofluorescent staining), and the transcriptional level of efferocytosis-related genes (TIMD4, FOLR2, LYVE1, MERTK and LGMN) (qPCR) were detected. Metagenomic sequencing and targeted metabolomics were performed to detect the changes in intestinal microbiome and the short-chain fatty acid levels in feces respectively. MI mice and murine macrophage cell line (RAW264.7) were treated with butyrate. The transcriptional level of efferocytosis-related genes was detected by qPCR.

Results MTHSW treatment improved cardiac function, reduced myocardial fibrosis, and increased the proportion of RCMs with elevated efferocytosis-related gene expression. Metagenomic and targeted metabolomic data showed that MTHSW treatment increased the relative abundance of butyrate-producing bacteria, correlating with elevated butyrate content. Butyrate treatment increased efferocytosis-related gene expression both in MI mice and RAW264.7.

Conclusion These findings demonstrate MTHSW improves MI repair in mice by regulating gut microbiota to increase butyrate production, which potentiates RCM efferocytosis, establishing a novel gut-heart axis therapeutic strategy.

Keyword: gut-heart axis; modified Taohong Siwu decoction; myocardial infarction; resident cardiac macrophages

ID: 320641

Near-Infrared Light Induces Neurogenesis and Modulates Anxiety-like Behavior

Xing Qi Shuwei Liu Xi Li
Shandong University

Background The hippocampus is associated with mood disorders, and the activation of quiescent neurogenesis has been linked to anxiolytic effects. Near-infrared (NIR) light has shown potential to improve learning and memory in human and animal models. Despite the vast amount of information regarding the effect of visible light, there is a significant gap in our understanding regarding the response of neural stem cells (NSCs) to NIR stimulation, particularly in anxiety-like behavior. The present study aimed to develop a new optical manipulation approach to stimulate hippocampal neurogenesis and understand the mechanisms underlying its anxiolytic effects.

Methods We used 940 nm NIR (40 Hz) light exposure to stimulate hippocampal stem cells in C57BL/6 mice. The enhanced proliferation and astrocyte differentiation of NIR-treated NSCs were assessed.



essed using 5-ethynyl-2'- deoxyuridine (EdU) incorporation and immunofluorescence assays. Additionally, we evaluated calcium activity of NIR light-treated astrocytes using GCaMP6f recording through fluorescence fiber photometry. The effects of NIR illumination of the hippocampus on anxiety-like behaviors were evaluated using elevated plus maze and open-field test.

Results NIR light effectively promoted NSC proliferation and astrocyte differentiation via the OPN4 photoreceptor. Furthermore, NIR stimulation significantly enhanced neurogenesis and calcium-dependent astrocytic activity. Moreover, activating hippocampal astrocytes with 40-Hz NIR light substantially improved anxiety-like behaviors in mice.

Conclusions We found that flickering NIR (940 nm/40Hz) light illumination improved neurogenesis in the hippocampus with anxiolytic effects. This innovative approach holds promise as a novel preventive treatment for depression.

Keyword: anxiety, astrocytes, calcium activity, Neural stem cells, NIR light

ID: 321260

Dendrobine and Erianin alleviate inflammation-induced depressive-like behaviors by targeting phosphodiesterase 4B in adolescent mice

史家明
山东大学

Purpose Depression in adolescence is highly prevalent due to current adverse circumstances like academic failure and substance abuse. Inflammation in early-life is able to evoke adolescent depression. DEN and ERI are two active constituents of *Dendrobium officinale*. However, their roles in inflammation-induced adolescent depression remain unclear.

Methods Inflammation-mediated depression model was performed by intraperitoneal injection of LPS and multiple behaviors were tested in adolescent mice. By using multi-histological and molecular experiments and combined with multi-omics analysis, the improvement effects and mechanisms of two drugs on depression in adolescent mice were explored.

Results Network pharmacology analysis showed that DEN and ERI were closely associated with depressive disorder. Administration of DEN and ERI alleviated LPS-induced depressive-like behaviors, and impairment of neurons and synapses in the HIP and PFC of adolescent mice. DEN and ERI prevented microglial activation, release of pro-inflammatory cytokines, oxidative stress and enlargement of TLR4/NF- κ B pathway. Importantly, PDE4B was proved as a crucial target protein of DEN and ERI. Besides, compared with ERI, DEN exhibited more beneficial effects on preventing LPS-induced intestinal flora disorders and intestinal epithelial cells injury via remodeling microbiota in mice.

Conclusion Together, the protective effects of DEN and ERI in inflammation-induced depressive disorder will identify DEN and ERI-directed PDE4B/TLR4/NF- κ B pathway as a therapeutic target for treatment of adolescent patients.

Keyword: Dendrobine, Erianin, Major depressive disorder, neuroinflammation, phosphodiesterase 4B



ID: 321420

Association Analysis the Intra-individual Structural Covariance Brain Network and Brain-gut axis Dysregulation in Individuals with Autism

Wangyu¹ Aihua Cao² Tianci Liu¹ Feifei Xu¹ Shuwei Liu¹

1.Shandong university

2.Shandong University Qilu Hospital

Brain-gut axis studies have revealed that the metabolites of the gut microbiota may affect brain function through blood circulation and neural pathways. However, whether there is brain-gut axis dysregulation in patients with autism and the mechanism by which this dysregulation affects the intra-individual structural covariance brain network remain to be further explored. To better explore the impact of autism spectrum disorder(ASD) on the topological properties of brain networks, this study performed intra-individual structural covariance brain network analysis in 86 ASD children and 46 age- and sex-matched typical developing children. Spearman correlation analyses were performed between altered node properties and changes in gut microbiota and serum metabolites in the ASD group to investigate the effects of gut-brain axis dysregulation on structural covariance brain networks in ASD. Random forest classifier was employed to assess whether combinations of gut microbiota, serum metabolites, and intra-individual structural covariance brain network features could serve as potential biomarkers for ASD. This study found that in the ASD group, there were significant correlations between serum metabolites and gut microbiota and the attributes of multiple key regional nodes in the brain. The random forest classification model showed that the multi-omics combination characteristics of serum metabolites Cys-Cys, intestinal microbiota Agathobacter, Lachnoclostridium and the clustering coefficient of the right superior frontal gyrus exhibited a high accuracy when differentiating individuals with ASD. These findings provide valuable information for understanding the neurobiological mechanism of ASD and its related intervention strategies.

Keyword: Autism Spectrum Disorder, gut microbiota, intra-individual structural covariance brain network, multi-omics analysis, serum metabolomics

ID: 321424

The Role and Mechanism of Perineuronal Nets in the Medial Prefrontal Cortex in Methamphetamine-induced Conditioned Place Preference in Mice

Yao Jia-yu Li Chang-Qi*

Central South University

Objectives Methamphetamine (MA) has become a particularly prevalent substance of abuse. The medial prefrontal cortex (mPFC), a critical hub for regulating drug-seeking behaviors, exhibits neuroplastic adaptations mediated by perineuronal nets (PNNs), specialized extracellular matrix structures governing synaptic stabilization. While PNNs are recognized modulators of learning and memory processes, including addictive memory, their mechanistic contributions to MA addiction remain elusive. Here we investigate the role and mechanism of PNNs in the mPFC in MA-induced addictive behaviors in mice.



Methods The MA-induced conditioned place preference (CPP) model, including acquisition, extinction, and reinstatement stages, was established in mice, and neuronal activation in the mPFC was observed by c-Fos immunohistochemistry staining combined with fiber photometry recordings. At different stages of CPP, PNNs were assessed using Wisteria floribunda agglutinin histochemistry and degraded by intra mPFC infusion of chondroitinase ABC. Immunohistochemistry and immunofluorescence staining were employed to examine parvalbumin (PV) neuron expression.

Results The mPFC region exhibited marked activation during CPP expression in mice. Across distinct stages of CPP, PNNs expression within the mPFC of MA-treated mice demonstrated significant upregulation. Ablation of PNNs in the mPFC at different stages effectively attenuated MA-induced CPP behaviors, and reduced c-Fos and PV expression.

Conclusion Our findings demonstrate that PNNs in the mPFC critically mediate MA addictive behaviors. Notably, targeted ablation of PNNs in the mPFC across distinct addiction stages effectively attenuated MA-induced addictive behaviors, which indicates that targeting PNNs may be an effective therapeutic option for MA-induced addictive behaviors.

Keyword: Drug addiction; Methamphetamine; Perineuronal nets; Medial prefrontal cortex

ID: 321534

Melatonin Attenuates Sepsis by Modulating Dendritic Cell Function

zhenguo xu
Fujian Medical University

Objectives Sepsis is a life-threatening syndrome characterized by organ dysfunction due to dysregulated host immune responses to infection. Dendritic cells (DCs), key regulators of immune responses, exhibit dynamic changes in number and function during sepsis, which are associated with disease progression and outcome. Melatonin (MLT), an endogenous indoleamine, has demonstrated immunomodulatory properties. This study aimed to investigate whether MLT alleviates sepsis through the modulation of DC function.

Methods A mouse model of sepsis was established via cecal ligation and puncture (CLP). Mice were treated with MLT, and survival, histopathology, and immune parameters were assessed. Flow cytometry was used to evaluate splenic DC populations and their maturation markers. Inflammatory cytokine mRNA levels were measured using q-PCR. To confirm direct effects on DCs, bone marrow-derived dendritic cells (BMDCs) were stimulated with LPS in vitro, with or without MLT pre-treatment.

Results MLT significantly prolonged survival in septic mice and reduced histopathological damage in the liver, lungs, and kidneys. MLT treatment decreased the percentage of splenic CD11c⁺ MHC II⁺ DCs and downregulated MHC II, CD80, and CD86 expression. q-PCR revealed lower mRNA levels of IL-6, IL-12, and IFN- γ in peritoneal lavage fluid. In vitro, MLT pre-treatment suppressed LPS-induced upregulation of MHC II, CD80, CD86, and proinflammatory cytokine mRNA in BMDCs in a dose-dependent manner.

Conclusion MLT ameliorates sepsis-induced organ injury by suppressing DC activation and inflammatory responses, suggesting DCs are a potential target for MLT-based immunotherapy in sepsis.

Keyword: Dendritic cells, Immunomodulation, Melatonin, Sepsis, Systemic inflammation



ID: 323013

Establishment of Complete Vibrissae Paralysis via Transection of Marginal Mandibular and Buccal Branches of Facial Nerve in Rats: A Pilot Study

SUN QINGNING
USM

Objectives Functional nerve studies involving vibrissae paralysis secondary to facial nerve transection have been widely practiced. The aim of this study was to establish a reliable model for complete vibrissae paralysis through variable transection of the BB and/or MMB in rats.

Methods Six adult Sprague Dawley (SD) rats were randomly and equally divided into three groups (n=2/group) to explore a variable vibrissae paralysis model. In Group 1, only the right BB was transected. In Group 2, only the right MMB was transected. In Group 3, both the right BB and MMB were transected. Vibrissae movement was recorded, and the angle of vibrissae movement was assessed at day 1, day 10 and day 20 post-transection.

Results At day 1, day 10 and day 20 post-transection, vibrissae movement on both sides was preserved in Groups 1 and 2, but eliminated on the injured side in Group 3.

Conclusion The establishment of a complete facial nerve paralysis model was validated through transection of both the BB and MMB of facial nerve. This model is recommended for demonstrating facial nerve paralysis in functional facial nerve studies.

Keyword: Keywords: facial nerve, vibrissae, angular movement, complete paralysis, nerve transection

ID: 325349

Plumbagin Promotes Ferritinophagy Mediated Ferroptosis in Nonfunctioning Pituitary Adenomas by Down-regulating the Nrf2/FTH1 Pathway

Dong Fan
School of Basic Medical Sciences, Guangdong Pharmaceutical University

Objectives Nonfunctioning pituitary adenomas (NFPAs) lack pharmacological therapies. This study aimed to define whether plumbagin (PLB) induces ferroptosis in NFPAs and its mechanism.

Methods PLB's effects on PDFS cells were tested via CCK-8, colony formation, and EdU assays. Ferroptosis-related pathways were screened by KEGG/GO/PPI analyses and molecular docking. The Nrf2/FTH1/NCOA4 axis was validated by qPCR and Western blot.

Results PLB selectively inhibited PDFS cell viability at lower doses than temozolomide. It suppressed Nrf2/FTH1, increasing lipid peroxidation and labile iron pools (LIP), while upregulating NCOA4 to enhance ferritinophagy-dependent iron release. NK-252 restored Nrf2/FTH1 expression and DFO reduced iron levels, both reversing PLB-induced cell death. In vivo, PLB suppressed tumor growth without organ toxicity.

Conclusion PLB can inhibit Nrf2/FTH1 to promote oxidative stress and activating NCOA4-mediated ferritinophagy to increase free iron. This identifies PLB as a novel therapeutic candidate for NFPAs.



Keyword: Ferroptosis, Ferritinophagy, Pituitary adenomas, Plumbagin

ID: 341074

A randomized controlled study of high and low frequency transcranial magnetic stimulation in the treatment of Alzheimer's disease

Ting Hou Junting Huang
Sun Yat-sen Medical College

Objectives Recent studies have demonstrated that Repetitive transcranial magnetic stimulation (rTMS) has the advantage of improved cognition and mild side effects in the treatment of Alzheimer's disease (AD) . To analyze the difference between high-frequency transcranial magnetic stimulation and low-frequency transcranial magnetic stimulation in the clinical treatment of AD patients, the changes of cerebral metabolism and function were studied by imaging wave imaging in order to deduce the related mechanism.

Methods Sixty AD patients were randomly assigned to high frequency (20 Hz) and low frequency (1 Hz) treatment groups. The target area of stimulation was the left dorsolateral prefrontal cortex (L-DLPFC) . After two consecutive weeks of treatment, the patients were assessed with different scale , to assess their cognitive function. Mrs and rfMRI were performed before and after treatment to analyze the signal changes of glutamate.

Results Both high-frequency RTMS and low-frequency RTMS could improve cognitive function of AD. Both MRS and resting-state brain functional connectivity results were shown by the difference.

Conclusion 1. Although both high-frequency RTMS and low-frequency rTMS have improved cognitive function, high-frequency RTMS is superior to low-frequency RTMS in improving cognitive function in AD patients.

2. The results of Mrs and RFMRI showed that the changes of neurotransmitters and functional connections between brain regions in AD patients were different after high-frequency and low-frequency therapy, so high-frequency and low-frequency therapy had different therapeutic mechanisms.

Keywords: Alzheimer's disease, repetitive transcranial magnetic stimulation, clinical efficacy, magnetic resonance popper, resting state functional connectivity

Experiments were conducted with the knowledge and consent of the subjects



ID: 318674

Mots-c Induced Macrophage Mitophagy via the AMPK/NLRX1 Signaling Pathway

Hang Liu Siquan Wen Yuanjie xie Zhongcheng Mo
guilin medical university

Objective To elucidate the molecular mechanism by which Mots-c regulates macrophage mitophagy via the AMPK/NLRX1 signaling pathway, with a focus on its dynamic binding properties and downstream functional effects.

Methods Molecular dynamics simulations analyzed the structural stability and residue fluctuations of Mots-c-AMPK and Mots-c-NLRX1 complexes. Binding free energy was calculated using MM-PBSA. Western blot and immunofluorescence detected AMPK/NLRX1 expression and autophagy markers, while qRT-PCR measured related mRNA levels.

Results Mots-c bound AMPK and NLRX1 with free energies of -55.48 and -72.37 kcal/mol, mainly driven by van der Waals forces and electrostatic interactions. Positive solvation free energy (ΔG_{solv}) indicated that solvation effects reduced binding affinity. MD simulations showed stable complex conformations, with local residue fluctuations suggesting functional regulation. WB and immunofluorescence confirmed Mots-c dose- and time-dependent upregulation of AMPK/NLRX1, increased LC3-II expression, and NLRX1 perinuclear aggregation.

Discussion This study integrates computational and experimental approaches to elucidate how Mots-c activates the AMPK/NLRX1 signaling pathway to promote mitophagy. Despite the solvation energy penalty ($\Delta G_{\text{solv}} > 0$), the dominant contributions of van der Waals forces and electrostatic interactions ensured thermodynamically spontaneous binding. Structural stability combined with residue-specific flexibility may reflect functional adaptability during signal transduction. Experimental validation confirmed that Mots-c enhances mitophagy through AMPK/NLRX1 activation. Future studies should employ site-directed mutagenesis to validate key binding residues and explore how the in vivo microenvironment modulates solvent effects to optimize therapeutic targeting.

Keyword: Mots-c; Mitophagy; Molecular dynamics

ID: 318853

Association of serum per- and polyfluoroalkyl substances and dietary live microbes with Anemia in adults: 2003-2018 NHANES

Ruoyu Gou¹ Danni Dou² Guanghua Li^{1,2}

1.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

2.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China.

Objective It is important to explore the effects of PFASs and dietary live microbes on anemia in non-pregnant adults. Objective To explore the effect of serum perfluoroalkyl substances (PFAS) and dietary live microbes on the anemia in adults with data from the National Health and Nutrition Survey (NHANES) database.

Methods Non-pregnant adults (≥ 20 years) ($n=3,698$) were recruited from the U.S. Health and Nutrition Examination Survey from 2003 to 2018. We determined the association between PFAS exposure, dietary live microbes, and anemia in individuals with logistic regression analysis.



Results After the full adjustment for confounders, PFHS may be a protective factor for anemia (OR: 0.8673, 95% CI: 0.7719, 0.9746, and $P = 0.0185$). The P -value was 0.0299 and OR (95%CI) was 0.2962 (0.0996, 0.8802) for anemia with multivariate logistic regression analysis, indicating a protective factor (PFDO). Grams Lo was the protective factor for anemia with the full adjustment for confounders, and P -value was <0.0001 , OR (95% CI) was 0.9998 (0.9996, 0.9999). But no significant association was detected between the other dietary live microbe groups, PFAS groups and anemia.

Conclusions PFHS, PFDO, Grams Lo are negatively correlated with anemia and may be protective factors for anemia. In addition, further research is needed on the potential mechanisms that may involve the association between participants' exposure to PFASs, dietary live microbes and anemia.

Keyword: Anemia, perfluoroalkyl substances, dietary live microbes, NHANES

ID: 318854

Association of multiple heavy metal exposure with hypertension: a cross-sectional study in Gongcheng County, China

Ruoyu Gou¹ Danni Dou² Guanghua Li^{1,2}

1.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

2.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China.

Objective The aim of this study was to investigate the relationship between hypertension and exposure to manganese (Mn), lead (Pb), copper (Cu), zinc (Zn), cadmium (Cd) and antimony (Sb).

Methods A cross-sectional study of 3,446 subjects was conducted. Logistic regression was used to estimate the relationship between each metal exposure and risk of hypertension. The potential heterogeneity of groups according to sex, age and smoking status was investigated, and metal mixtures and interactions were assessed by Bayesian kernel machine regression (BKMR).

Results The logistic regression analysis identified Cu ([OR]=7.796, 95% [CI]: 3.395-17.903, $P < 0.001$) and Cd (OR=1.894, 95% CI: 1.385-2.592, $P < 0.001$) as risk factors for hypertension. The BKMR analysis indicated that all heavy metals had a complex, nonlinear exposure-response relationship with the risk of hypertension in participants aged 60-99; the stratified analysis of all Cu levels also showed a complex nonlinear relationship. The stratified analysis revealed a significant correlation between the plasma levels of heavy metals and risk of hypertension aged 30-59, nonsmokers, and women.

Conclusion Plasma Cu and Cd levels were positively correlated with risk of hypertension when the metal levels were assessed individually or in combination and may be risk factors for hypertension. Future cohort studies with larger sample sizes and longer follow-up periods are necessary to confirm these associations.

Keyword: general population; high blood pressure; heavy metals; Bayesian kernel machine regression; overall effect



ID: 318855

Association of Dietary Intake of Saturated Fatty Acids with depression in U.S. Adults: 2005-2019 National Health and Nutrition Examination Survey

Ruoyu Gou¹ Danni Dou² Guanghua Li^{1,2}

1.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

2.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China.

Objective The dietary inflammatory index (DII), saturated fatty acids (SFAs), is associated with depression, and the association between SFAs and depression may be mediated by DII. The aim of this study was to assess the association of SFAs with depression risk and the mediating role of DII.

Method Among 22, 478 U.S. adults according to the NHANES, univariate logistic regression, and multivariate logistic regression were used to evaluate the association between dietary intake of SFAs and the risk of depression, respectively. Additionally, dietary inflammation levels were evaluated using the DII. Mediation analysis was used to investigate the risk of DII and depression.

Results The study included 22,478 participants (≥ 20 , years old). There was a significant difference in SFA 6.0 dietary intake between depression and non-depression individuals. After adjusting for potential confounders, multifactorial logistic regression results showed that SFA 8.0 (Q3 1.58 (1.09, 2.30), P-value = 0.017; Q4 1.55 (1.00, 2.42), P-value = 0.050) may increase the prevalence factor for depression, SFA 14.0 (Q3 0.67 (0.47, 0.94), P-value = 0.020) may decrease the risk of depression. Furthermore, DII was recognized as a mediator of the association between SFAs and the risk of depression.

Conclusions The findings suggest that dietary intake of SFAs is associated with the risk of depression in relation to the chain length of SFAs, and this may be due to the mediating effect of DII.

Keyword: SFAs, DII, NHANES, Depression, Mediation

ID: 318856

Association of dietary intake of saturated fatty acids with obstructive sleep apnea: mediating effects of Life's Crucial 9

Ruoyu Gou¹ Danni Dou² Guanghua Li^{1,2}

1.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

2.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China.

Objectives Obstructive sleep apnea (OSA) is a global public health issue. This study aims to assess the association between dietary intake of SFAs and the risk of OSA, and the mediating effect of LC9.

Methods Based on the NHANES, dietary questionnaires of participant were collected, and the average values of 24-h dietary recall data over 2 days were obtained. Weighted multivariable logistic regression models were used to estimate the weighted odds ratios (ORs) and their 95% confidence intervals (CIs) for SFAs and OSA. Evaluate the mediating role of LC9 in the relationship between SFAs and OSA.

Results The total SFAs could increase the risk of OSA [Model 1, Q3, 0.03, 1.49 (1.03, 2.15); Model 2, Q3, 0.04, 1.47 (1.01, 2.13)]. It was emphasized that dietary intake of Sfa 12.0, Sfa 14.0, and Sfa 16.0 were protective factors for OSA. Moreover, Sfa 12.0 exhibited a better protective effect



in female participants [Q3, 0.04, 0.66 (0.45, 0.99)]. The cardiovascular health score - LC9 had a mediating effect in Sfa4.0 on OSA [Proportion of mediation: -0.035, 95% CI: (-0.058, -0.01)]. There was a nonlinear relationship between dietary intake of Sfa 12.0, Sfa 16.0, and Sfa 18.0 and OSA.

Conclusion These findings suggest that dietary mixtures of saturated fatty acids increase the risk of OSA. SFA 4:0 can increase the risk of OSA through the level of cardiovascular health.

Keyword: saturated fatty acid (SFAs), obstructive sleep apnea (OSA), Life's Crucial 9 (LC9), mediation, NHANES, cross-sectional study

ID: 318859

Association of Social determinants of health and Life's Essential 8 with chronic kidney disease in US adults

Ruoyu Gou¹ Danni Dou² Guanghua Li^{1,2}

1.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

2.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China.

Background Chronic kidney disease (CKD) is closely related to CVD. Aim was to evaluate the association of social determinants of health (SDOH) and Life's Essential 8 (LE8) with CKD.

Methods This population-based cross-sectional study used data from the NHANES (2005-2018), ≥ 20, years old). The American Heart Association defines the LE8 score. SDOH was collected by self-report questionnaire. Multivariate logistic and restricted cubic spline (RCS) models were used to evaluate the association with CKD.

Results Among the 24,161 participants, 17.59% (4,251) had CKD, age-standardized prevalence 13.44 % (12.87, 14.00). Additionally, among women (B), the prevalence was even higher at 18.45% (16.87, 20.02). Undesirable SDOH appears to be closely associated with CKD and could potentially be a risk factor. When the SDOH Score ≥3, Model 2, the OR (95% [CI]) is 1.27 (1.01, 1.59), 1.54 (1.25, 1.89), 1.53 (1.22, 1.92), 1.41(1.13, 1.76). With the LE8 gradually increased, the risk of CKD decreased. In Model 2, the OR (95% CI) was 0.60 (0.52, 0.69), 0.53 (0.43, 0.66). This association remains the same across subgroups of different genders, ages, and ethnicities.

Conclusions The risk of CKD is impacted by a combination of social and cardiovascular health factors. Encouraging adherence to optimal LE8 levels and managing risk factors related to unfavorable SDOH could potentially help reduce the impact of CKD.

Keyword: Life's Essential 8, SDOH, CKD, NHANES, Adults



ID: 318860

Association between dietary patterns and metabolic syndrome among middle-aged and elderly Yao people in Gongcheng County, Guangxi

Ruoyu Gou¹ Danni Dou² Guanghua Li^{1,2}

1.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

2.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China
ChinSchool of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, Chin

Objective Evaluating the relationship between dietary patterns and metabolic syndrome in a middle-aged Yao population (≥ 45 years old) in a county of Guangxi. Summarize dietary patterns that are beneficial in alleviating the metabolic syndrome (MS).

Methods A cross-sectional survey was conducted in Gongcheng County, Guangxi, China, to collect 109 food intakes, blood biochemical index tests, and basic health status from Yao participants ($N = 1,602$, ≥ 45 , years). Factor analysis was used to extract major dietary patterns (EigenV > 1). Multiple logistics regression model was used to analyze the relationship between dietary patterns and MS.

Result The extracted dietary patterns were: Oil & Salt Dietary Pattern, Mushroom & Dairy Dietary Pattern, Staple Food Dietary Pattern and Alcohol & Aquatic Dietary Pattern. Mushroom & Dairy Dietary Pattern and Staple Food Dietary Pattern may have protective effects against diabetes, while Alcohol & Aquatic Dietary Pattern may increase the risk. Additionally, Mushroom & Dairy Dietary Pattern may be a risk factor for low high-density lipoprotein cholesterol (HDL-C) (Model III: Q4, 2.73 (1.29, 5.95)), while Alcohol & Aquatic Dietary Pattern and Oil & Salt Dietary Pattern may have a protective effect. Lastly, Alcohol & Aquatic Dietary Pattern may be a protective factor for hyperlipidemia (Model III: Q3, 0.69 (0.48, 1.00)).

Conclusion Among Gongcheng Yao participants (≥ 45 , years), the prevalence of MS was low and the effect of dietary patterns on metabolic syndrome was not significant. Dietary patterns were associated with components of metabolic syndrome.

Keyword: dietary pattern; factor analysis method; metabolic syndrome; diet

ID: 318861

Association of Life's Essential 8 with osteoarthritis in United States adults: mediating effects of dietary Intake of Live Microbes

Ruoyu Gou^{1,2} Danni Dou³ Guanghua Li^{2,3}

1.宁夏医科大学

2.School of Public Health, Ningxia Medical University, Yinchuan 750004, China

3.School of Basic Medical Sciences, Ningxia Medical University, Yinchuan 750004, China.

Objective Osteoarthritis (OA) is associated with CVD, with a persistent economic and physical burden on the U.S. participant. We evaluate the association of CVH (Life's Essential 8, LE8) with OA in adults and the mediated effect of Live Microbes.

Method This cross-sectional study use data from the National Health and Nutrition Examination Survey (NHANES, ≥ 20 , years old, 1999-2019). LE 8 scores (0-100) were measured according to th



e American Heart Association definitions and categorized as low (0-49), moderate (50-79), and high (80-100) CVH. OA disease status was collected through participant self-report. Multivariate logistic models and restricted cubic spline models (RCS) were used to evaluate the relationships. Mediating analysis was used to evaluate the mediating effect of dietary Intake of Live Microbes on the association of LE8 with OA risk.

Results The study included 23,213 participants (≥ 20 , years old). The higher LE8 scores were associated with a lower incidence of OA, (OR (95% CI)), Moderate (0.81 (0.69, 0.96)), High (0.55 (0.44, 0.69)), and a nonlinear dose-response relationship was observed. Grams Lo mediated the association of LE8, Health behaviors score, Health factors score with OA risk, which does not reduce OA risk.

Conclusions These results suggest that adherence to higher levels of LE8 reduces the risk of OA and that Grams Lo may reduce the protective effect of LE8.

Keyword: Osteoarthritis, Life's Essential 8, Mediation analyses, Live Microbes, NHANES

ID: 318947

Minocycline ameliorates cognitive impairment in rats with trigeminal neuralgia by regulating microglial polarization

Junjie Li¹ Xiaojuan Mi¹ Juan Liu^{1,2}

1.School of Basic Medical Sciences, Ningxia Medical University

2.General Hospital of Ningxia Medical University

Trigeminal neuralgia (TN)-related cognitive impairment is a common cause of decreased quality of life in patients and is closely associated with neuroinflammation. Although minocycline has demonstrated antiinflammatory, analgesic, and neuroprotective functions, its role in treating TN-related cognitive impairment remains unreported. In this study, we used an in vivo TN model and an in vitro model of primary microglial neuroinflammation to investigate the potential effects of minocycline on cognitive function and microglial polarization in TN rats. Our results suggested that minocycline treatment attenuated cognitive deficits by alleviating hippocampal neuronal damage and enhancing synaptic plasticity in TN rats. Furthermore, both in vitro and in vivo assays demonstrated that minocycline polarized activated microglia to the M2 phenotype, leading to the reduction of pro-inflammatory factors, including tumor necrosis factor- α and interleukin-1, and an increase in the anti-inflammatory factors, such as interleukin-4 and interleukin-10, thereby attenuating neuroinflammation. Moreover, it was found that the TLR4/MyD88/NF- κ B pathway was involved in the shift of microglia from a proinflammatory (M1) to an anti-inflammatory (M2). In summary, minocycline likely mediated the process of microglia polarization partly via the TLR4/MyD88/NF- κ B pathway, promoting neuronal survival and restoring synaptic plasticity, thereby improving TN-related cognitive impairment.

Keyword: Minocycline; Trigeminal neuralgia; Neuroinflammation; Microglial polarization; Cognitive impairment



ID: 318955

Dexas1: A Key Regulator of the Hippocampal-Hypothalamic Axis in Stress-Related Behaviors

qiuyahong zhulijuan
Southeast University

Objectives Prolonged stress leads to HPA axis hyperactivity and has been associated with the development of anxiety, depression, and other mood disorders. Nevertheless, the molecular mechanisms underlying this impairment remain incompletely elucidated.

Methods Mice were anesthetized with a mixture of ketamine (100 mg/kg) and xylazine (10 mg/kg) diluted in 0.9% sterile saline. Mice were administered the glucocorticoid receptors antagonist mifepristone through pre-implanted cannulae following chronic stress exposure. RNA-seq was performed on the hippocampus and PVN, and a public scRNA-seq dataset of the HPA axis after chronic social defeat stress was re-analyzed. Immunofluorescence staining, Western blotting and ELISA were employed. Behavioral tests were conducted to evaluate anxiety-, depression-like, and social behaviors in mice.

Results Chronic stress upregulates the levels of Dexas1 in the hippocampus, and AVP in the PVN via hippocampal glucocorticoid receptors. Further investigation revealed that hippocampal Dexas1 upregulated PVN AVP and induced anxiety-, depressive-like behaviors and social impairments. Moreover, we found that hippocampal Dexas1 significantly increased IGHG2B, and the subsequent elevated Ttr in the PVN. Importantly, we demonstrated that IGHG2B or Ttr infusion into the PVN abolished the behavioral effects of hippocampal Dexas1 knockdown. Our results identified that hippocampal Dexas1 knockdown attenuated the chronic stress-activated HPA axis, whereas infusion of AVP into PVN abolished the effects of hippocampal Dexas1 knockdown on chronic stress-induced HPA axis activation.

Conclusions Our findings revealed that Dexas1 is an important molecule underlying the effects of hippocampus-hypothalamic axis on stress-related behaviors.

Keyword: Anxiety, AVP, Chronic stress, Depression, Dexas1, HPA axis

ID: 318964

A bibliometric and visualization analysis of electrochemical biosensors for early diagnosis of eye diseases

18570321003
central south university

Objectives Electrochemical biosensors can provide an economical, accurate and rapid method for early screening of disease biomarkers in clinical medicine due to their high sensitivity, selectivity, portability, low cost and easy manufacturing, and multiplexing capability. Tear, a fluid naturally secreted by the human body, is not only easily accessible but also contains a great deal of biological information. However, no bibliometric studies focus on applying electrochemical sensors in tear/eye diseases.

Methods We utilized VOSviewer and CiteSpace, to perform a detailed bibliometric analysis of 114 papers in the field of research on the application of tear in electrochemical biosensors screened from Web of Science with the combination of Scimago Graphica and Microsoft Excel for visualization to show the current research hotspots and future trends.

Results The results show that the research in this field started in 2008 and experienced an emerging period in recent years. Researchers from China and the United States mainly contributed to the



e thriving research areas, with 41 and 29 articles published, respectively. Joseph Wang from the University of California San Diego is the most influential author in the field, and Biosensors & Bioelectronics is the journal with the most published research and the most cited journal. The highest appearance keywords were "biosensor" and "tear glucose," while the most recent booming keywords "diagnosis" and "in-vivo" were.

Conclusion This study elucidates current trends, hotspots, and emerging frontiers, and provides future biomarkers of ocular and systemic diseases by electrochemical sensors in tear with new ideas and opinions.

Keyword: Bibliometrics; CiteSpace; VOSviewer; electrochemical biosensors; eye diseases; tears.

ID: 318966

Identification and Validation of Oxidative Stress Signature Genes in the Trabecular Meshwork of Glaucoma

Xu Weiye
Central south university

Objective Oxidative stress (OS) plays a key role in trabecular meshwork (TM) dysfunction in glaucoma, but its molecular mechanisms remain unclear.

Methods We integrated the GSE27276 dataset with OS-related genes from GeneCards to identify differentially expressed OS-related genes (DEOSGs). Functional enrichment, protein-protein interaction (PPI) network, immune infiltration, regulatory network, and drug-gene interaction analyses were performed.

Results A total of 61 DEOSGs were identified. These genes were mainly enriched in IL-17, TNF, and NF- κ B signaling pathways. PPI network analysis revealed seven hub genes: CCL3, CXCL1, NFKBIA, VCAM1, LCN2, TNFRSF1A, and HP. Validation using GSE124114 confirmed downregulation of TNFRSF1A and CXCL1. Four hub genes showed strong diagnostic value ($AUC > 0.7$). Immune analysis indicated correlations with regulatory T cells and neutrophils. RELA, NFKB1, and hsa-miR-34a-5p may regulate core genes. Thirty-five candidate drugs, including Infliximab and Vitamin B6, were identified.

Conclusion This study highlights key OS-related genes and regulatory networks in glaucoma, offering potential diagnostic biomarkers and therapeutic targets.

Keyword: Glaucoma, oxidative stress, trabecular meshwork, GEO database, bioinformatics analysis, hub genes



ID: 320064

Mechanism of CRHergic pathway from CeA to vIPAG participating in the regulation of itch

朱心怡 李辉

Air Force Medical University

Objectives Corticotropin-releasing hormone (CRH) has been demonstrated to participate in itch regulation across multiple studies. The central amygdala (CeA) contains abundant CRH-positive neurons, and our previous research identified substantial neural projections from CeA to the ventrolateral periaqueductal gray (vIPAG). This study aims to clarify the mechanisms of CRHergic pathway from CeA to vIPAG [(CeA→vIPAG)^{CRH}] participating in the regulation of itch.

Methods Fiber photometry recorded CeA^{CRH} neuron activity during scratching. Viral tracing confirmed the (CeA→vIPAG)^{CRH} pathway. Optogenetic/chemogenetic manipulations, combined with behavioral tests (scratching, open field, elevated maze), assessed its function in acute itch.

Results Time-locked recordings showed an increase in CeA^{CRH} neuron activity coinciding with scratching. Both chemogenetic/optogenetic activation and inhibition of this pathway consistently promoted pain responses while suppressing itch behaviors. Subsequent optogenetic activation of this pathway with concurrent inhibition of either GABAergic or glutamatergic neurons in vIPAG revealed: ① Following activation of CRH-positive GABAergic neurons in CeA, the activity of GABAergic neurons in vIPAG was suppressed. This disinhibition facilitated anti-pruritic effects. ② Optogenetic activation of CeA CRH-positive GABAergic neurons inhibited glutamatergic neuronal activity in vIPAG, resulting in pro-pruritic effects.

Conclusion In this study, we delineated the regulatory role of the (CeA→vIPAG)^{CRH} pathway on itch, demonstrating its capacity to exert both pro-pruritic and anti-pruritic effects through distinct GABA/glutamate-mediated synaptic mechanisms, and providing theoretical basis for developing CRH pathway-targeted anti-pruritic therapies.

Keyword: CeA, CRH, Itch, vIPAG

ID: 320124

Modulation of GABAergic neuronal activity in the central amygdala by acupuncture improves gastric dysfunction and depressive-like phenotype in CUMS mice

Hongkun Ma Yi Yuan XueYan Li Xiyang Wang Guoming Shen

安徽中医药大学

Objective Chronic unpredictable mild stress (CUMS) induces gastric dysfunction and depressive-like behavior, and GABAergic neurons in the central amygdala (CeA) play a key role in mediating the stress response and visceral regulation. This study explores whether electroacupuncture (EA) alleviates CUMS-induced pathologies through CeA GABAergic neuronal modulation.

Methods Thirty male C57BL/6 mice were randomized into control, CUMS, and CUMS+EA groups. Depression-like phenotype and gastric function in mice were assessed using behavioral tests, gastric motility sensor tests, and ELISA assays. And CeA GABAergic neuronal activity through c-Fos/GABA immunofluorescence. Chemogenetic activation (hM3Dq DREADDs) and optogenetic inhibition (NpHR3.0) of CeA GABAergic neurons were performed, with real-time calcium dynamics



monitored via fiber photometry. A small animal respiratory anesthesia machine 3% isoflurane induced anesthesia and 1.5% maintenance anesthesia was used in all in vivo mouse experiments.

Results CUMS mice exhibit depressive-like behavior, decreased body weight, decreased food intake, decreased gastric motility, slowed gastric emptying, and decreased serum gastrin. EA intervention significantly ameliorated these parameters ($p < 0.05$). Chemogenetic activation of CeA GABAergic neurons reproduced the CUMS phenotype, whereas optogenetic inhibition replicated the therapeutic effects of EA, improving depressive-like behavior and gastric function. Fiber photometry confirmed EA-induced suppression of calcium transients in CeA GABAergic neurons.

Conclusion EA alleviates CUMS-induced gastrointestinal and behavioral abnormalities by normalizing CeA GABAergic neuronal hyperexcitability and rebalancing gastro-brain axis communication. These findings elucidate a neural circuitry mechanism underlying acupuncture's therapeutic efficacy in stress-related comorbidities.

Keyword: CUMS; CeA GABAergic neuronal; electroacupuncture; gastric dysfunction

ID: 320401

Augmented Reality-Assisted Preoperative Planning for Basilar Artery Aneurysm Surgery: Comparative Analysis of Subtemporal and Orbito-Zygomatic Approaches

Guo Yiding¹ Zhao Bneqi² Zhang Peihai¹ Liu yong³ Yang Xuejun¹ Guo yi¹

1. Department of Neurosurgery, Beijing Tsinghua Changgung Hospital, School of Clinical Medicine, Tsinghua Medicine, Tsinghua University

2. Department of Radiology, Beijing Tsinghua Changgung Hospital, School of Clinical Medicine, Tsinghua Medicine, Tsinghua University

3. Department of Neurosurgery, Erdos Central Hospital, Erdos

Background Augmented reality (AR) offers benefits in neurosurgery by improving preoperative planning through 3D visualizations of complex structures. This study evaluates the use of AR-assisted planning for basilar artery (BA) aneurysms, comparing two surgical approaches: subtemporal and orbito-zygomatic.

Objective This study aims to applicate AR technology in real practice. We hope it will bring novel paradigm in future.

Method Preoperative CTA data from 9 patients with BA aneurysms were used to create 3D models of the skull and vasculature using SurgicalAR®. These models were visualized on a head-mounted AR device for surgical planning, focusing on key structures like the BA and posterior cerebral artery (PCA). The two approaches were compared in terms of vessel exposure and measurement accuracy.

Results The subtemporal approach provided superior visualization of the ipsilateral PCA (22.4 ± 0.4 mm) and BA (18.5 ± 0.6 mm) compared to the orbito-zygomatic approach, which measured the PCA at 8.4 ± 0.5 mm and BA at 7.5 ± 0.4 mm. The subtemporal approach allowed more precise identification of vascular structures, although soft tissue and real-time surgical deviations were limitations in the AR models.

Conclusion AR-assisted preoperative planning improved anatomical understanding, particularly for the subtemporal approach in surgery. While the orbito-zygomatic approach showed limited vascular exposure, AR technology demonstrated potential in enhancing surgical precision. Further research is needed to optimize clinical use and address challenges in soft tissue visualization and image quality.



Keyword: Augmented Reality (AR), Basilar Artery (BA), aneurysm, surgical planning, surgical training

ID: 320549

Divergent GluA2-mediated regulation of myelination by ZCAN262: beneficial in development but detrimental in remyelination

Wu Zhonghao Shen Yan Jiang Zhuoxu Niu Jianqin
Army medical university

Objectives ZCAN262, a novel allosteric modulator of AMPA receptors, was found to be therapeutically effective in promoting myelin formation. However, its specific effects in myelin-deficit-related conditions and mechanisms are not yet fully understood.

Methods We conducted drug simulation docking and calcium imaging experiments to confirm the effect of ZCAN262 on AMPA receptors. Subsequently, we compared the roles of ZCAN262 in (re)myelination in different physiological and pathological mouse models.

Results The drug simulation docking revealed that ZCAN262 had the highest matching score for GluA2, which is predominantly expressed in OPCs and neurons. Calcium imaging in vitro indicated that ZCAN262 can reduce the calcium activity mediated by GluA2 but not by GluA1, 3 or 4. In vivo, we found that ZCAN262 increases the content of myelin structures in a developmental mouse model, but decreases remyelination in a lyssolecithin-induced demyelination mouse model.

Conclusion The roles of ZCAN262 mediated by GluA2 in development and regeneration are diverse; although the underlying mechanism remains vague, our data suggest a heterogeneous requirement of neuronal inputs in myelin formation across various physiological and pathological conditions.

Keyword: GluA2, myelin, OPC, ZCAN262

ID: 321229

Achyranthes bidentata Blume-based medicinal and edible resources for the prevention and treatment of ischemic stroke: A study based on machine learning and molecular docking

WuDi Lei Shen^{*}
Qiqihar Medical University

Objectives This study proposed a medicinal and edible plant lineage for the prevention of IS, revealed the therapeutic effect and molecular mechanism of *A. bidentata* Blume in IS, and provided a potential prevention model for the reduction of ischemic stroke (IS).

Methods Network pharmacology and bioinformatics were employed to explore potential targets and pathways of *A. bidentata* Blume for IS treatment. Molecular docking and dynamics simulations verified interactions between its main components and core targets.

Results The targets of the components of *A. bidentata* Blume were predicted by TCMSP and Pharm Mapper, and the co-expressed genes were screened by combining the GEO database. The core proteins, including MMP9, CASP1 and ALOX5, were determined by Weighted gene co-expression



sion network analysis (WGCNA), Lasso regression analysis and (Protein-protein interaction) PPI network construction. Molecular docking showed that the binding energy of the main components of *A. Bidentata* Blume, with the three core proteins were all less than -5 kcal/mol. The molecular dynamics simulation of Quercetin-ALOX5 complex with the best molecular docking binding energy was carried out to further verify the stability of Quercetin-ALOX5 complex. Based on these core genes, 29 medicinal and edible Chinese medicines were obtained. The main active ingredients of these traditional Chinese medicines are: Stigmasterol, stearic acid, quercetin, beta-sitosterol.

Conclusion In summary, our study uses a multifaceted approach to study the value and mechanism of *Achyranthes bidentata* Blume in the treatment of IS, providing potential medicine and food homology for the prevention and treatment of IS.

Keyword: *Achyranthes bidentata* Blume, ischemic stroke, network pharmacology, molecular docking, medicine and food homology



<http://apica2025.csas.org.cn/>