

李剛

GANG LI



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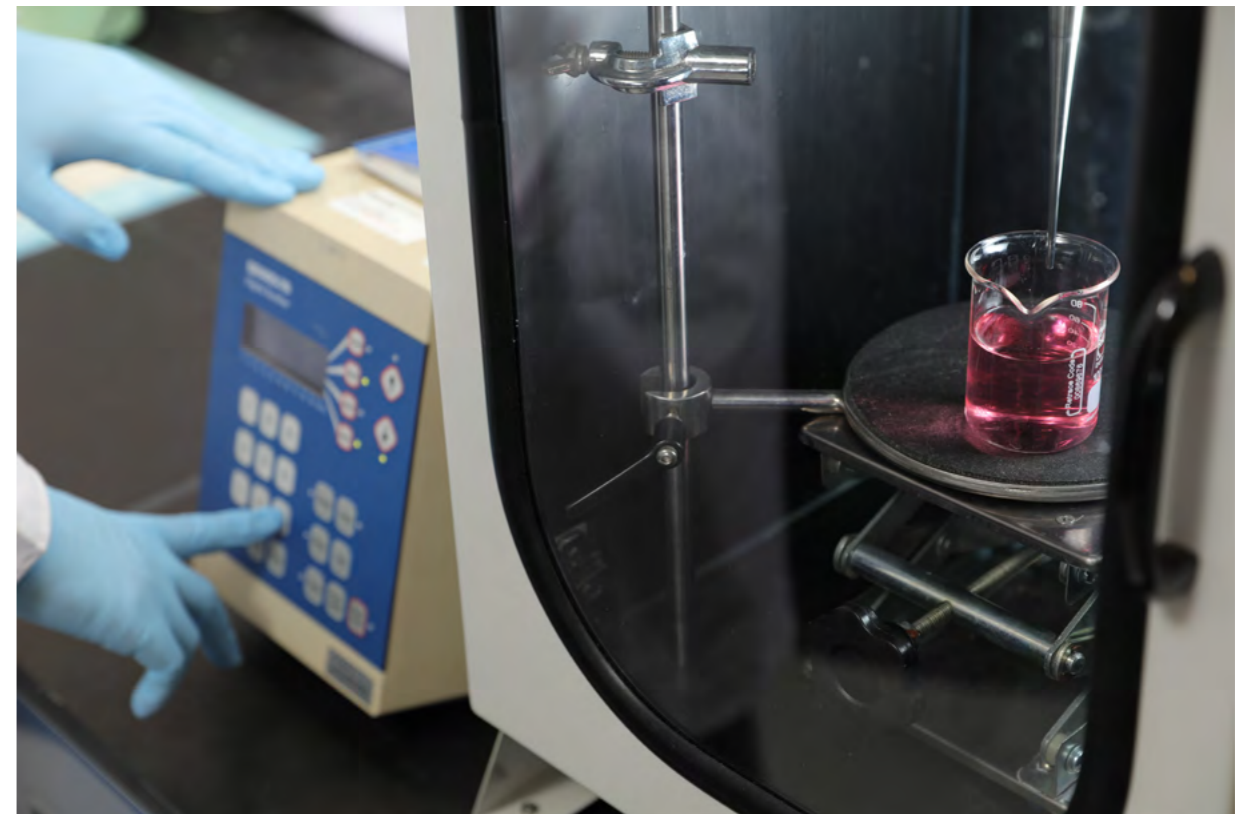
STEM CELLS AND TISSUE REGENERATION

Adult Stem Cell Biology and Applications

Research Progress Summary

In 2021, there are 16 members in the research team led by Gang Li (1 Research Assistant Professor, 4 Postdoctoral Fellows, 2 Research Associates, 9 PhD Students) with the following research programs carried out: (1) Development and mechanistic studies of tibial cortex transverse transport (TTT) surgery for the management of diabetic foot ulcers. (2) Development and mechanistic studies of cranial bone transport (CBT) surgery for the management of ischemic stroke and Alzheimer's disease. (3) Novel therapy strategies for osteoporotic bone fracture and chronic wounds. (4) Industry and Hong Kong Government contract research works on pre-clinical studies of biological compounds and biophysical stimulations. These research programs have been progressed well as planned, with more than 20 peer-reviewed publications and over HK\$10 million research grants income.

Gang has been invited to give keynote speeches and lectures at various national and international conferences and meetings (virtual form) for more than 10 times in 2021, and continuously serves as visiting professors at many prestigious universities such as Monash University, Australia; University of Malaya, Malaysia; Guangdong Medical University China, etc. He also serves as the council member or member-at-large for 4 prestigious national research societies, and editorial board members for 6 international journals. Notably Gang and his collaborators from mainland China won the First-Class Award in Science Advances, Ministry of Science and Technology of the People's Republic of China in 2021 for his achievements in new musculoskeletal tissue regeneration technologies, which is one of the most prestigious national awards in China.





Principal Investigator

Gang Li



Team members

Sien Lin, Yan Wang, Lu Feng, Weiping Lin, Linlong Li, Yucong Li, Haixing Wang, Xiaoting Zhang, Yuan Li, Zhengmeng Yang, Shanshan Bai, Min Wang, Xuan Lu, Yongkang Yang, Zhaowei Jiang, Yuejun Lin

Research Awards and Recognitions

Member's Name	Details	
	Award	Organisation
Gang Li	First-Class Award in Science Advances	Ministry of Science and Technology, China

Fellowships

Member's Name	Details	
	Fellowship	Organisation
Gang Li	Adjunct Professor	Australian Regenerative Medicine Institute, Monash University, Australia
	Visiting Professor and Assessor of Teaching Program	Department of Orthopaedic Surgery and Traumatology, University of Malaya, Malaysia
	Visiting Professor	Guang Dong Medical College, China

Research and Scholarship

Member's Name	Details	
	Fellowship	Organisation
Gang Li	Visiting Professor	Shenzhen Baoan People's Hospital, Shenzhen, China
		China Medical University, Shenyang, China
	General Secretary, Division of Limb Deformity Correction and Reconstruction	Chinese Association of Orthopaedic Surgeons
	Co-Chairman	China Branch, International Limb Lengthening and Reconstruction Societies
		Association from Study and Application of the Methods of Ilizarov
	骨橫搬糖足學組副主任委員	中國骨科醫師協會
	Council Member of Academic Division	Hong Kong Association of Scientists
	Vice Chairman, Branch of Regenerative Biomaterials	Chinese Association of Materials
	Member-at-Large (Global position)	Tissue Engineering and Regenerative Medicine International Society Asia Pacific
	Council and Funding Member	Hong Kong Society of Cell Biology
Fellow	International Combined Orthopaedic Research Societies	
Fellow	American Orthopaedic Research Society	

Academic Editorship

Member's Name	Details	
	Role	Journal
Gang Li	Executive Associate Editor	Journal of Orthopaedic Translation
	Member of Editorial Board	Calcified Tissue International
		Bone and Joint Research
		Bone
		Journal of Orthopaedic Research
China Medical Journal		

Reviewer of Journal / Conference

Member's Name	Details	
	Role	Journal / Conference
Gang Li	Reviewer	Stem Cells Research and Therapy
		Biomaterials
		Stem Cells
		Frontiers in Cell Biology
		Science Advances
		Cytotherapy
		Journal of Physiology
		Journal of Chemical Engineering

Grants and Consultancy

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK\$)
Gang Li	The Role of LGR5 in Cartilage Development and Mesenchymal Stem Cells Mediated Cartilage Repair	Research Grants Council – General Research Fund	01/01/2021	31/12/2023	996,285
	Engineering the Biomimetic Structural and Mechanical Heterogeneity of Cell-Adaptable Nanocomposite Hydrogels for Biomedical Applications	Research Grants Council – General Research Fund	01/01/2021	31/12/2023	1,185,400
	Modulating Osteoarthritis Development via Balancing Endogenous Expression of Smad3 and Smad7	Research Grants Council – General Research Fund	01/01/2019	31/12/2021	953,029
	Exploiting the True Joint Progenitor Cell for Articular Cartilage Repair	Research Grants Council – Collaborative Research Fund	01/06/2019	31/05/2022	7,370,000
	Functional Bone Regeneration in Challenging Bone Disorders and Defects	Research Grants Council – Theme Based Research Scheme	01/11/2017	31/10/2022	333,333,333
	Aging, Skeletal Degeneration and Regeneration	Research Grants Council – Areas of Excellence Scheme	01/05/2021	30/04/2029	64,889,000

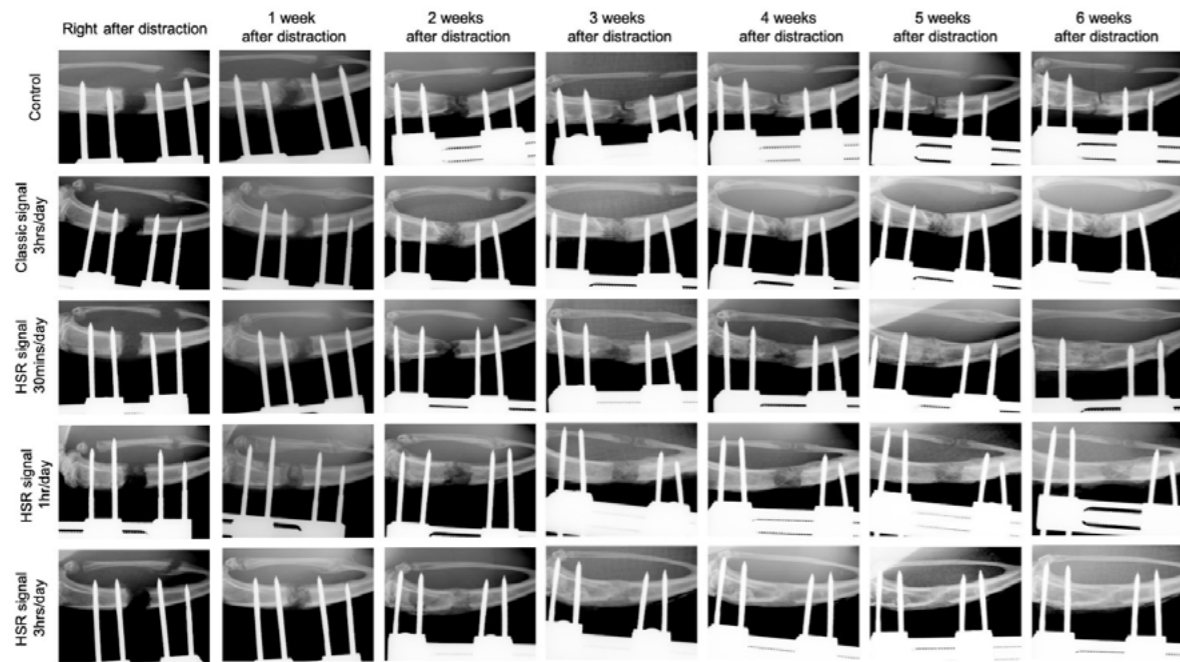
Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK\$)
Gang Li	Effect of Sesamin on Promoting Osteoporotic Fracture Healing	Food and Health Bureau – Health and Medical Research Fund	01/09/2020	28/02/2023	1,337,032
	Effects of Danshen and Jixuecao Extracts on Glucocorticoid Induced Bone Loss and Growth Suppression	Food and Health Bureau – Health and Medical Research Fund	01/07/2019	30/06/2022	1,495,584
	Development of Staphylococcal Enterotoxins C2 (SEC2) as a Drug to Promote Osteoporotic Fracture Healing	Innovation Technology Commission – Partnership Research Programme	01/04/2020	30/09/2022	2,268,318
	Development of Staphylococcal Enterotoxins C2 (SEC2) as a Drug to Promote Osteoporotic Fracture Healing	Innovation Technology Commission – Postdoctoral Fellowship Matching Programme	01/04/2020	30/09/2022	2,682,861
	Studies of Cranial Bone Transport for Stroke Management	The Government of the Hong Kong Special Administrative Region – PGM-01 Research Matching Scheme	01/01/2021	31/12/2025	800,000

Publications

A. Journal Papers

- Yang Z, Feng L, Wang H, Li Y, Lo JHT, Zhang X, Lu X, Wang Y, Lin S, Tortorella MD, Li G. DANCR mediates the rescuing effects of sesamin on postmenopausal osteoporosis treatment via orchestrating osteogenesis and osteoclastogenesis. *Nutrients*. 2021;13(12):4455. doi:10.3390/nu13124455.
- Deng Y, Zhang X, Li R, Li Z, Yang B, Shi P, Zhang H, Wang C, Wen C, Li G, Bian L. Biomaterial-mediated presentation of wnt5a mimetic ligands enhances chondrogenesis and metabolism of stem cells by activating non-canonical Wnt signaling. *Biomaterials*. 2022;281. doi:10.1016/j.biomaterials.2021.121316. (Epub ahead of print)
- Li Y, Yang Y, Wang M, Zhang X, Bai S, Lu X, Li Y, Waldorff EI, Zhang N, Lee WYW, Li G. High slew rate pulsed electromagnetic field enhances bone consolidation and shortens daily treatment duration in distraction osteogenesis. *Bone & Joint Research*. 2021;10(12):767-779. doi:10.1302/2046-3758.1012.bjr-2021-0274.r1.
- Shakoor A, Wang B, Fan L, Kong L, Gao W, Sun J, Man K, Li G, Sun D, Shakoor A, Fan L, Gao W, Sun J, Sun D, Wang B, Li G, Kong L, Man K, Kong H. Automated optical tweezers manipulation to transfer mitochondria from fetal to adult MSCs to improve antiaging gene expressions. *Small*. 2021;17(38):2103086. doi: 10.1002/sml.202103086.
- Yang Z, Feng L, Huang J, Zhang X, Lin W, Wang B, Cui L, Lin S, Li G. Asiatic acid protects articular cartilage through promoting chondrogenesis and inhibiting inflammation and hypertrophy in osteoarthritis. *European Journal of Pharmacology*. 2021;907. doi: 10.1016/j.ejphar.2021.174265.
- Wang P, Wang M, Zhuo T, Li Y, Lin W, Ding L, Zhang M, Zhou C, Zhang J, Li G, Wang H, Xu L. Hydroxysafflor yellow A promotes osteogenesis and bone development via epigenetically regulating β -catenin and prevents ovariectomy-induced bone loss. *The International Journal of Biochemistry & Cell Biology*. 2021;137. doi: 10.1016/j.biocel.2021.106033.
- Li Y, Xu J, Mi J, He X, Pan Q, Zheng L, Zu H, Chen Z, Dai B, Li X, Pang Q, Zou L, Zhou L, Huang L, Tong W, Li G, Qin L. Biodegradable magnesium combined with distraction osteogenesis synergistically stimulates bone tissue regeneration via CGRP-FAK-VEGF signaling axis. *Biomaterials*. 2021;275:120984. doi: 10.1016/j.biomaterials.2021.120984.
- Shi L, Liu Y, Yang Z, Wu T, Lo HT, Xu J, Zhang J, Lin W, Zhang J, Feng L, Li G. Vasoactive intestinal peptide promotes fracture healing in sympathectomized mice. *Calcified Tissue International*. 2021;109(1):55-65. doi:10.1007/s00223-021-00820-9.
- Lin W, Chen S, Wang Y, Wang M, Lee WYW, Jiang X, Li G. Dynamic regulation of mitochondrial-endoplasmic reticulum crosstalk during stem cell homeostasis and aging. *Cell Death and Disease*. 2021;12(9):794. doi:10.1038/s41419-021-03912-4.
- Kong L, Wang Y, Wang H, Pan Q, Zuo R, Bai S, Zhang X, Lee WY, Kang Q, Li G. Conditioned media from endothelial progenitor cells cultured in simulated microgravity promote angiogenesis and bone fracture healing. *Stem Cell Research & Therapy*. 2021;12(1):1-14. doi:10.1186/S13287-020-02074-Y/FIGURES/7.
- Zong Z, Zhang X, Yang Z, Yuan W, Huang J, Lin W, Chen T, Yu J, Chen J, Cui L, Li G, Wei B, Lin S. Rejuvenated ageing mesenchymal stem cells by stepwise preconditioning ameliorates surgery-induced osteoarthritis in rabbits. *Bone & Joint Research*. 2021;10(1):10-21. doi:10.1302/2046-3758.101.BJR-2020-0249.R1.
- Li Q, Wang H, Zhang J, Kong APS, Li G, Lam TP, Cheng JCY, Lee WYW. Deletion of SIRT3 inhibits osteoclastogenesis and alleviates aging or estrogen deficiency-induced bone loss in female mice. *Bone*. 2021;144. doi:10.1016/j.bone.2020.115827.
- Feng L, Yang ZM, Li YC, Wang HX, Lo JHT, Zhang XT, Li G. Linc-ROR promotes mesenchymal stem cells chondrogenesis and cartilage formation via regulating SOX9 expression. *Osteoarthritis and Cartilage*. 2021;29(4):568-578. doi: 10.1016/j.joca.2020.12.020.
- Luo S, Kong L, Wang J, Nie H, Luan B, Li G. Development of modified Ilizarov hip reconstruction surgery for hip dysfunction treatment in adolescent and young adults. *Journal of Orthopaedic Translation*. 2021;27:90-95. doi:10.1016/j.jot.2020.11.002.
- Pan Q, Li Y, Li Y, Wang H, Kong L, Yang Z, Zhang X, Bai S, Zong Z, Chen G, Lin S, Li G. Local administration of allogeneic or autologous bone marrow-derived mesenchymal stromal cells enhances bone formation similarly in distraction osteogenesis. *Cytotherapy*. 2021;23(7):590-598. doi: 10.1016/j.jcyt.2020.12.005.

16. Yu J, Xia X, Dong Y, Gong Z, Li G, Chen GG, San Lai PB. CYP1A2 suppresses hepatocellular carcinoma through antagonizing HGF/MET signaling. *Theranostics*. 2021;11(5):2123-2136. doi: 10.7150/thno.49368.



Radiological assessment results. At the end of lengthening, a weekly anteroposterior radiograph including the distraction zone was taken until termination. Representative series of radiographs across the duration of distraction osteogenesis (DO) showed the progression of bone consolidation. All pulsed electromagnetic field (PEMF) treatments had different levels of promoting effects on callus formation. GHSR3h group appeared to have the best bone-healing outcome with earlier continuous callus formation and better consolidation. Gclassic3h and GHSR1h groups appeared to have a similar healing outcome, which was better than those of GHSR1/2h and Gcon groups, but not as good as GHSR3h. HSR, high slew rate groups.

Source: Li Y, Yang Y, Wang M, Zhang X, Bai S, Lu X, Li Y, Waldorff EI, Zhang N, Lee WYW, Li G. *High slew rate pulsed electromagnetic field enhances bone consolidation and shortens daily treatment duration in distraction osteogenesis. Bone & Joint Research*. 2021;10(12):767-779. doi:10.1302/2046-3758.1012.bjr-2021-0274.r1.

