

5. Stem Cells and Tissue Regeneration Research (Part I: Adult Stem Cell Biology and Applications)

PI: Li Gang (Department of Orthopaedics and Traumatology)
Team: Dr. Wayne Lee (Research Assistant Professor); Dr. Zhang Jinfang (Research Assistant Professor); Dr. Xu Liangliang (Postdoctoral Fellow); Dr. Guo Jia (RA); Dr. Lin Sien (RA); Ms. Liu Yang (PhD student); Mr. Cheng Yuanfeng (PhD student); Mr. Wu Tainyi (PhD student); Mr. Sun Yixin (PhD student); Mr. Wang Bin (PhD student); Mr. Shi Liu (PhD student); Mr. Xu Jia (Visiting Fellow).

Non-technical Summary (in layman language, i.e. a short paragraph of less than 100 words in both English and Chinese characters):

English version (less than 100 words):

The main research interests of this team are to investigate the use of specific tissue-derived stem cells for musculoskeletal tissue engineering. The team has published 14 research papers, 12 China national invention patents and generated over HK\$4.0 M research grants in 2015. Prof. Li has been elected as the Chairman of China Branch, International Limb Lengthening and Reconstruction Societies (ILLRS) and Association from Study and Application of the Methods of Ilizarov (ASAMI) and members of several national orthopaedic research societies. Prof. Li has successfully organized the 5th CUHK International Symposium on Stem Cell Biology and Regenerative Medicine in Hong Kong, 12 November 2015, with more than 20 overseas invited speakers and over 150 attendants; Mainland, Taiwan, Hong Kong and Macau Forum on Tissue Regeneration Innovation and Translation (Chinese Academy of Engineering Forum), 13-14 November 2015, Shenzhen, China, with 7 academicians of CAE and over 20 invited speakers from USA, Australia, Europe and over 300 people including our VC Prof. Joseph Sung attended the meeting; the two meetings received overwhelmingly good feedbacks.

Chinese version (less than 100 words):

李剛教授實驗室的主要研究興趣是利用特殊組織來源的間充質幹細胞進行骨骼肌肉系統的組織工程學的科研工作。本研究組在 2015 年共發 14 篇研究論文，12 個中國發明專利並獲得了超過四百萬港幣的新的研究經費。李教授於 2015 年 9 月被選為國際肢體延長和重建學會和 Ilizarov 方法研究和應用協會中國部主席。李教授與 2015 年 11 月 12 日在香港中文大學威爾士醫院成功主辦了第五屆香港中文大學幹細胞與再生醫學國際研討會，共有 20 多位海外嘉賓參會；2015 年 11 月 13-14 日在中國深圳成功舉辦了海峽兩岸及香港、澳門地區創傷修復（愈合）與組織再生創新成果及轉化應用論壇（暨中國工程院院士論壇），共有 7 位中國工程院院士和 20 多位來自美國和歐洲等特邀嘉賓和超過 300 多人參會，兩個大會受到參會人員的一致的好評。

Research Progress Summary:

In 2015, the research team has 12 members (2 RAPs; 1 Postdoc Research Assistant, 2 Research Assistants, 1 Visiting Fellow, 6 PhD students) with the following research projects firmly carried out: (1) Circulating stem cells in diseases and regeneration; their recruitment and homing potentials and underlying biological mechanisms. 循环幹細胞在疾病和組織再生中的作用；他們的調動和募集的生物學機理。(2) Tendon, cartilage and bone tissue engineering research and new technologies development. 肌腱、軟骨、骨組織工程新技術的研發。(3) Industry contract research work for new technologies development and developments of preclinical disease animal models. 與公司合作利用前臨床疾病動物模型開發新的治療方法。 These projects all progress as planned, with 14 papers have been published from the research work and over HK\$4.0 Million research grants have been secured by this PI in 2015. The PI has been invited to give keynote speeches and lectures at various national and international conferences and meetings for 10 times in 2015, and served as visiting professors in 4 Chinese universities and council members of more than 8 national and international research societies. The PI also engaged in knowledge transfer and provided advice/consultation service for Hong Kong Science Park, local and international healthcare related industries, etc. The PI also served as co-inventor for 12 China national invention patents in 2015. The PI has contributed to the CUHK Shenzhen Research Institute serving as a deputy director of the CUHK-ACC Joint Laboratory of Space Medicine and Health Maintenance, and successfully organized 2 international and national symposiums on stem cells biology and regenerative medicine in 2015.

Recognitions:

Awards and Fellowships (Please provide relevant document, e.g. copy of notification letter)

Member's Name	Details
Gang Li	Visiting Professor, Guang Dong Medical College, Dongguan, China.
Gang Li	Visiting Professor, Key Laboratory of Cell Biology, Ministry of Education of PRC, China Medical University, Shenyang, China
Gang Li	Visiting Professor, Xijing Orthopaedic Hospital, The Fourth Military Medical University, Xian, China.
Gang Li	Visiting Professor, South Eastern University Medical School, Nanjing, China.
Gang Li	Member of Member of Advisory Board, Shanghai Key Laboratory of Orthopaedic Implant, Shanghai Jiaotong University, China.
Gang Li	Associate Editor, Journal of Orthopaedic Translation
Gang Li	Member of Editorial Board, Calcified Tissue International
Gang Li	Council member, Chinese Orthopaedic Research Society, Chinese Orthopaedic Association 中國骨科醫學會基礎醫學組委員
Gang Li	Council Member, Tissue Engineering and Regenerative Medicine Division, Chinese Association of Biomedical Engineering 中國生物醫學工程學會組織工程與再生醫學分會 理事會委員
Gang Li	Member, Division of Orthopaedic Research, Chinese Association of Orthopaedic Surgeons
Gang Li	General Secretary, Division of Limb Deformity Correction and Reconstruction, Chinese Association of Orthopaedic Surgeons
Gang Li	Council member, Orthopaedic Committee, Chinese Association of Combined

	Traditional and Western Medicine (中国中西医结合学会第7届骨伤科专业委员会委员)
Gang Li	Chairman of China Branch, International Limb Lengthening and Reconstruction Societies (ILLRS) and Association from Study and Application of the Methods of Ilizarov (ASAMI) (国际肢体延长和重建学会, Ilizarov方法研究和应用协会 中国部主席)
Gang Li	Standing Committee Member, The First Committee of Orthopaedic Research Society, SICOT China Chapter (SICOT 中国部骨科基础学会第一届委员会常务委员)
Gang Li	Vice Chairman, Orthopaedic Committee of Guangdong, Hong Kong and Macau, Association of Biomedical Engineering of Guangdong Province (广东省生物医学工程学会粤港澳骨科专业委员会 副主任委员)

Grants and Consultancy (Please provide relevant document, e.g. copy of notification letter)

Name of PI	Project Title	Funding Source	Grant Reference	Start/End dates (dd/mm/yy)	Amount (HK\$)
Gang Li	Promote fracture healing by administration of allogenic mesenchymal stem cells (MSCs)	Research Grant Council, Hong Kong Government	CUHK 470813	01/01/2014-31/12/2016	\$779,429
Gang Li	Is Smad7 a potential therapeutic target for preventing osteoporotic bone loss?	Research Grant Council, Hong Kong Government	CUHK 14119115	01/01/2016-31/12/2018	\$821,097
Gang Li	SOX11 调控骨髓间充质干细胞分化与迁移的研究及其在骨/软骨再生中的应用	国家自然科学基金	81371946	01/01/2014-31/12/2017	RMB 700,000
Gang Li	系统注射同种异体骨髓间充质干细胞促进骨折愈合的研究	深圳市科技创新委员会	JCYJ20130401171935811	01/10/2013-31/09/2015	RMB 150,000
Gang Li	血管和神经化促进组织工程骨形成的机制研究	国家自然科学基金	81374568	01/03/2015-31/12/2019	RMB 600,000
Gang Li	Study the effects of Super-antigens on stem cells functions and their applications	Shenyang Xiehe Pharma Company, China	CUHK 7104942	01/09/2014-31/08/2017	\$800,000
Sub-Total				Approx. HK\$4.0M	

Publications:

To avoid duplication of outputs between years, only published (online or in print form) publications within the period of 1 January 2015 – 31 December 2015 **with the Li Ka Shing Institute of Health Sciences acknowledged** should be counted. Papers ahead of printing, or published after 31 December 2014 will be reserved for next year's report. (Please provide details of the publications in APA style and relevant document, e.g. first page of papers or conference abstracts)

Journal Papers

1. Huang S, Xu LL, Sun YX, Zhang YF, **Li G**. The fate of systemically administrated allogeneic mesenchymal stem cells (MSCs) in mouse femoral fracture healing. *Stem Cell Research and Therapy*, 2015; 6: 206.
2. Yu LM, Huang JP, Wang J, Cui L, Sun YX, Chen LY, Su YJ, Lin S, **Li G**. Antler collagen/chitosan scaffolds improve critical calvarial defect healing in rats. *Journal of Biomaterials and Tissue Engineering*, 2015; 5:1-6.
3. Fu WM, Zhu X, Wang WM, Lu YF, Hu BG, Wang H, Liang WC, Wang SS, Ko CH, Waye MMY, Kung HF, **Li G**, Zhang JF. Hotair mediates hepatocarcinogenesis through suppressing MiRNA-218 expression and activating P14 and P16 signaling. *Journal of Hepatology*; 2015 Oct; 63(4): 886-95.
4. Chen YF, Sun YX, Pan XH, Ho KW, **Li G**. Joint distraction attenuates osteoarthritis by reducing secondary inflammation, cartilage degeneration and subchondral bone aberrant change. *Osteoarthritis and Cartilage*; 2015; 23 (10): 1728-1735.
5. Rui YF, Xu LL, Chen R, Zhang T, Lin S, Hou YH, Liu Y, Meng FB, Liu ZQ, Ni M, Tsang KZ, Yang FY, Wang C, Chan HC, Jiang XH, **Li G**. Epigenetic memory gained by priming with osteogenic induction medium improves osteogenesis and other properties of mesenchymal stem cells. *Scientific Reports*, 2015; 5:11056.
6. Lin SE, Huang JP, Fu ZW, Liang YL, Wu HY, Xu LL, Sun YX, Lee WYW, Wu T, Qin L, Cui L, **Li G**. The effects of atorvastatin on the prevention of osteoporosis and dyslipidemia in the high-fat-fed ovariectomized rats. *Calcified Tissue International*, 2015 Jun; 96(6):541-51.
7. Sun YX, Xu LL, Huang S, Liu Y, Hou YH, Chan KM, Pan XH, **Li G**. Mir-21 overexpressing mesenchymal stem cells accelerate fracture healing in a rat closed femur fracture model. *BioMed Research International*, 2015:412327.
8. Wang KX, Xu LL, Rui YF, Huang S, Lin SE, Xiong JH, Li YH, Lee WYW, **Li G**. The effects of secretion factors from umbilical cord derived mesenchymal stem cells on osteogenic differentiation of mesenchymal stem cells. *PLoS One*, 2015; 10(3): e0120593.
9. Huang B, **Li G**, Jiang XH. Fate determination in mesenchymal stem cells: A perspective from histone modifying enzymes. *Stem Cell Research & Therapy*, 2015; 6(1): 35.
10. Wu CL, Liu FL, Li PD, Zhao GF, Lan SW, Jiang WY, Meng XW, Tian LX, **Li G**, Li YL, Liu JY. Engineered hair follicle mesenchymal stem cells overexpressing controlled-release insulin reverse hyperglycemia in mice with type 1 diabetes. *Cell Transplantation, Cell Transplantation*, 2015; 24: 891-907.
11. Nadeem D, Smith CA, Dalby MJ, Meek RMD, Lin S, **Li G**, Su B. Three-dimensional CaP/gelatin lattice scaffolds with integrated osteoinductive surface topographies for bone tissue engineering. *Biofabrication*, 2015; 7(1):015005.
12. Xu LL, Huang S, Hou YH, Liu Y, Ni M, Meng FB, Wang KX, Rui YF, Jiang XH, **Li G**. Sox11-modified mesenchymal stem cells (MSCs) accelerate bone fracture healing: Sox11

regulates differentiation and migration of MSCs. *FASEB Journal*, 2015; 29(4):1143-52.

13. Xu LL, Liu Y, Hou YH, Wang KX, Wong YM, Lin SE, Li G. U0126 promotes osteogenesis of rat bone marrow-derived mesenchymal stem cells by activating BMP/Smad signaling pathway. *Cell & Tissue Research*, 2015; 359(2): 537-545.

14. Huang S, Xu LL, Sun YX, Wu TY, Wang KX, Li G. An improved protocol for isolation and culture of mesenchymal stem cells from mouse bone marrow. *Journal of Orthopaedic Translation*; 2015; 3: 26-33.

Book Chapters

张涛, 王喜良, 李刚。“肢体再生的生物学基础和再生医学” pp 185-191。干细胞与再生医学习题集。庞希宁, 付小兵。人民卫生出版社, 北京, 2015 (ISBN 978-7-117-20957-1/ R.20958).

Others (Patents)

1. 踝关节冠状面畸形调控矫形器。夏和桃, 李刚, 彭爱民, 王坤正, 唐海, 夏洪箐。中國發明專利 ZL 2013 1 0400836.6。授權證書號 1685211.
2. 踝关节多维调控矫形器。夏和桃, 李刚, 彭爱民, 夏洪箐, 刘利民。中國發明專利 ZL 2013 1 0400817.3。授權證書號 1684956.
3. 肘关节动静结合调控外固定器。夏和桃, 李刚, 彭爱民, 夏洪箐, 刘利民。中國發明專利 ZL 2013 1 0400954.7。授權證書號 1661159.
4. 膝关节动静结合调控外固定器。夏和桃, 李刚, 彭爱民, 夏洪箐, 杨华清, 刘利民。中國發明專利 ZL 2013 1 0400953.2。授權證書號 1660045.
5. 快速牵伸延长杆。夏和桃, 李刚, 唐佩福, 彭爱民, 王坤正, 夏洪箐。中國發明專利 ZL 2013 1 0400851.0。授權證書號 1660706.
6. 肩关节动静结合调控外固定器。夏和桃, 李刚, 彭爱民, 唐佩福, 刘利民, 夏洪箐。中國發明專利 ZL 2013 1 0400834.7。授權證書號 1659033.
7. 肱骨近端 T 型外固定器。夏和桃, 唐海, 唐佩福, 彭爱民, 李刚, 杨华清, 夏洪箐。中國發明專利 ZL 2013 1 0400794.6。授權證書號 1684697.
8. 马蹄足矫形器。夏和桃, 李刚, 唐海, 彭爱民, 夏洪箐, 刘利民。中國發明專利 ZL 2013 1 0400853.X。授權證書號 1659597.
9. 管状牵伸加压连接杆控制装置及骨外固定器。夏和桃, 李刚, 唐海, 彭爱民, 夏洪箐, 刘利民。中國發明專利 ZL 2013 1 0400810.1。授權證書號 1659055.
10. 髌关节矫形与股骨延长器。夏和桃, 李刚, 彭爱民, 刘利民, 王坤正, 夏洪箐。中國發明專利 ZL 2013 1 0400852.5。授權證書號 1659311.
11. 跟足多功能调控外固定器。夏和桃, 李刚, 彭爱民, 夏洪箐, 刘利民, 杨华清。中國發明專利 ZL 2013 1 0400828.1。授權證書號 1660513.
12. 踝关节冠状面复合畸形调控矫形器。夏和桃, 李刚, 彭爱民, 唐佩福, 夏洪箐, 刘利民。中國發明專利 ZL 2013 1 0400826.2。授權證書號 168833.

One to two Symbolic Figure(s) which can represent your team's research area (aim to emphasize your team's characteristics and help people relate to your area of research) (Please separately attach the figure(s) in graphic format, e.g. jpg, and provide supporting document for copyright permission for using the figure(s)):

Source of figure	Legend of figure	Copyright owner and year
<p>Fig.1</p> <p>Rui YF, Xu LL, Chen R, Zhang T, Lin S, Hou YH, Liu Y, Meng FB, Liu ZQ, Ni M, Tsang KZ, Yang FY, Wang C, Chan HC, Jiang XH, Li G. Epigenetic memory gained by priming with osteogenic induction medium improves osteogenesis and other properties of mesenchymal stem cells. <i>Scientific Reports</i>, 2015; 5:11056.</p>	<p>Fig. 1. The schematic outlines of the procedure for de-osteogenic differentiation of MSCs and involvement of Nanog/Oct4 in this process.</p>	<p>Gang Li 2015</p>
<p>Fig. 2</p> <p>Xu LL, Huang S, Hou YH, Liu Y, Ni M, Meng FB, Wang KX, Rui YF, Jiang XH, Li G. Sox11-modified mesenchymal stem cells (MSCs) accelerate bone fracture healing: Sox11 regulates differentiation and migration of MSCs. <i>FASEB Journal</i>, 2015; 29(4):1143-52.</p>	<p>Figure 6. Histological analysis of fracture calluses. At 5-week after cell transplantation, the femurs were collected for histological analysis. (A) Longitudinal sections of calluses were subjected to HE and Safranin O staining and immunohistochemical analysis with GFP and OCN antibodies. (B) The region of interest was 3 mm below and above the fracture line identified in the sections. (C&D) The percentage of bone in callus and chondrocytes in the uncalcified callus was calculated using Image J software according to histological staining. Sections were obtained from at least 4 rats from each group. *p<0.05.</p>	<p>Gang Li 2015</p>

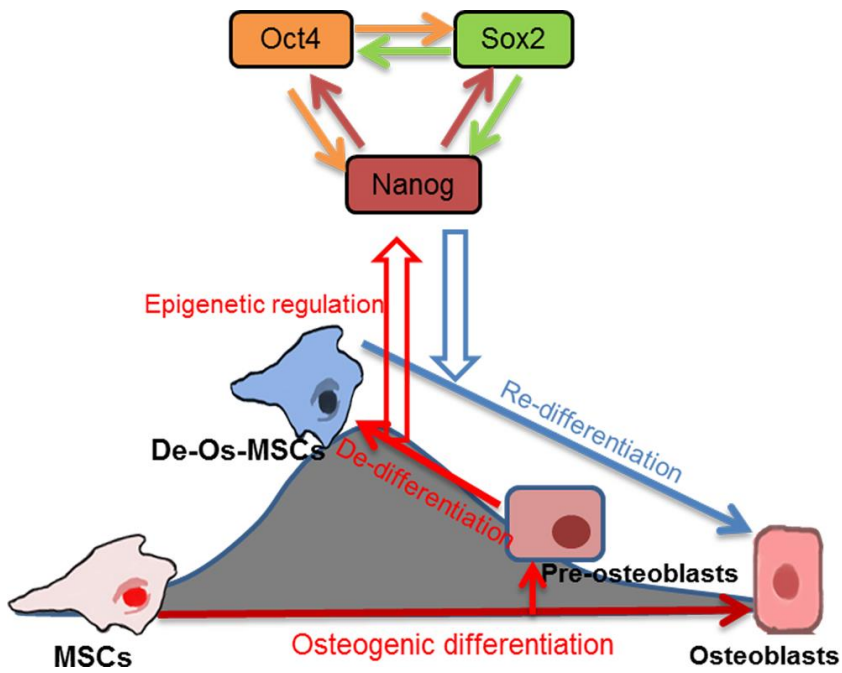


Figure 1.

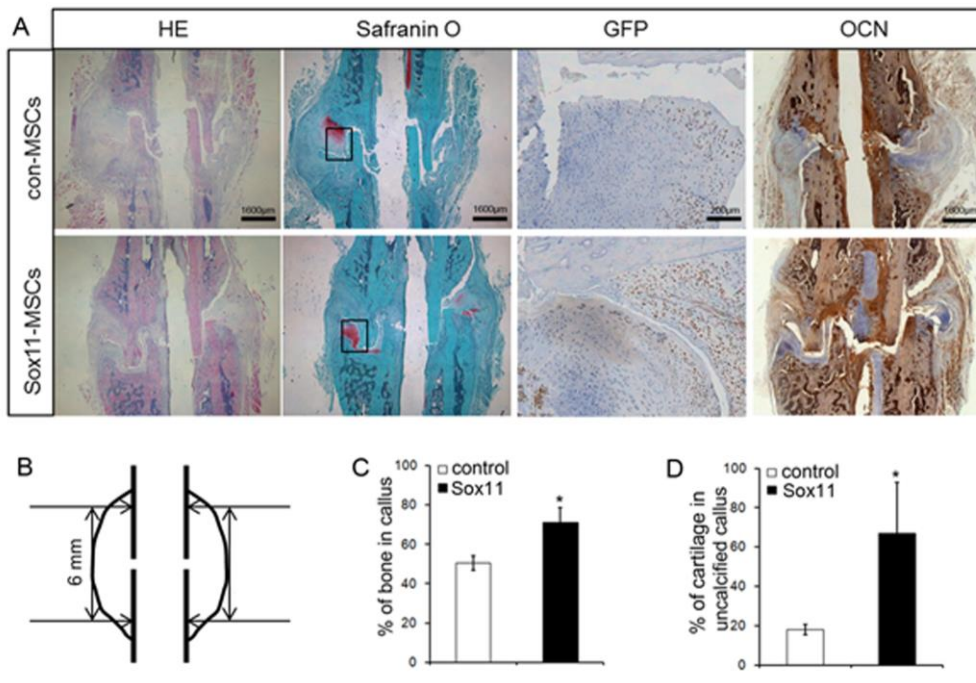


Figure 2.

Checklist for Report submission

- ✓ Supporting documents, e.g. copy of notification letter, for Awards and Fellowships
- Supporting documents, e.g. copy of notification letter, for Grants and Consultancy
- ✓ Supporting documents, e.g. the first page of papers or conference abstracts or the page with affiliation, for Publications
- ✓ Graphic file(s) for one to two symbolic figure(s)
- Supporting documents for copyright permission for using the above figure(s)