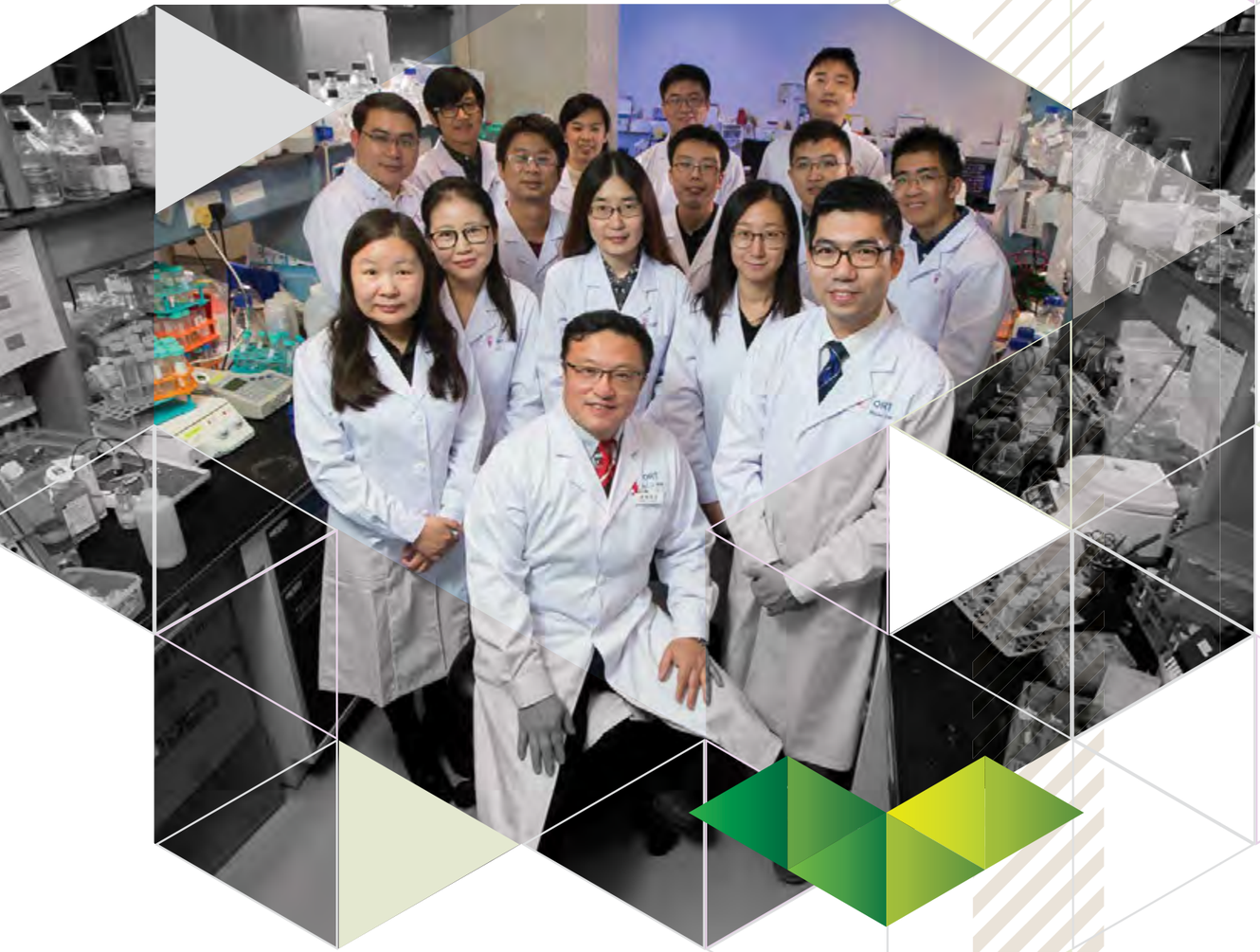
11
STEM CELLS AND TISSUE REGENERATION
(Adult Stem Cell Biology and Applications)



Principal Investigators

Professor Gang Li (Department of Orthopaedics and Traumatology)

Team

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Research Progress Summary

In 2016, the research team has 19 members (2 Research Assistant Professors, 2 Postdoctoral fellows, 2 Research Assistants, 4 Visiting fellows and 9 PhD students) with the following research projects firmly carried out: (1) Exploring the clinical application potential of secretomes derived from human mesenchymal stem cells. (2) Biological roles of microRNAs and novel development of biomaterials in bone, cartilage and tendon tissue engineering research. (3) Industry contract research works on pre-clinical studies of biological compounds. (4) Engaging in two pioneer clinical trials of mesenchymal stem cells therapy for chondral lesion in wrist and knee in Hong Kong. These projects are in good progress as planned, with 17 peer-reviewed publications generated. Meanwhile, over HK$3.9 million research grants have been secured by Prof. Li in 2016.

This year, Prof. Li has organised the 6th CUHK International Symposium and the 1st Croucher Summer Course on Stem Cell Biology & Regenerative Medicine, and co-organised the 1st International Combined Meeting of Orthopaedic Research Societies in Xian, China as Scientific Chairman. Prof. Li has been invited to give keynote speeches and lectures at various national and international conferences and meetings for 14 times in 2016, and served as Visiting Professors in 3 universities, as well as council members of at least 5 research societies. He also actively engages in knowledge transfer and provided advice/consultation service for the Hong Kong Science Park, local and international healthcare related industries. Prof. Li contributes to the CUHK Shenzhen Research Institute by severing as the Deputy Director of the CUHK-ACC Joint Laboratory of Space Medicine and Health Maintenance.

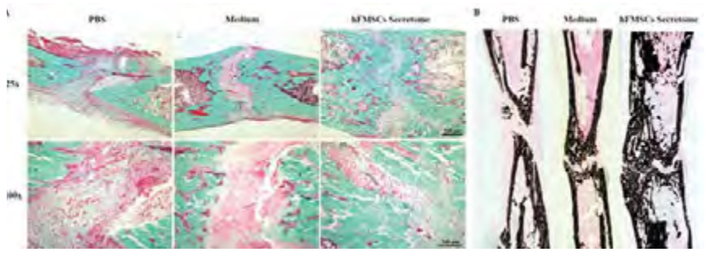

Fig. 1
Histological analysis showed that the secretome intervention accelerated new callus consolidation. (A) Representative sections stained with Trichrome Goldner showing better quality callus formation in the secretome group than that of the other two groups. (B) Von Kossa staining clearly exhibited that most of new bone has been consolidated and the continuity of the cortical bone and bone marrow cavities was evident in the secretome group at week 6.

The figure was published by Stem Cell Research & Therapy 2016

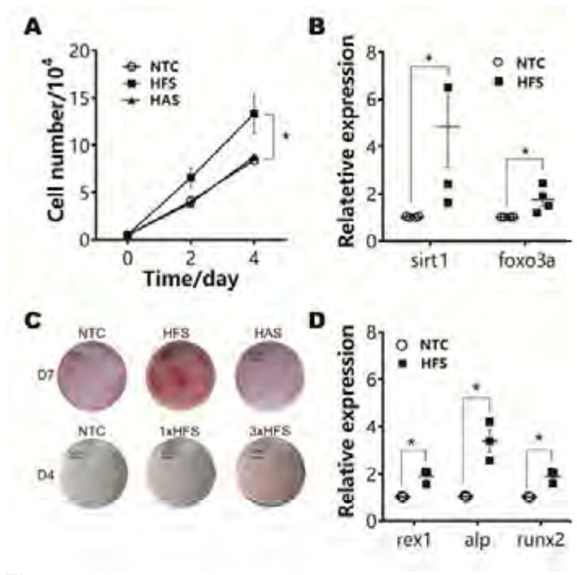

Fig.2
HFS treatment promoted hAMSC proliferation and osteogenic differentiation. hAMSC was treated with either HFS, HAS or vehicle control. (A) Direct cell count showed that HFS treatment (50μg/mL) increased the cell proliferation of hAMSC at day 2 and 4. The increment is statistical significant at day 4. HAS did not possess detectable effect on cell proliferation when compared with control group. (B) qPCR result showed significant up-regulation of sirt1 and foxo3a in hAMSC after HFS treatment for 3 days. (C) Alizarin red staining showed HSF promoted the formation of calcium nodules in a concentration dependent manner. (D) HFS treatment induced the up-regulation of osteogenic genes Rex1, Alp and Runx2 at day 3. N=3. *p<0.05, Mann-Whitney-U-test.

The figure was published by Stem Cells and Development 2016

Recognitions

Awards and Fellowships

Member's Full Name	Details
Liu Yang	Best Paper Award, 2016 International Combined Meeting of Orthopaedic Research Societies (ICORS)
Wayne Lee	Best Paper Recognition Award, 2016 International Combined Meeting of Orthopaedic Research Societies (ICORS)
Zhang Jinfang	Best Paper Recognition Award, 2016 International Combined Meeting of Orthopaedic Research Societies (ICORS)
Feng Lu	Best Paper Recognition Award, 2016 International Combined Meeting of Orthopaedic Research Societies (ICORS)
Gang Li	Visiting Professor, Guang Dong Medical College, Dongguan, 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	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	General Secretary, Division of Limb Deformity Correction and Reconstruction, Chinese Association of Orthopaedic Surgeons
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)（國際肢體延長和重建學會、Ilizarov方法研究和應用協會 中國部主席）

Grants and Consultancy

Full Name of PI	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Gang Li	Mir-21調控間充質幹細胞成骨/軟骨分化的機制及應用研究	深圳市科技創新委員會	01/01/2016	31/12/2017	RMB 300,000
Gang Li	Promote Fracture Healing by Administration of Allogenic Mesenchymal Stem Cells (MSCs)	Research Grant Council - General Research Fund	01/01/2014	31/12/2016	779,429
Gang Li	Is Smad7 a Potential Therapeutic Target for Preventing Osteoporotic Bone Loss?	Research Grant Council - General Research Fund	01/01/2016	31/12/2018	821,097
Gang Li	SOX11調控骨髓間充質幹細胞分化與遷移的研究及其在骨/軟骨再生中的應用	The National Natural Science Foundation of China	01/01/2014	31/12/2017	RMB 700,000
Gang Li	血管和神經化促進組織工程骨形成的機制研究	The National Natural Science Foundation of China	01/03/2015	31/12/2019	RMB 600,000
Gang Li	A Micro Array Chip based Single Cell Manipulation System for Characterization of Electrical Stimulation Induced Stem Cell Differentiation	The National Natural Science Foundation of China - Research Grant Council Joint Research Scheme	01/01/2016	31/12/2019	400,000 (Amount allocated to Professor Gang Li)

Publications

A. Journal Papers

1. Huang S, Xu LL, Sun YX, Lin SE, Gu WD, Liu YM, Zhang JF, Chen L, Li G. Systemic administration of allogeneic mesenchymal stem cells does not halt osteoporotic bone loss in ovariectomized rats. *PLOS ONE*, 2016; 11(10):e0163131.
2. Lu YF, Liu Y, Fu WM, Xu J, Wang B, Sun YX, Wu TY, Xu LL, Chan KM, Zhang JF, Li G. Long noncoding RNA H19 accelerates tenogenic differentiation and promotes tendon healing through targeting miR-29b-3p and activating TGF-b1 signaling. *The FASEB Journal*, 2016; 31(3):954-64.
3. Wu TY, Liu Y, Wang B, Sun YX, Xu J, Lee WY, Xu LL, Zhang JF, Li G. The use of co-cultured mesenchymal stem cells with tendon-derived stem cells as a better cell source for tendon repair. *Tissue Engineering Part A*, 2016; 22(19-20):1229-40.
4. Wang B, Guo J, Feng L, Fu WM, Zhang JF, Li G. MiR124 suppresses collagen formation of human tendon derived stem cells through targeting *egr1*. *Experimental Cell Research*, 2016; 347(2):360-6.
5. Xu J, Wang B, Sun YX, Wu TY, Liu Y, Zhang JF, Lee WY, Pan XH, Chai YM, Li G. Human fetal mesenchymal stem cell secretome enhances bone consolidation in distraction osteogenesis. *Stem Cell Research & Therapy*, 2016; 7(1):134.
6. Wang B, Lee WY, Huang B, Zhang JF, Wu TY, Jiang XH, Wang CC, Li G. Secretome of human fetal mesenchymal stem cells ameliorates replicative senescence of human adult mesenchymal stem cells. *Stem Cells and Development*, 2016; 347(2):360-6.
7. Xu J, Wu TY, Sun YX, Wang B, Zhang JF, Lee WY, Chai YM, Li G. Staphylococcal enterotoxin C2 expedites bone consolidation in distraction osteogenesis. *Journal of Orthopedic Research*, 2016.
8. Fu X, Yang H, Wang G, Liu K, Gu Q, Tao Y, Chen G, Jiang X, Li G, Gu Y, Shi Q. Improved osteogenesis and upregulated immunogenicity in human placenta-derived mesenchymal stem cells primed with osteogenic induction medium. *Stem Cell Res Therapy*, 2016; 7(1):138.
9. Lee WY, Li N, Lin SE, Wang B, Lan HY, Li G. miRNA-29b improves bone healing in mouse fracture model. *Molecular and Cellular Endocrinology*, 2016; 430:97-107.
10. Meng FB, Xu LL, Huang S, Liu Y, Hou YH, Wang KX, Jiang XH, Li G. Small nuclear ribonucleoprotein polypeptide N (Sm51) promotes osteogenic differentiation of bone marrow mesenchymal stem cells by regulating Runx2. *Cell & Tissue Research*, 2016; 366(1):155-62.
11. Yin Zi, Guo J, Wu TY, Chen X, Xu LL, Lin SE, Sun YX, Chan KM, Ouyang HW, Li G. Stepwise differentiation of mesenchymal stem cells augments tendon-like tissue formation and defect repair *in vivo*. *Stem Cells Translational Medicine*, 2016; 5(8):1106-16.
12. Lu YF, Li G, Chan KM, Zhang JF. Tendon differentiation and noncoding RNA: from bench to bedside. *Experimental Cell Research*, 2016; 341(2):237-42. (Review)
13. Liang WC, Fu WM, Sun YX, Xu LL, Wang YB, Chan KM, Li G, Waye MM, Zhang JF. H19 activates Wnt signaling and promotes osteoblast differentiation by functioning as a competing endogenous RNA. *Scientific Reports*, 2016, 6:20121.
14. Chen YF, Lin S, Sun YX, Pan XH, Xiao LB, Zou LY, Ho KW, Li G. Translational potential of ginsenoside Rb1 in managing progression of osteoarthritis. *Journal of Orthopaedic Translation*, 2016; 6:27-33.
15. Deng YJ, Li P, Li G, Qin L, Mak KK. Yap1 regulates multiple steps of chondrocyte differentiation during skeletal development and bone repair. *Cell Reports*, 2016; 14(9):2224-37.
16. Guo J, Chan KM, Zhang JF, Li G. Tendon-derived stem cells undergo spontaneous tenogenic differentiation. *Experimental Cell Research*, 2016; 341:1-7.
17. Liu Y, Rui YF, Cheng TY, Huang S, Xu LL, Meng FB, Lee W, Ke HZ, Li G. Effects of sclerostin antibody on the healing of femoral fractures in ovariectomised rats. *Calcified Tissue International*, 2016; 98(3):263-74.