

**Anna Xiaodan YU (余晓丹), Ph.D.**

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School of Biomedical Science,  
The University of Hong Kong, Hong Kong



**RESEARCH INTERESTS**

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I investigated the role of Mmp14, a membrane-type 1 matrix metalloproteinase (MT1-MMP), as well as ER stress mediated by Col10a1 mutant in endochondral bone integrity. Utilizing advanced genomics, lineage tracing approach, transgenic mouse, cell biology, biochemistry, scRNA-Seq, Spatial transcriptomics, and proteomics techniques, I discovered MMP14 in the Hypertrophic chondrocytes (HC) is essential for maintaining trabecular bone integrity through its influence on the HC lineage via skeletal stem and progenitor cells (SSPCs) and communication with neutrophils. In my future research, I will focus on the following main areas in skeletal cell biology: 1) investigate the intrinsic and extrinsic mechanism of HC lineage differentiation program by comparative study on pluripotent HC and non-pluripotent HC; 2) determination of the characteristics and the biological properties of HC-derived skeletal stem and progenitor cells (SSPCs); and, 3) Screening and developing a potential compound/drug that can treat bone loss via stimulating SSPC generation.

**EDUCATION**

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- **09/2016- 09/2020 Ph.D. in Life Science**  
The Hong Kong University of Science and Technology (HKUST), Hong Kong  
Thesis: Evaluation and mechanism study of Psoraleae Fructus on bone cells: identification of its bioactive ingredient and development of potential compound against osteoporosis  
Advisor: Professor Karl Tsim, Director
- **09/2012- 07/2015 Mphil in Chinese pharmacy**  
Guangzhou University of Chinese Medicine (GUCM), China  
Thesis: Biological Evaluation and Molecular Docking of Baicalin and Scutellarin as *Helicobacter pylori* Urease Inhibitors  
Advisor: Professor Ziren Su
- **09/2008- 06/2012 Bachelor in Chinese pharmacy, GPA: 3.89**  
Guangdong Pharmaceutical University (GPU), China

**RESEARCH EXPERIENCE**

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- **12/2020- current Postdoctoral Fellow**  
The University of Hong Kong, Hong Kong  
Advisor: Professor Kathy Cheah, Director  
Projects: (1) Mechanism of MMP14 control of bone mass via chondrocyte to osteoblast conversion; (2) ER stress disrupts hypertrophic chondrocyte differentiation and trabecular

bone formation via SOX9 in a mouse model of MCDS; (3) Aptamer-mediated targeting of MMP14 as a potential therapeutic for low bone mass

- **08/2015- 07/2016 Research Assistant**  
Shenzhen Traditional Chinese Medicine Hospital, Shenzhen  
Advisor: Dr. Chen Jianping, Deputy Director  
Project: Chemical standardization of an herbal medicine, Jian Pi Yi Shen Formula, by HPLC fingerprinting

## **PROFESSIONAL MEMBERSHIP**

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- Licensed pharmacist, approved and authorized by China Food and Drug Administration, 2015
- Member of Australia and New Zealand Bone and Mineral Society (ANZBMS), 2019
- Member of International Society for Stem Cell Research (ISSCR), 2025

## **FUNDING**

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Aptamer-mediated targeting of MMP14 as a potential therapeutic for low bone mass. Health and Medical Research Fund, Hong Kong, 2022 awarded. Project reference: 09202246. (Principle investigator, HKD 1,499,040)

## **AWARDS**

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- 03/2024** Best oral presentation award (First Place award) of the 1st HKU-CUHK Joint Postdoctoral Biomedical Sciences Symposium 2024
- 08/2020** Tianjiang Cup Li Shizhen Youth Outstanding Thesis Award & Best poster presentation award of the 16th IPSCM
- 08/2019** Tianjiang Cup Li Shizhen Youth Outstanding Thesis Award & Best oral presentation award of the 15th IPSCM
- 06/2015** Award for Outstanding Graduate, GUCM
- 08/2014** Third place award of the 5th National Pharmacy Postgraduates Academic Forum
- 2012-2013** National Postgraduate Scholarship
- 12/2012** Second place award of postgraduate Badminton Tournament, GUCM
- 2011-2012** Daxiang Group Pharmaceutical Scholarship, GPU
- 2010-2011** Second place award of University Scholarship, GPU;  
National motivational scholarship, GPU;  
Third place award of artistic specimen competition of TCM, GPU
- 2009-2010** Second place award of University Scholarship, GPU;  
National motivational scholarship, GPU;  
Award for the title of "Excellent sister for dedication of love", GPU
- 2008-2009** Second place award of University Scholarship, GPU

## **CONFERENCE**

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- 11/2024** Integrating single-cell RNA-seq and spatial transcriptomics reveals the role of Mmp14 as an immune-related regulator for endochondral bone integrity. The

Croucher Advanced Study Institute titled Technology in Development and Disease. The University of Hong Kong, Hong Kong. **(Selected Speaker)**

- 03/2024** Integrating single-cell RNA-seq and spatial transcriptomics reveals the role of Mmp14 as an immune-related regulator for endochondral bone integrity. The 1st HKU-CUHK Joint Postdoctoral Biomedical Sciences Symposium 2024. The University of Hong Kong, Hong Kong. **(Selected Speaker)**
- 08/2020** Corylin inhibits RANKL-induced osteoclastogenesis: signaling mediated by NF- $\kappa$ B pathways. The 16th International Postgraduate Symposium on Chinese Medicine (16th IPSCM). Hong Kong Convention and Exhibition Center, Hong Kong. **(Poster session)**
- 10/2019** Corylin, derived from Psoralea Fructus, induces bone differentiation and metabolic profiling: illustration by using osteoblasts and bone micromass cultures. 29th Australian and New Zealand Bone and Mineral (ANZBM) Society Annual Scientific Meeting. Darwin Convention Centre, Darwin, Australia. **(Poster session)**
- 08/2019** Corylin induces bone differentiation and metabolic profiling: illustration by using cultured osteoblasts and bone micromass. The 15th IPSCM. Hong Kong Convention and Exhibition Center, Hong Kong. **(Selected Speaker)**
- 07/2017** Improving the development of cities via urban water management. 2017 ASPIRE Forum. Nanyang Technological University, Singapore. **(Selected Speaker)**
- 08/2014** Selective antibacterial activity of patchouli alcohol against Helicobacter pylori based on inhibition of urease. The 5th Pharmacy Postgraduates Academic Forum in China. Sun Yat-sen University, Guangzhou. **(Selected Speaker)**
- 08/2014** Selective antibacterial activity of patchouli alcohol against Helicobacter pylori based on inhibition of urease. The 10th IPSCM. Hong Kong Convention and Exhibition Center, Hong Kong. **(Selected Speaker)**
- 08/2013** Inhibition of Helicobacter pylori by baicalin: elucidation of the mechanism via the study on urease. The 9th IPSCM. Hong Kong Convention and Exhibition Center, Hong Kong. **(Poster session)**

## **RESEARCH MENTORSHIP**

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### **At The University of Hong Kong, Hong Kong:**

1 PhD candidates (3 years, project “Aptamer-mediated targeting of MMP14 as a potential therapeutic for low bone mass”)

### **At The Hong Kong University of Science and Technology, Hong Kong:**

2 guest scientists (6 months, cell culture & molecular biological techniques)

1 master student (6 months, cell culture & molecular biological techniques)

1 undergraduate student (6 months, molecular biological techniques)

### **At Guangzhou University of Chinese Medicine, China:**

1 undergraduate student (1 year, basic laboratory techniques)

## ADMINISTRATION SKILLS

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### Organizing Committee / Session Chair

**08/2019** The 15th International Postgraduates Symposium on Chinese Medicine (IPSCM)

## TEACHING

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**2016-2020** Teaching assistant in HKUST

## PATENT

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CHEN Jianping, LI Shun-min, ZHANG Shangbin, ZHENG Ping, HE Taidong, YU Xiaodan. 一种治疗慢性肾功能衰竭的中药组合物的质量控制方法. CN 105548426 A. 2016

## LABORATORY TECHNIQUES

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- Skilled with molecular biological techniques, such as MTT assay, BrdU assay, Enzyme assays, RNA and DNA isolation, real time PCR, WB, DNA transfection, luciferase reporter assay, ELISA assay, flow cytometry, histological staining, immunocytochemistry, confocal imaging, and CRISPR-Cas9 technique.
- Skilled with isolation of mesenchymal stem cells (MSCs) and bone marrow macrophages (BMMs), as well as zebrafish scale *ex vivo* model.
- Skilled with culture of bone micromass and mammalian cells, e.g., primary osteoblasts and osteoclasts; cell line culture, including MG63, Saos-2, and MC3T3-E1 cell lines.
- Skilled with laboratory mouse management and mouse experiments.
- Skilled with micro-CT analysis.
- Skilled with sample preparation for RNA-Seq and Spatial transcriptomics.
- Skilled with bioinformatic analysis (bulk RNA-Seq, ScRNA-Seq, and Spatial transcriptomic analysis).
- Familiar with patent writing and academic funding applications.
- Familiar with chromatographic analysis techniques such as HPLC-DAD, UPLC-MS/MS, TLC, etc.
- Familiar with isolation and separation of natural products from plants.

## LANGUAGE & SKILLS

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- Language: Teochew (native), Mandarin (native), English (fluent), Cantonese (good), understand basic R language, Python, and Linux.
- English level: CET-6, IELTS
- Skilled with Excel, PowerPoint, Adobe Illustrator, SigmaPlot, GraphPad Prism, EndNote, SPSS, FlowJo, ImageJ, Fiji, ChemOffice, micro-CT analysis software, R-Studio, and Jupyter Notebook.

## PUBLICATIONS

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1. Tsz Long Chu, Peikai Chen, Anna Xiaodan Yu, Mingpeng Kong, Zhijia Tan, Kwok

- Yeung Tsang, Zhongjun Zhou, Kathryn S.E. Cheah. MMP14 cleaves PTH1R in the chondrocyte derived osteoblast lineage, curbing signaling intensity for proper bone anabolism. *eLife*. **2023**
2. **Yu A. X.D.**, Xiao J., Zhao S.Z., Kong X.P., Kwan K. K.L., Zheng B. Z.Y., Wu Q.Y., Dong T. T.X., Tsim K. W.K. Biological Evaluation and Transcriptomic Analysis of Corylin as an Inhibitor of Osteoclast Differentiation. *International Journal of Molecular Sciences*. **2021** Apr; 22(7): 3540.
  3. Kwan K. K.L., Wong, T.Y., **Yu A. X.D.**, Dong T. T.X., Lam, H.H.L., Tsim K. W.K. The Osteogenic Function of Danggui Buxue Tang, a Herbal Decoction Containing Astragali Radix and Angelicae Sinensis Radix, Is Optimized by Boiling the Two Herbs Together: Signaling Analyses Revealed by Systems Biology. *Processes*. 31 July **2021**
  4. Kwan K. K.L., Wong Tin Yan, **Yu A. X.D.**, Dong T. T.X., Lam Henry H.N., Tsim K. W.K. Integrated Omics Reveals the Orchestrating Role of Calycosin in Danggui Buxue Tang, a Herbal Formula Containing Angelicae Sinensis Radix and Astragali Radix, in Inducing Osteoblastic Differentiation and Proliferation. *Front. Pharmacol*. 23 June **2021**
  5. **Yu A. X.D.**, Xu M. L., Yao P., Kwan K. K.L., Liu Y.X., Duan R., Dong T. T.X., Ko R. K.M., Tsim K. W.K. Corylin, a flavonoid derived from Psoraleae Fructus, induces osteoblastic differentiation via estrogen and Wnt/ $\beta$ -catenin signaling pathways. *FASEB Journal*. **2020**
  6. Liu E. Y.L., Xia Y.J., Kong X.P., Guo M. S.S., **Yu A. X.D.**, Zheng B. Z.Y., Mak M. S.H., Xu M. L., Tsim K. W.K. Interacting with  $\alpha 7$  nAChR is a new mechanism for AChE to enhance the inflammatory response in macrophages. *Acta Pharmaceutica Sinica B*. **2020**
  7. Kong X.P., Liu E. Y.L., Chen Z.C., Xu M. L., **Yu A. X.D.**, Wu Q.Y., Xia Y.J., Duan R., Dong T. T.X., and Tsim K. W.K. Synergistic inhibition on acetylcholinesterase by alkaloids deriving from Stephaniae Tetrandrae Radix, Coptidis Rhizoma and Phellodendri Chinensis Cortex. *Molecules*. **2019**, 24, 4567; doi:10.3390/molecules24244567.
  8. CHEN JP, ZHANG SB, ZHENG P, **YU XD**, HE TD, SUO J, LI ZG, LI SM. Optimization of Water Extraction Technology of Jianpi Yishen Pills by Orthogonal Test. *China Pharmacy* **2016**, 27(34): 4833-4835 doi: 10.6039/j. issn.1001-0408.2016.34.25
  9. Zhao XN, Wang XF, Liao JB, Guo HZ, **YU XD**, Liang JL, Zhang Xie, Su ZR, Zhang XJ, Zeng HF. Antifatigue Effect of Millettiae speciosae Champ (Leguminosae) Extract in Mice. *Tropical journal of pharmaceutical research*. **2015**, 14(3): 479-485.
  10. **Yu XD**, Zheng RB, Xie JH, Zheng YF, Huang XQ, Wang YH, Mo ZhZh, Wu XL, Wu DW, Liang YE, Zeng HF, Su ZR, Huang P. Biological evaluation and molecular docking of baicalin and scutellarin as *Helicobacter pylori* urease inhibitors. *Journal of Ethnopharmacology* **2014**, 162:69-78.
  11. **Yu XD**, Xie JH, Wang YH, Li YC, Mo ZhZh, Zheng YF, Su JY, Liang YE, Liang JZ, Su ZR, Huang P. Selective antibacterial activity of patchouli alcohol against *Helicobacter pylori* based on inhibition of urease. *Phytotherapy Research* **2014**, 29:67-72.
  12. Zheng YF, Xie JH, Xu YF, Liang YZ, Mo ZZ, Jiang WW, Chen XY, Liu YH, **Yu XD**, Huang P, Su ZR. Gastroprotective effect and mechanism of patchouli alcohol against ethanol, indomethacin and stress-induced ulcer in rats. *Chemico-Biological Interactions* **2014**, doi: 10.1016/ j.cbi.2014.08.008.

13. Wu DW †, **Yu XD** †, Xie JH, Su ZQ, Su JY, Tan LR, Huang XQ, Chen JN, Su ZR. Inactivation of jack bean urease by scutellarin: elucidation of inhibitory efficacy, kinetics and mechanism. *Fitoterapia* **2013**, 91:60-67. (Co-first author)
14. Tan LR, Su JY, Wu DW, **Yu XD**, Su ZQ, He JJ, Wu XL, Kong SZ, Lai XP, Lin J, Su ZR. Kinetics and mechanism study of competitive inhibition of jack bean urease by baicalin. *The Scientific World Journal* **2013**, doi: 10.1155/2013/879501.

#### MANUSCRIPT IN PREPARATION:

15. **Anna Xiaodan Yu**, Guan Wang, Nelson Dung, Tsz Long Chu, Jiashun Xiao, Xiaomeng Wan, Nickolas Jia Ming Teo, Can Yang, Reinhard Fässler, Kathryn S.E. Cheah. Integrating single-cell RNA-seq and spatial transcriptomics reveals the role of Mmp14 as an immune-related regulator for endochondral bone integrity. *Science Advances*. **2025 (under preparation)**
16. **Anna Xiaodan Yu**, Zhijia Tan, Cheng Wang, Alan Boyde, Danny Chan, Kathryn S.E. Cheah. ER stress disrupts hypertrophic chondrocyte differentiation and trabecular bone formation via SOX9 in a mouse model of MCDS. *PNAS*. **2025 (under preparation)**

#### REFERENCES

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- **Prof. Karl Tsim**, Professor in Life Science, HKUST  
E-mail: botsim@ust.hk
- **Prof. Reinhard Fässler**, Professor in Max Planck Institute of Biochemistry  
E-mail: faessler@biochem.mpg.de
- **Prof. Danny Chan**, Professor in SBMS, HKU  
E-mail: chand@hku.hk
- **Prof. Kathryn Cheah**, Professor in SBMS, HKU.  
E-mail: kathycheah@hku.hk