Yang Zhou, Ph.D.

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Education and Training

2014/05 – 2018/12	**Postdoctoral Fellow**	
	Field of Study:	Cardiovascular Biology
	Mentor:	Li Qian, Ph.D.,
	Department/Institute:	Department of Pathology and Laboratory Medicine McAllister Heart Institute University of North Carolina at Chapel Hill
09/2007 –01/2014	**Doctor of Philosophy**	
	Field of Study:	Development Biology
	Mentor:	Ying Jin, M.D., Ph.D.
	Department/Institute:	Institute of Health Sciences Chinese Academy of Sciences, Shanghai, China
09/2003– 07/2007	**Bachelor of Science**	
	Major:	Biology
	Institute:	School of Life Sciences Fudan University, Shanghai, China

Employments and Professional Experience

2019 –	**Assistant Professor**, Department of Biomedical Engineering, University of Alabama at Birmingham, Birmingham, AL
2014 – 2018	**Postdoctoral Fellow**, Lab of Li Qian, Ph.D., McAllister Heart Institute, UNC at Chapel Hill, Chapel Hill, NC
2007 – 2014	**Graduate Student Researcher**, Lab of Ying Jin, M.D., Ph.D., Institute of Health Sciences, Chinese Academy of Sciences, Shanghai, China
2006	**Research Assistant**, State Key Laboratory of Genetic Engineering, Institute of Genetics, School of Life Sciences, Fudan University, Shanghai, China

Personal Statement

My research interests have long been focused on understanding cellular and molecular mechanisms underlying cell fate determination. In particular, my current focuses on understanding the molecular basis of direct cardiac reprogramming, which converts a somatic non-myocyte directly into an induced cardiomyocyte (iCM), and

applying the knowledge to improve clinical applicability and efficiency of this novel approach. My recent research focus and past achievements in this broad area include:

1. **Single-Cell Transcriptomics of Cardiac Reprogramming:** Recently, I and my colleagues have reconstructed the reprogramming path during murine iCM reprogramming by utilizing single-cell RNA sequencing (Liu Z *et al.*, Nature*, 2017)*. Taking advantage of the reproducible human cardiac reprogramming platform that I newly developed, I utilized approaches of single-cell transcriptomics, computational modeling and functional genetics to dissect our understanding of gene regulatory mechanisms underlying cardiac reprogramming in human cells (Zhou Y *et al.*, *Cell Stem Cell*, 2019).
2. **Comparative Analysis of Cardiac Reprogramming:** I have determined the distinct molecular features between iCM and induced pluripotent stem cell-derived CMs (iPSC-CMs) through comparative transcriptomics and functional validations, where I found that iCMs and iPSC-CMs represent distinct developmental stages (Zhou Y *et al.*, Cell Reports, 2017).
3. **Epigenetic Regulation of Direct Cardiac Reprogramming**: Utilizing a strategy of loss-of-function screen, I have identified Bmi1 as a key epigenetic barrier to iCM reprogramming (Zhou Y *et al*., Cell Stem Cell, 2016), as well as other epigenetic modifiers and splicing factors regulating reprogramming (Zhou Y *et al*., Stem Cells International*,* 2018).
4. **MicroRNA and Stem Cell Differentiation**: In the neural stem cells model that I developed from human embryonic stem cells, I have discovered the interplay between microRNA miR-195 and ARL2 gene in regulating cellular response to neurotoxicity (Zhou Y *et al.*, Cell Death & Disease*,* 2013).

Combining my interests in regenerative medicine, epigenetics, and gene regulation with my rigorous training in stem cell biology and cardiovascular biology, I look forward to developing my independent research contributing to comprehensive understanding of genetic and epigenetic regulation for cell fate determination, which will ultimately aid in the achievement of regenerative therapy and personalized medicine in the future.

Publications

First Author Publications

1. **Zhou Y**, Zhang J#. Single-cell Transcriptomics: New Insights in Heart Research. ***Circulation***. 2020 May 26; 141 (21), 1720-1723.

2. Garbutt, T*, **Zhou Y***#, Keepers B, Liu J, Qian L#. An Optimized Protocol for Human Direct Cardiac Reprogramming. ***STAR Protocols***. 2020 Jun 3:100010. (*Co-first authors, #Co-corresponding authors)

3. **Zhou Y***, Liu Z*, Welch JD, Gao X, Wang L, Ma H, Garbutt T, Huang PS, Vaseghi HR, Yin C, Prins JF, Shen W, Liu J, Qian L. Comparative single cell transcriptomics reveals distinct cell fate transition statuses during human cardiac reprogramming. ***Cell Stem Cell***. 2019 Jul 3;25(1):149-64

4. **Zhou Y,** Alimohamadi S, Wang L, Liu Z, Wall JB, Yin C, Liu J, Qian L. A loss of function screen of epigenetic modifiers and splicing factors during early stage of cardiac reprogramming. ***Stem cells international***. 2018 Mar 18;2018.

5. **Zhou Y**, Wang L, Liu Z, Alimohamadi S, Liu J, Qian L. Comparative gene expression analyses reveal

distinct molecular signature between differentially reprogrammed cardiomyocytes. ***Cell Reports***. 2017 Sep 26;20(13):3014-3024.

6. **Zhou Y,** Wang L, Vaseghi HR, Liu Z, Lu R, Alimohamadi S, Yin C, Fu JD, Wang GG, Liu J, Qian L. Bmi1 is a key epigenetic barrier to direct cardiac reprogramming. ***Cell Stem Cell***. 2016 Mar 3;18(3):382-395.
    - **Highlighted** in *Cell Stem Cell*:
      Milad Rezvani, Regina Español-Suñer, Laure Dumont, and Yann Malato, First Author Journal Club: 2016 Selections. *Cell Stem Cell.* 2016 Jun 2;18(6): 692-694.
    - **Commented** in *Stem Cell Investigation*:
      Herrero D, Bernad A. Bmi1-mediated epigenetic signature acts as a critical barrier for direct reprogramming to mature cardiomyocytes. *Stem Cell Investigation*. 2016 Jul 20;3:28.

7. **Zhou Y,** Qian L. Advanced technologies lead iNto new reprogramming routes. ***Cell Stem Cell***. 2016 Sep 1;19(3):286-8.

8. **Zhou Y,** Jiang H, Gu J, Tang Y, Shen N, Jin Y. MicroRNA-195 targets ADP-ribosylation factor-like protein 2 to induce apoptosis in human embryonic stem cell-derived neural progenitor cells. ***Cell Death & Disease***. 2013 Jun 27;4:e695.
    - **Recommended** in *F1000Prime*:
      Bosnjak Z: F1000Prime Recommendation. In F1000Prime, 11 Jul 2013; DOI: 10.3410/f.718023613.793479605. F1000Prime.com/718023613#eval793479605

Collaborative Publications

9. Wang L., Ma H., Huang P., Xie Y., Near D., Wang H., Xu J., Yang Y., Xu Y., Garbutt T., **Zhou Y**., Liu Z., Yin C., Bressan M., Taylor J.M., Liu J. and Qian L. (2020) Downregulation of Beclin1 promotes direct cardiac reprogramming. ***Sci Transl Med***. In press

10. Zhao M*, Zhang E*, Wei Y, **Zhou Y**, Walcott G, Zhang J. Apical Resection Prolongs the Cell Cycle Activity and Promotes Myocardial Regeneration after LV Injury in Neonatal Pig. ***Circulation*** *2020;142:913–916*

11. Zhang H, Zhang Y, Wright S, Hyle J, Zhao L, An J, Zhou X, Zhoa X, Shao Y, Lee H, Chen T, **Zhou Y**, Lu R, Li C. Functional Interrogation of HOXA9 Regulome in MLLr Leukemia via Reporter-based CRISPR/Cas9 screen. ***bioRxiv***. 2020 Jan 1.

12. Fang Z*, Liu X*, Wen J, Tang F, **Zhou Y**, Jing N, Jin Y. SOX21 Ensures Rostral Forebrain Identity by Suppression of WNT8B during Neural Regionalization of Human Embryonic Stem Cells. ***Stem cell reports*** 13 (6), 1038-1052.

13. Zhao M*, Tang Y*, **Zhou Y**, Zhang J. Deciphering Role of Wnt Signalling in Cardiac Mesoderm and Cardiomyocyte Differentiation from Human iPSCs: Four-dimensional control of Wnt pathway for hiPSC-CMs differentiation. ***Scientific Reports***. 2019 9 (1), 1-15.

14. Liu Z, Wang L, Welch JD, Ma H, **Zhou Y**, Vaseghi HR, Yu S, Wall JB, Alimohamadi S, Zheng M, Yin C, Shen W, Prins JF, Liu J, Qian L. Single-cell transcriptomics reconstructs fate conversion from fibroblast to

cardiomyocyte. ***Nature***. 2017 Nov 2;551(7678):100-104.

15. Liu Z, Chen O, Wall JB, Zheng M, **Zhou Y**, Wang L, Vaseghi H, Qian L, Liu J. Systematic comparison of 2A peptides for cloning multi-genes in a polycistronic vector. ***Scientific Reports***. 2017 May 19;7(1):2193.

16. Ju XC, Hou QQ, Sheng ALS, Wu KY, **Zhou Y,** Jin Y, Wen T, Yang Z, Wang X, Luo ZG. The hominoid-specific gene TBC1D3 promotes generation of basal neural progenitors and induces cortical folding in mice. ***Elife***. 2016 Aug 9;5.

17. Vaseghi HR, Yin C, **Zhou Y,** Wang L, Liu J, Qian L. Generation of an inducible fibroblast cell line for studying direct cardiac reprogramming. ***Genesis***. 2016 Jul;54(7):398-406.

18. Lu R, Wang P, Parton T, **Zhou Y,** Chrysovergis K, Rockowitz S, Chen WY, Abdel-Wahab O, Wade PA, Zheng D, Wang GG. Epigenetic perturbations by Arg882-mutated DNMT3A potentiate aberrant stem cell gene-expression program and acute leukemia development. ***Cancer Cell***. 2016 Jul 11; 30(1):92-107.

19. Liu Z, Chen O, Zheng M, Wang L, **Zhou Y,** Yin C, Liu J, Qian L. Re-patterning of H3K27me3, H3K4me3 and DNA methylation during fibroblast conversion into induced cardiomyocytes. ***Stem Cell Research***. 2016 Mar;16(2):507-518.

20. Wang L, Liu Z, Yin C, **Zhou Y,** Liu J, Qian L. Improved generation of induced cardiomyocytes using a polycistronic construct expressing optimal ratio of Gata4, Mef2c and Tbx5. ***Journal of Visualized Experiments***. 2015 Nov 13;(105).

21. Li H*, Wang B*, Yang A*, Lu R, Wang W, **Zhou Y**, Shi G, Kwon S, Zhao Y, Jin Y. Ly-1 antibody reactive clone is an important nucleolar protein for control of self-renewal and differentiation in embryonic stem cells. ***Stem Cells***. 2009 Jun;27(6):1244-54. (* co-first authors)

Book Chapters:

1. Tang Y, **Zhou Y**. Direct cardiac reprogramming of human fibroblasts into induced cardiomyocytes via retroviral delivery of MEF2C, GATA4, TBX5, and miR-133. Cardiomyocytes, *Springer*. (Invited)

2. **Zhou Y**, Liu J, Qian L. Epigenomic reprogramming in cardiovascular disease. Computational epigenetics and diseases, *Elsevier*. 2019:149-163.

3. **Zhou Y,** Jin Y. Differentiation of human embryonic stem cells into neural lineage cells. Stem cells and cancer stem cells, Volume 7. *Springer Netherlands*, 2012: 229-239.

Honors and Awards

2020	Outstanding Early Career Investigator Award Finalist at the Basic Cardiovascular Sciences (BCVS) 2020 Scientific Sessions, American Heart Association
2018	Postdoctoral Award for Research Excellence (PARE), UNC-Chapel Hill
2012	International Society for Stem Cell Research (ISSCR) Travel Grant

2011	Poster Award at the 9th Graduate Research Appreciation Day, Institute of Health Sciences. Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences.
2011	Students Excellence Award. Chinese Academy of Sciences
2010	Special Scientific Picture Award at the 8th Graduate Research Appreciation Day, Institute of Health Sciences.

Teaching and Mentoring Experience

2020-	Thesis committee member for BME graduate student Lu Wang (Zhang Lab)
2020-	Co-mentor for the BME graduate student Yawen (Grace) Tang
2020 Spring	Lecturer, BME 670/770 Quantitative Physiology (UAB)
2019-	Thesis committee member for BME graduate student Yawen (Grace) Tang (Zhang Lab)
2019	Mentored BME graduate rotation student Yuhua Wei
2016	Mentored MD/PhD rotation student Benjamin Keepers (Qian Lab)
2015	Mentored graduate rotation student Haley Ruth Vaseghi (Qian Lab)
2014-2016	Mentored undergraduate student Sahar Alimohamadi (Qian Lab)
2013	Mentored graduate student Zhuoqing Fang (Jin Lab)
2012-2013	Mentored graduate student Chenling Zhou (Jin Lab)
2011	Mentored graduate student Shiyue Zhang (Jin Lab)

Selected Presentations

2020 "Single Cell Transcriptomics Reveals Extended Regenerative Capacity in Adult Pig Hearts Pretreated with Apex Resection at P1" 4th Annual NHLBI Progenitor Cell Translational Consortium (PCTC) Meeting, Virtual (Oral Presentation)

2020 "*TBX20 Activates Cardiac Maturation Gene Programs Promoting Direct Human Cardiac Reprogramming*" Outstanding Early Career Investigator Award Competition, Basic Cardiovascular Sciences 2020 (Oral Presentation)

2019 "*Single-Cell Transcriptomic Analyses of Cell Fate Transitions during Human Cardiac Reprograming*" Innovations in Cardiovascular Sciences and Therapeutics PACEinSCIENCE Young Investigator Symposium 2019 (Oral Presentation)

2019 "*Molecular Regulation during Direct Conversion of Cardiac Muscle Cells from Human Fibroblasts*" 2019 3rd Annual NHLBI Progenitor Cell Translational Consortium (PCTC) Meeting (Oral Presentation)

2019 *"Direct Cardiac Reprogramming for Heart Regeneration"* 2019 UAB Department of Biomedical Engineering Weekly Seminar (Oral Presentation)

2018 "*Reprogramming 2.0: Save the Broken Heart*" 2018 UNC Postdoctoral Award for Research Excellence Ceremony and Reception. (Oral Presentation)

2018 "*Comparative Single Cell Transcriptomics Reveals Distinct Cell Fate Transition Statuses during Human Cardiac Reprogramming*" 2018 UNC School of Medicine Department of Pathology and Laboratory Medicine Annual Research Symposium. (Poster Presentation)

2018 *"Epigenetic Reprogramming for Cardiovascular Diseases"* 2018 Carolina Chromatin Consortium (C3) meeting. (Oral Presentation)

2018 *"Direct Conversion of Somatic Cells into Functional Cardiomyocytes"* Pathology Special Seminar Series, Department of Pathology, Division of Molecular and Cellular Pathology, University of Alabama at Birmingham. (Oral Presentation)

2016 "*Comparative gene expression analyses of induced cardiomyocytes and induced pluripotent stem cell-derived cardiomyocytes."* 2016 UNC School of Medicine Department of Pathology and Laboratory Medicine Annual Research Symposium. (Oral Presentation)

2016 "*Comparative gene expression analyses of induced cardiomyocytes and induced pluripotent stem cell-derived cardiomyocytes."* Weinstein Cardiovascular Development and Regeneration Conference 2016. (Poster Presentation)

2016 "*Removal of Epigenetic Barriers by Bmi1 Depletion Promotes Direct Cardiac Reprogramming."* 2016 IVB/MHI Annual Spring Research Symposium. (Poster Presentation)

2012 "*Differentiation of Human Embryonic Stem Cells into Neural Lineage Cells.*" 2012 Student's Seminar of Institute of Health Sciences. (Oral Presentation)

2012 "*MicroRNA-195 targets ADP-ribosylation factor like protein 2 inducing apoptosis in human embryonic stem cell-derived neural progenitor cells.*" The 10th International Society for Stem Cell Research (ISSCR) Annual Meeting, Yokohama, Japan. (Poster Presentation)

2011 "*miR-195 Induces Apoptosis in Human Embryonic Stem Cell Derived Neural Progenitor Cells through a Novel Target."* The 9th Graduate Research Appreciation Day Institute of Health Sciences. (Poster Presentation)

Academic Services

2019 – date Ad hoc journal reviewer for *Scientific Reports*, *BioMed Research International, Annals of Biomedical Engineering, Stem Cells*

2019 Judge for Trainees' presentations. Innovations in Cardiovascular Sciences and Therapeutics PACEinSCIENCE Young Investigator Symposium

Research Support

Ongoing

1. **NIH NHLBI R01 R01HL153220 (Zhou)**
   Role: **PI** (PI: Zhou, Yang) 08/25/2020 - 07/31/2024
   Title: Critical Role of TBX20 in Cardiomyocyte Maturation during Direct Cardiac Reprogramming
   Objective: To investigate the novel reprogramming factor TBX20 in promoting cardiomyocyte fate conversion.

2. **NIH NHLBI R01 1R01HL149137**
   Role: **Co-I** (PI: Zhang, Jianyi) 07/15/2019 - 06/30/2023
   Title: Deciphering the Neonatal Cardiac Regenerative Potential and Regulators in Large Animals
   Objective: To establish a novel porcine heart regeneration model and dissect the underlying mechanisms.

3. **NIH PCTC Clinical Translation Award**
   Role: **Co-I** (PI: Zhang, Jianyi) 03/01/2020 – 11/30/2020

Title: Single Nucleus RNA Sequencing in Pig Heart Development and Regeneration
Objective: To generate transcriptomic profiling in single cell level to decipher the neonatal cardiac regeneration potential in the pig model.

Complete

1. **Postdoctoral Award for Research Excellence, UNC-Chapel Hill** 2018