FELLOWSHIP APPLICANT BIOGRAPHICAL SKETCH

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NAME OF FELLOWSHIP APPLICANT	POSITION TITLE
Jiao, Alex	Graduate Research Assistant
eRA COMMONS USER NAME (credential, e.g., agency login) alexjiao	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Northwestern University, Evanston, IL	BSc	06/10	Biomedical Engineering
University of Washington, Seattle, WA	PhD	12/15	Bioengineering

A. Personal Statement

The goal of the proposed research is to develop bioengineered 3D human cardiac tissue models with physiological structure and function to be used both as cardiac microenvironments and engineered tissue constructs. I have previously had research experience in biomaterials and engineered tissues and 3D cellular microenvironments as an undergraduate researcher. At the University of Michigan, I worked as a summer lab assistant under the supervision of Jan Stegemann for two summers. I worked on fabrication of agarose/fibrin microbeads for use as an engineered cellular microenvironment as well as developed a composite collagen/hydroxyapatite cell encapsulated scaffold which was subsequently mineralized using Simulated Body Fluid for bone tissue engineering. These projects yielded a first author audiovisual presentation and co-authored manuscript (*Acta Biomaterialia 2012*) and poster presentation. At Northwestern University, I worked for two years as an undergraduate researcher under the supervision of Guillermo Ameer. My projects involved the characterization of β-amyloid 1-40 and 1-42 peptides on the inflammatory response of endothelial cells, as well as the fabrication and characterization of receptor-immobilized agarose microbeads which were used to bind β-amyloid peptides out of solution as an engineered biomaterial. Both research opportunities gave me extensive experience in human cell culture, biomaterial fabrication and development, and surface modifications and chemistries. As a PhD student at the University of Washington, I selected Deok-Ho Kim as a sponsor to combine my research interests and experiences of biomaterials and tissue engineering. Additionally, I have selected Charles Murry as a co-sponsor to help train in areas of stem cell biology, differentiation, and cardiovascular biology. I have gained experience in micro- and nanofabrication, surface modifications, scaffold design, stem cell biology and differentiation, stem cell-derived cardiomyocyte culture, and cardiovascular physiology and pathology. My initial project involved maturing primary cardiomyocyte monolayers using combinatorial nanotopographical and electrical stimulation. I then focused my efforts on 3D, scaffold-free tissue engineering for cardiac tissue engineering applications. This led to a collaborative co-authored manuscript (*Acta Biomaterialia 2013*) and the independent development of a thermoresponsive, nanofabricated substratum. The developed substratum was combined with another independently developed method to transfer aligned cell monolayers without loss of structural anisotropy and stack aligned monolayers into 3D tissues with controllable architectures, leading to a first author manuscript (*ACS Nano 2014*). The developed platform for 3D tissue fabrication is now being applied to cardiac tissues for the fabrication of physiologically structured, human cardiac tissue models. Additionally, under the mentorship of Dr. Kim and Dr. Murry, I have also co-authored two reviews, had numerous poster and audiovisual presentations at both local and international conferences, and filed 2 provisional patents and 1 full patent. I believe I have demonstrated a record of successful and productive research while as a student in areas of high relevance for the proposed studies and I believe my expertise and experiences have prepared me to successfully undertake the proposed project.

B. Positions and Honors

ACTIVITY/OCCUPATION	BEGINNING DATE (mm/yy)	ENDING DATE (mm/yy)	FIELD	INSTITUTION/COMPANY	SUPERVISOR/ EMPLOYER
Undergraduate Lab Assistant	06/2008	09/2009	Biomedical Engineering	University of Michigan	Jan P. Stegemann, PhD
Undergraduate Researcher	09/2008	06/2010	Biomedical Engineering	Northwestern University	Guillermo A. Ameer, ScD
Graduate Research Assistant	09/2010	Present	Bioengineering	University of Washington	Deok-Ho Kim, PhD

Academic and Professional Honors

2009-2010 Northwestern University McCormick School of Engineering Dean's List
2010 Department of Defense SMART Grant Semifinalist
2010 Society for Biomaterials STAR Award Honorable Mention
2011 NSF Graduate Research Fellowship Program Honorable Mention
2011-2013 Bioengineering Cardiovascular Training Grant Recipient
2013 BMES Cellular & Molecular Bioengineering Special Interest Group Student Award
2013 Outstanding Paper Award, 2013 ASME NanoEngineering in Medicine and Biology Conference
2013 Most Downloaded and Most cited Review Article; Annals of Biomedical Engineering
2013-2014 Cardiovascular Pathology Training Grant Recipient
2014 Institute of Translational Health Sciences TL1 Summer Program Awardee
2014 American Heart Association Predoctoral Fellowship

C. Selected Publications and Patent Citations

Journal Publications

1. **Jiao A**, Trosper NE, Yang HS, Tsui JH, Frankel SD, Murry CE, Kim DH. (2014). "A thermoresponsive nanofabricated substratum for the engineering of three-dimensional tissues with layer-by-layer architectural control," ACS Nano. (In Press) DOI: 10.1021/nn4063962
2. Kim P, Yuan A, **Jiao A**, Nam K, Kim DH. (2013). "Fabrication of poly(ethylene glycol):gelatin methacrylate composite nanostructures with tunable stiffness and degradation for vascular tissue engineering," Biofabrication. (In Press)
3. Lee B, **Jiao A**, Yu S, You JB, Kim DH, Im SG. (2013). "Initiated chemical vapor deposition of thermoresponsive poly(N-vinylcaprolactam) thin films for cell sheet engineering." Acta Biomaterialia 9(8): 7691-7698.
4. Macadangdang J, Lee HJ, Carson D, **Jiao A**, Fugate J, Pabon L, Regnier M, Murry C, Kim DH. Capillary Force Lithography for Cardiac Tissue Engineering. Journal of Visualized Experiments. In Press. 2013.
5. Kim HN, **Jiao A**, Hwang NS, Kim MS, Kang DH, Kim DH, Suh KY. (2012). "Nanotopography-guided tissue engineering and regenerative medicine." Advanced Drug Delivery Reviews 65(4): 536-558. (**Featured as cover article**)
6. Rao RR, **Jiao A**, Kohn DH, Stegemann JP. (2012). "Exogenous mineralization of cell-seeded and unseeded collagen–chitosan hydrogels using modified culture medium." Acta Biomaterialia 8(4): 1560-1565.
7. Kim H, Kang DH, Kim M, **Jiao A**, Kim DH, Suh KY. (2012). "Patterning Methods for Polymers in Cell and Tissue Engineering." Annals of Biomedical Engineering 40(6): 1339-1355.
8. **Jiao A**, Rao RR, Kohn DH, Stegemann JP. (2010) "Rapid Mineralization of Cell-Seeded Collagen-Hydroxyapatite Composite Scaffolds via a Biomimetic Process". Transactions of the Society for Biomaterials(35).

Presentations and Posters

9. **Jiao A**, Trosper NE, Tsui J, Murry CE, Kim DH. (2013). In vitro fabrication of scaffold-free skeletal muscle tissue with defined 3D structure using a thermoresponsive, nanotopographically-defined platform. Short talk presented at Biomedical Engineering Society (BMES) 2013 Annual Meeting; September 28; Seattle, WA

10. Trosper N, **Jiao A**, Kim DH. (2013). Nanoengineered PNIPAAm platform combined with microstencil-assisted cell patterning towards cell sheet origami. Poster presentation at Biomedical Engineering Society (BMES) 2013 Annual Meeting; September 27; Seattle, WA
11. **Jiao A**, Lee B, Lee J, Im SG, Kim DH. (2013). Nanopatterned, Scaffold-Free 3D Muscle Patches with Controllable Structure. Poster presented at the ASME 2013 2nd Global Congress on NanoEngineering for Medicine and Biology; February 4; Boston, MA.
12. **Jiao A**, Trosper NE, Carson DS, Murry CE, Kim DH. (2013). Fabrication of Human Stem Cell-Derived, Scaffold-Free, Anisotropic Cardiac Sheets. Short talk presented at Biomedical Engineering Society (BMES) Cellular and Molecular Bioengineering 2013 Conference; January 4; Waimea, HI
13. Rao RR, **Jiao A**, Kohn DH, Stegemann JP. (2011) Mineralization of Cell-Seeded Collagen-Chitosan Matrices using Modified Culture Medium. Poster presented at Tissue Engineering and Regenerative Medicine International Society (TERMIS) 2011 North American Annual Meeting; December 14; Houston TX.
14. Gauthier-Bell K, Britain DM, **Jiao A**, Kim DH. (2011). Novel Nanotopograhically Defined Spatially Organized Co-Culture System for Cardiac Tissue Engineering. Poster presented at UW Summer STEM Undergraduate Research Poster Session; August 17; Seattle, WA.
15. **Jiao A**, Yang HS, Lee HJ, Jiang I, Kim DH. (2011). Nano and Microscale Engineering of Stem Cell Niche Environment and Cardiovascular Therapy. Poster presented at Rushmer Poster Presentations; March 25; Seattle, WA.
16. **Jiao A**, Rao RR, Kohn DH, Stegemann JP. (2010). Rapid Mineralization of Cell-Seeded Collagen-Hydroxyapatite Composite Scaffolds via a Biomimetic Process. Short talk presented at the Society for Biomaterials 2010 Annual Meeting; April 22; Seattle, WA.

Patents

17. Kim DH, Laflamme M, Murry CE, Gupta K, Yoo H, Jiao A, "System and method for engineering muscle tissue," United States Patent, PCT/US2013/032237, filed 03/15/2013.
18. Kim DH, Murry CE, Laflamme M, Jiao A. A device with controlled nanotopography and stiffness for promoting the maturation of stem cell-derived cardiac tissues. U.S. Provisional Patent Application# 61/620,301. Filing Date: 4/4/12
19. Kim DH, Jiao A. A Device for Organized, Aligned, and Patterned Cell Culture Using Polymeric Nano-Patterned Surfaces. U.S. Provisional Patent Application# 61/567,911. Filing Date: 12/7/11

D. Research Support

NIH training Grant T32-HL007312-35
Date: 08/01/13 – 07/31/14
Title: Fabrication of 3D, physiological cardiac tissue for structure-function and disease modeling studies
The goal of this project is to develop a platform for the engineering of 3D cardiac tissues with specific structures using human induced pluripotent stem cells. The fabricated 3D cardiac tissues will be fabricated to study structure-function relationship of both healthy and infarcted cardiac tissues.
Role: Trainee

NIH training Grant T32-EB001650-07
Date: 06/01/11 – 06/01/13
Title: A nanoengineered human cardiac tissue engineering patch for myocardial regeneration
The goal of this project is to improve the maturity of neonatal rat ventricular myocytes and pluripotent stem cell-derived cardimyocytes by utilizing a nanotopographically-defined biodegradable scaffold and electrical field stimulation.
Role: Trainee