BIOGRAPHICAL SKETCH

NAME: Binata Joddar

eRA COMMONS USER NAME (credential, e.g., agency login): bjoddar

POSITION TITLE: Associate Professor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Pune University, India	B.S	Aug/99	Pharmaceutical Sci. and Tech.
Jadavpur University, India	M.S	Aug/01	Biomedical Engineering
Clemson University, SC, USA	Ph.D	Aug/06	Bioengineering
The Ohio State University, OH, USA	Post-Doc Researcher	June/10	Biomedical Engineering
RIKEN Center for Emergent Matter Science (CEMS), Japan	Post-Doctoral fellowship/ scholarship	March/14	Stem Cells, Tissue Engineering, Biomaterials, Nanotechnology

A. Personal Statement

An organ-on-a-chip is a microfluidic cell culture device created with microchip manufacturing methods that contains continuously perfused chambers inhabited by living cells arranged to simulate tissue- and organ-level physiology. By recapitulating the multicellular architectures, tissue-tissue interfaces, physicochemical microenvironments and vascular perfusion of the body, these devices produce levels of tissue and organ functionality not possible with conventional 2D or 3D culture systems. One of my career objectives is to explore the utility of novel biomaterial scaffolds and techniques in combination for making organ-on-a-chip models that will enable high-resolution, real-time imaging and in vitro analysis of biochemical, genetic and metabolic activities of living cells in a functional tissue and organ like environment. I am bioengineer by way of training, and during my PhD years I have worked extensively with hydrogels based biomaterials (e.g. Hyaluronic acid, collagen, elastin, gelatin) for cardiovascular elastin regeneration. My first postdoctoral position at Ohio State exposed me to a wider clinical environment (OSU Ross Heart Hospital) where I worked with an interdisciplinary team of CT-surgeons and biomedical engineers trying to elucidate the mechanisms modulating saphenous vein graft disease after CABG. This experience allowed me to envision applications of biomaterials for cardiac and vascular tissue engineering applications. After this, I received a fellowship to work in the area of stem cells and tissue engineering in RIKEN, Japan, where I gained expertise in culturing stem cells on artificial biomaterial scaffolds. Recent publications stemming from this work are:

1) Alonzo, Matthew, et al. "Hydrogel scaffolds with elasticity-mimicking embryonic substrates promote cardiac cellular network formation." Progress in biomaterials 9.3 (2020): 125-137.
2) Alonzo, Matthew, et al. "A comparative study in the printability of a bioink and 3D models across two bioprinting platforms." Materials Letters 264 (2020): 127382.
3) Anil Kumar, Shweta, et al. "A visible light-cross-linkable, fibrin–gelatin-based bioprinted construct with human cardiomyocytes and fibroblasts." ACS biomaterials science & engineering 5.9 (2019): 4551-4563.
4) AnilKumar, Shweta, et al. "The applicability of furfuryl-gelatin as a novel bioink for tissue engineering applications." Journal of Biomedical Materials Research Part B: Applied Biomaterials 107.2 (2019): 314-323.

B. Positions and Honors

1. Positions/Employment

2020, Sept 1st: Associate Professor of Metallurgy, Materials Science and Biomedical Engineering at the University of Texas at El Paso (UTEP), USA
2014-2020: Assistant Professor at UTEP.

2. Selected Awards/ Honors

2010 Foreign Post-Doctoral Researcher Fellowship at RIKEN, JAPAN
2009 David & Lindsay Morgenthaler Endowed Fellowship (declined) at the Cleveland Clinic Foundation, Cleveland, OH, USA.
2008 Distinguished Post-Doctoral Fellow Award at the Dorothy.M.Davis Heart and Lung Research Institute of Ohio State University, Columbus, OH, USA
2003 Graduate Research Fellowship at Clemson University Bioengineering Department, USA

3. Professional Memberships and other affiliations

PEER REVIEWER
• American Heart association, National Science Foundation.

AFFILIATIONS
• The Tissue Engineering and Regenerative Medicine International Society (TERMIS) (Member)
• The International Society for Stem Cell Research (ISSCR) (Member)
• The American Heart Association (AHA) (Member)
• The Biomedical Engineering Society (BMES), the Whitaker Foundation (Member)
• Japanese Society of Regenerative Medicine (Member)
PROFESSIONAL SERVICE: Ad hoc REVIEWER
• Scientific Reports (Nature)
• Biomaterials
• Acta Biomaterialia
• Tissue engineering
• Tissue Engineering and Regenerative Medicine
• International Journal of Nanomedicine
• Annals of Biomedical Engineering
• Atherosclerosis, Thrombosis and Vascular Biology (ATVB-AHA)
• Journal of Pharmacy and Pharmacology
EDITOR
• Member of the Editorial Board. World Journal of Stem Cells.
• Member of the Editorial Board of Scientific Reports (Nature Publishing): Stem Cells and Development

C. Contributions to Science

1. As part of my doctoral studies at Clemson, I focused my research on the use of biomaterials and scaffolds for reconstructing cell tissue. More specifically, my research has focused on the design of scaffolds for vascular elastin regeneration. Elastin is a natural tissue component that provides ‘elasticity’ and binds tissues together like a glue preventing disease invasion and making tissues resistant to enzymatic degradation in the body. Elastin degrades from tissues with age, or with disease. Once it is lost or degraded it is challenging to regrow. As a result, tissues lose elasticity and become more prone to disease. Therefore, I used biomaterial scaffolds as frames for the regeneration of elastin which has potential applications in replacing damaged veins or arteries. The most important conclusion from these studies was that scaffolds based on hyaluronan (HA), a glycosaminoglycan, may be useful to in regenerating vascular elastin, although these effects appear to be dictated by HA fragment size and/or dose. Specifically, HA oligomers (shorter fragments of HA) were proelastogenic compared to native long chain HA. This finding was novel and resulted in four peer-reviewed publications in a leading journal in the field of Biomaterials as well as the filing of a U.S. patent (Elastogenic cues and methods for using the same. Ramamurthi A., Joddar B., Kothapalli C. US Patent NO. 8,529,951). Other noteworthy publications stemming from this work are as follows:
• A surface-tethered model to assess size-specific effects of hyaluronan (HA) on endothelial cells. Ibrahim S., Joddar B., Craps M. and Ramamurthi A. Biomaterials 2007.

- Impact of delivery mode of hyaluronan oligomers on elastogenic responses of adult vascular smooth muscle cells. Joddar B., Ibrahim S, Ramamurthi A. Biomaterials 2007.
- Fragment size- and dose-specific effects of hyaluronan on matrix synthesis by vascular smooth muscle cells. Joddar B., Ramamurthi A. Biomaterials 2006.
- Elastogenic effects of exogenous hyaluronan oligosaccharides on vascular smooth muscle cells. Joddar B., Ramamurthi A. Biomaterials 2006.

2. By reason of my achievements as a Ph.D. student, in September 2006, I was offered a post-doctoral position at Ohio State University (OSU) in Columbus, Ohio. At OSU I collaborated with a group of cardiothoracic surgeons to continue my research on vascular biology and the use of therapeutic interventions to prevent or treat blood vessel remodeling in vivo. Specifically, my research focused on vascular remodeling that occurs when veins are grafted into the arterial circulation after coronary artery bypass graft surgery in patients. This research will provide many important cues to understand the challenges facing the medical community at large. As an indication of the importance of this research to the medical community, this work was accepted for presentation at the American Heart Association annual scientific meeting in 2008, following which an abstract was published in Circulation. I also received the Distinguished Post-Doctoral Fellow Award at the same time. In addition, this research work has been the basis of an impressive number of articles in peer-reviewed and refereed journals as well as presentations and articles for international conferences in the field of Biomaterials and Biomedical Engineering.
- Arterial levels of oxygen stimulate intimal hyperplasia in human saphenous veins via a ROS-and NOSdependent mechanism. Joddar B., Firstenberg M.S., Reen R.K., Gooch K.J. PLOS One. 2015.
- Protandim inhibits the development of intimal hyperplasia in human saphenous veins ex vivo via a catalase dependant pathway. Joddar B., Reen R.K, Firstenberg Michael.F, Varadharaj Saradhadevi, McCord Joe.M, Zweier Jay.L, Gooch Keith.J. Free Radical Biology of Medicine 2011.
- Arterial pO2 stimulates intimal hyperplasia and serum stimulates inward eutrophic remodeling in porcine saphenous veins cultured ex vivo. Joddar B., Shaffer RJG, Reen RK, Gooch KJ. Biomechanics and Modeling in Mechanobiology 2009.
- Role of oxygen tension and oxidative stress in modulating the development of neointimal hyperplasia in human saphenous veins. Joddar B., Reen.R.K, Firstenberg.M.F, Gooch.K.J. Circulation 2008.

3. In 2010 I attained the prestigious 'Foreign Post-Doctoral Fellowship' (FPR) from the renowned research institute RIKEN in Japan to work with stem cells and regenerative medicine. While working in Tokyo, Japan at RIKEN I collaborated with many scientists in (RIKEN Brain Science Institute) and outside RIKEN (USA, Germany, UK, and Turkey). One of the most productive collaborations was with the Center for Induced Pluripotent stem cells research and application (CiRA) at Kyoto, Japan. This center which was founded by Shinya Yamanaka (Nobel Prize 2012, Physiology and Medicine) wherein I received training to work with induced pluripotent stem cells (iPSC). iPSCs are being claimed to be the game changer for the field of regenerative medicine. They can be differentiated into any kind of body component cells thereby making them an attractive tool to regenerate organs, or tissues lost due to injury or disease in vivo. Integrating the abilities to culture human iPSCs and bioprinting of cells in hydrogels I hope to mimic healthy or diseased tissue-on-a-dish allowing unique avenues for in vitro investigation into complex 3D tissues which is not possible in vivo.
- The significance of membrane fluidity of feeder cell-derived substrates for maintenance of iPS cell stemness. Y Zhou, H Mao, B Joddar, N Umeki, Y Sako, KI Wada, C Nishioka et al. Scientific reports 5, 11386 2015.
- Stem cell culture using cell-derived substrates. Joddar B., Takashi Hoshiba, Guoping Chen, Yoshihiro Ito. Biomaterials Science 2014.
- Sustained release of siRNA from dopamine coated stainless steel surfaces for siRNA-mediated gene silencing. Joddar B., Aydin Albayrak, Jeonghwa Kang, Mizuki Nishihara, Hiroshi Abe and Yoshihiro Ito. Acta Biomaterialia 2013.
- Artificial niche substrates for maintenance of undifferentiated state or promoting differentiation of embryonic and induced pluripotent stem cells. Joddar B. and Yoshihiro Ito. Invited Article. Journal of Biotechnology 2013.

4. Most recently as faculty at UTEP, my lab is utilizing 3D bioprinting to mimic organ-on-a-chip to help explore disease modulation in vitro.
- The efficacy of Graphene-foams for culturing mesenchymal stem cells and differentiation into dopaminergic neurons. N Tasnim, V Thakur, M Chattopadhyay, B Joddar. Stem Cells International. 2018.

- Development of functionalized multi-walled carbon-nanotube-based alginate hydrogels for enabling biomimetic technologies. B Joddar, E Garcia, A Casas, CM Stewart - Scientific Reports, 2016.
- A Bioactive Hydrogel and 3D Printed Polycaprolactone System for Bone Tissue Engineering. I Hernandez, A Kumar, B Joddar. Gels 3 (3), 262. 2017.
- Attenuation of the in vitro neurotoxicity of 316L SS by graphene oxide surface coating. N Tasnim, A Kumar, B Joddar. Materials Science and Engineering: C 73, 788-797, 2017.

D. Additional Information: Research Support and/or Scholastic Performance

Selected awards:

- Futuristic Materials Manufacturing Technology: A NOVEL MICROFLUIDIC-BASED 3D BIOPRINTER FOR PROCESSING OF BIOMATERIALS IN FABRICATION OF TISSUE-ON-A-CHIP MODELS. NSF MRI $369,727. Role: PI. Period: August 2018-2021.
- NIH SC1: DEVELOPMENT AND VALIDATION OF A NOVEL BIOPRINTED, HUMAN-DIABETIC CARDIAC ORGANOID MODEL, $1,203,920. Role: PI. October 2020-2024.
- NSF/CASIS: Collaborative Proposal: ISS: Studying the Effects of Microgravity on 3D Cardiac Organoid Cultures, $259,350. Role: PI. 9/1/2019 to 8/31/2022.
- NSF IRES-I: US-CANADA COLLABORATIVE RESEARCH ON BIOMATERIALS FOR STEM CELL CULTURE AND NEURAL DIFFERENTIATION, $280,066. Role: PI. 9/1/2019 to 8/31/2022.

Completed:

- NIH SCORE SC2 ($437,700). Bio-printing of human iPSC to facilitate their Differentiation, recruitment and strategic assembly to form engineered cardiac patches in vitro. Role: PI. Period: April 2016-2020
- NSF PREM IRG ($20,000). Fabrication of Biomimetic, Shapeable Scaffolds for Thick Tissue Engineering. Role: co-PI. Period: March-December 2018.
- NIH BUILD summer sabbatical ($14000). To explore the effect of substrate stiffness towards human cardiomyocytes in culture.• UTEP COE Interdisciplinary Research funds (6000$) (Goals: To use bio-printing as a tool for transfection of Yamanaka factors into adult fibroblasts to make iPS cells). o Role: PI. Period: May 15-Aug 31, 2015.
- NIH BUILD Pilot Grant (20,000$) (Goals: To use chemically fixed ECM matrices to differentiate human mesenchymal stem cells into vascular phenotypes). Role: PI. Period: ~ Dec 2016
- UTEP COE Interdisciplinary Research funds (14000$) (Goals: Mechanical testing of novel biomaterial hydrogels and thin film coatings for improving biocompatibility of existing materials surfaces) Co-PI: October 2015- August 2016. PI: Calvin Stewart, PhD (Mechanical Engineering).
- NIH BUILD travel award in 2016 (2000$) to B.J to attend and present work at domestic conferences.
- UTEP URI research grant (5000$) Fabrication and characterization of hybrid carbon nanotube-alginate hydrogels for applications in cell therapy and tissue engineering. Role: PI. Period: Jan~ Aug 2016.
- Mini seed grant at Texas Tech University Health Sciences Center ($5500). A Mesenchymal Stem cell based tissue engineered patch to restore normal gastric histology. Role: co-PI. Period: March-August 2017.