

JOSHUA D. HUTCHESON

*Assistant Professor
Biomedical Engineering
Florida International University*

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GENERAL RESEARCH INTERESTS

*Cardiovascular disease and mechanobiology – Cellular mechanisms of disease
Cell-cell and cell-matrix interactions – Cellular interactions in tissue homeostasis
Tissue engineering – Development of engineered tissue substitutes
Molecular imaging – Imaging of cardiovascular tissue remodeling and disease*

PROFESSIONAL EXPERIENCE

Assistant Professor, Florida International University

(August 2016 – Present)

Biomedical Engineering

Postdoctoral Research Fellow, Harvard University Medical School

(September 2012 – August 2016)

Mentor: Dr. Elena Aikawa

Center for Interdisciplinary Cardiovascular Sciences

Cardiovascular Division

Department of Medicine

Brigham and Women's Hospital

EDUCATION

Doctor of Philosophy, Biomedical Engineering, Vanderbilt University, 2012

Dissertation Title: *TGF- β 1 –Induced Calcification of Valvular Myofibroblasts:*

Mechanisms and Therapeutic Strategies

Mentor: Dr. W. David Merryman

Master of Science, Chemical Engineering, Georgia Institute of Technology, 2008

Thesis Title: *Quantification and control of ultrasound-mediated cell death modes*

Mentor: Dr. Mark R. Prausnitz

Bachelor of Science, Chemical and Biomolecular Engineering, Georgia Institute of Technology, 2005

HONORS AND AWARDS

- 2014, Center for Interdisciplinary Cardiovascular Sciences Innovation Award
- 2013, Atherosclerosis, Thrombosis and Vascular Biology (ATVB) Young Investigator Travel Award; \$500 travel stipend given to outstanding abstracts presented at the American Heart Association national scientific sessions
- 2013, North American Vascular Biology Organization (NAVBO) Outstanding Poster Award; \$250 award given based upon judged scoring of poster presentations at the annual NAVBO meeting
- 2010, Pre-doctoral Fellowship, American Heart Association
- 2008, Engineering Scholars Award, University of Alabama at Birmingham
- 2006, GAAN Fellowship, Department of Education
- 2005, President's Undergraduate Research Award, Georgia Institute of Technology

RESEARCH SUPPORT

Pilot Grant, Harvard Catalyst Reactor Program, Completed

Novel mechanism of atherosclerotic plaque rupture: Zooming in on the genesis of microcalcifications

Role: Co-Investigator, PI: Elena Aikawa, 3/1/2014 – 6/30/2015, \$40,000 direct.

Pre-doctoral Fellowship, American Heart Association (10PRE4290020) Completed

Targeted GPCR strategies for the prevention of aortic valve disease

Role: PI, Mentor: W. David Merryman, 7/1/10-6/30/12, \$43,540 direct.

JOURNAL PUBLICATIONS

26. R Krammann, C Goettsch, J Wongboonsin, H Iwata, RK Schneider, C Kuppe, N Kaesler, M Chang-Panesso, F Machado, S Gratwohl, C Vemuri, K Madhurima, **JD Hutcheson**, S Jain, E Aikawa, BD Humphreys, "Adventitial MSC-like cells are progenitors of vascular smooth muscle cells and drive vascular calcification in chronic kidney disease", Accepted, *Cell Stem Cell*, 2016.
25. C Goettsch*, **JD Hutcheson***, S Hagita*, M Rogers, MD Creager, T Pham, J Choi, AK Mlynarchik, MF Kjolby, M Aikawa, E Aikawa, "A single injection of gain-of-function mutant PCSK9 adeno-associated virus vector induces cardiovascular calcification in mice with no genetic modification", In press, *Atherosclerosis*, 2016. ***Equal Contribution**
24. C O'Rourke, G Shelton, **JD Hutcheson**, MF Burke, T Martyn, HR Shakartzi, MD Buswell, RE Tainsh, B Yu, DK Rhee, C Wu, M Derwall, ES Buys, PB Yu,

- KD Bloch, E Aikawa, DB Bloch, R Malhotra, “Calcification of Vascular Smooth Muscle Cells and Imaging of Aortic Calcification and Inflammation”, In press, *Journal of Visualized Experiments*, 2016.
23. JD West, EJ Carrier, NC Bloodworth, AK Schroer, P Chen, LM Ryzhova, S Gladson, S Shay, **JD Hutcheson**, WD Merryman, “Serotonin 2B Receptor Antagonism Prevents Heritable Pulmonary Arterial Hypertension”, *PLoS One*, 11(2):e0148657, 2016.
 22. J Krohn, **JD Hutcheson***, E Martinez-Martinez, WS Irvin, S Bertazzo, CVC Bouten, MP Bendeck, E Aikawa*, “Discoidin Domain Receptor-1 Regulates Calcific Extracellular Vesicle Release in Vascular Smooth Muscle Cell Fibrocalcific Response via TGF- β Signaling”, *Arteriosclerosis, Thrombosis, and Vascular Biology*, 36(3):525-33, 2016. ***Co-corresponding authors**
 21. JL Ruiz, Weinbaum S, Aikawa, E, **JD Hutcheson**, “Zooming in on the genesis of atherosclerotic plaque microcalcifications”, *Journal of Physiology*, 594(11):2915-27, 2016.
 20. **JD Hutcheson**, C Goettsch, S Bertazzo, N Maldonado, JL Ruiz, W Goh, K Yabusaki, T Faits, C Bouten, P Libby, M Aikawa, S Weinbaum, E Aikawa, “High-resolution microscopic visualization of vascular calcification genesis, growth, and association with collagen in atherosclerotic plaques”, *Nature Materials*, 15(3):335-43, 2016.
 19. C Goettsch, **JD Hutcheson**, M Aikawa, A Nykjaer, M Kjolby, M Rogers, T Michel, M Shibasaki, DJ Rader, P Libby, SA Singh, E Aikawa, “Sortilin mediates vascular calcification via its recruitment into extracellular vesicles”, *Journal of Clinical Investigation*, 126(4):1323-36, 2016.
 18. J Hjortnaes, C Goettsch, **JD Hutcheson**, G Camci-Unal, L Lax, K Scherer, FJ Schoen, J Kluin, A Khademhosseini, E Aikawa, “Simulating Early Calcific Aortic Valve Disease within a 3D Heart Valve-like Construct: A Role for Myofibroblast Differentiation”, *Journal of Molecular and Cellular Cardiology*, 94:13-20, 2016.
 17. **JD Hutcheson**, C Goettsch, MA Rogers, E Aikawa, “Revisiting Cardiovascular Calcification: A Multifaceted Disease Requiring a Multidisciplinary Approach”, Invited Review, *Seminars in Cell and Developmental Biology*, 46:68-77, 2015.
 16. J Hjortnaes, K Shapero, C Goettsch, **JD Hutcheson**, J Keegan, J Kluin, JE Mayer, J Bischoff, E Aikawa, “Valvular Interstitial Cells Suppress Calcification of Valvular Endothelial Cells”, *Atherosclerosis*, 242(1): 251-260, 2015.
 15. J Ruiz, **JD Hutcheson**, E Aikawa, “Cardiovascular Calcification: Current Controversies and Novel Concepts”, Invited Review, *Cardiovascular Pathology*, 10(7), 2015.

14. **JD Hutcheson**, C Goettsch, T Pham, M Aikawa, SA Singh, E Aikawa, “Enrichment of calcifying extracellular vesicles using density-based ultracentrifugation protocol”, *Journal of Extracellular Vesicles*, Dec 5;3:25129, 2014.
13. **JD Hutcheson**, N Maldonado, E Aikawa, “Small entities with large impact: microcalcifications and atherosclerotic plaque vulnerability”, *Current Opinion in Lipidology*, 25(5):327-32, 2014.
12. J Hjortnaes, G Camci-Unal, **JD Hutcheson**, SM Jung, FJ Schoen, J Kluin, E Aikawa, A Khademhosseini, “Directing Valvular Interstitial Cell Myofibroblast-Like Differentiation in a Hybrid Hydrogel Platform”, *Advanced Healthcare Materials*, 4(1): 121-130, 2015.
11. **JD Hutcheson**, E Aikawa, WD Merryman, “Potential drug targets for calcific aortic valve disease”, *Nature Reviews Cardiology*, 11(4): 218-31, 2014.
10. E Aikawa, C Gardiner, **JD Hutcheson**, T Ochiya, X Osteikoetxea, M Pegtel, M Piper, P Quesenberry, RM Schiffelers, TG SZABo, and EI Buzas, “International Society for Extracellular Vesicles: Second Annual Meeting, 12-20 April 2013, Boston, MA (ISEV 2013)”, *Journal of Extracellular Vesicles* 2: 23070-23089, 2013.
9. C Goettsch, **JD Hutcheson**, and E Aikawa, “MicroRNA in cardiovascular calcification: Focus on targets and extracellular vesicle delivery mechanisms”, *Circulation Research* 112(7): 1073-84, 2013.
8. **JD Hutcheson**, J Chen, MK Sewell-Loftin, LM Ryzhova, CI Fisher, YR Su, WD Merryman, “Cadherin-11 regulates cell-cell tension necessary for calcific nodule formation by valvular myofibroblasts”, *Arteriosclerosis, Thrombosis, and Vascular Biology*, Vol. 33(1): 114-20, 2013.
7. **JD Hutcheson**, L Ryzhova, V Setola, and WD Merryman, “5-HT_{2B} antagonism arrests non-canonical TGF- β 1-induced myofibroblast differentiation”, *Journal of Molecular and Cellular Cardiology* 53(5): 707-714, 2012.
6. **JD Hutcheson**, R Venkataraman, FJ Baudenbacher, and WD Merryman, “Intracellular Ca²⁺ accumulation is strain-dependent and correlates with apoptosis in aortic valve fibroblasts”, *Journal of Biomechanics* 45(5): 888-894, 2012.
5. **JD Hutcheson**, V Setola, BL Roth, and WD Merryman, “Serotonin Receptors and Heart Valve Disease—It Was Meant 2B”, *Pharmacology & Therapeutics* 132(2): 146-157, 2011.
4. SO Choi, YC Kim, JH Park, **JD Hutcheson**, HS Gill, YK Yoon, MR Prausnitz, MG Allen, “An electrically active microneedle array for electroporation”, *Biomedical Microdevices* 12(2): 263-273, 2010.

3. **JD Hutcheson**, RK Schlicher, HK Hicks, and MR Prausnitz, "Saving cells from ultrasound-induced apoptosis: quantification of cell death and uptake following sonication and effects of targeted calcium chelation", *Ultrasound in Medicine and Biology* 36(6): 1008-1021, 2010.
2. RK Schlicher, **JD Hutcheson**, RP Apkarian and MR Prausnitz, "Changes in cell morphology due to plasma membrane wounding", *Ultrasound in Medicine and Biology* 36(4): 677-692, 2010.
1. PP Kamaev, **JD Hutcheson**, M Wilson, and MR Prausnitz, "Quantification of optison bubble size and lifetime during sonication dominant role of secondary cavitation bubbles causing acoustic bioeffects", *Journal of the Acoustical Society of America*. 115: 1818-1825, 2004.

BOOK CHAPTERS

4. **JD Hutcheson** and E Aikawa, *Pathobiology and optical imaging of calcific aortic valve disease*, *Cardiovascular Imaging - Arterial and Aortic Valve Inflammation and Calcification* ed. by Elena Aikawa, Springer, 2015.
3. **JD Hutcheson** and E Aikawa, *Optical Molecular Imaging of Inflammation and Calcification in Atherosclerosis*, *Cardiovascular Imaging - Arterial and Aortic Valve Inflammation and Calcification* ed. by Elena Aikawa, Springer, 2015.
2. **JD Hutcheson** and E Aikawa, *Valvular Heart Disease, Pathobiology of Human Disease* ed. by Linda M. McManus and Richard N. Mitchell, Elsevier, 2014.
1. **JD Hutcheson**, MP Nilo, and WD Merryman, *Mechanobiology of Heart Valves*, *Mechanobiology Handbook* ed. by Jiro Nagatomi, CRC Press, 2011.

CONFERENCE PODIUM PRESENTATIONS

* indicates presenter

13. J Krohn, **JD Hutcheson***, E Martinez-Martinez, CVC Bouten, MP Bendeck, E Aikawa. "Discoidin Domain Receptor-1: A Novel Molecular Switch Regulating Fibrocalcific Response in Vascular Smooth Muscle Cells." **Russell Ross Memorial Lecture**, AHA Scientific Sessions, Orlando, Florida, 2015
12. **JD Hutcheson***, C Goettsch, S Bertazzo, N Maldonado, P Ricchiuto, R Driessen, C Bouten, M Aikawa, and E Aikawa. "Plaque-destabilizing microcalcifications: Novel insights into atherosclerotic plaque vulnerability." Podium presentation, ISACB Conference, Cleveland, Ohio, 2014
11. **JD Hutcheson*** and WD Merryman. "Calcium Accumulation in Strained Aortic Valve Interstitial Cells." Podium presentation, BMES Conference 2010

10. **JD Hutcheson*** and WD Merryman. “Serotonin antagonists prevent cytokine and mechanical activation of aortic valve interstitial cells.” Podium presentation, Proceeding in Bioengineering (ASME), Naples, FL (6/2010)
9. WD Merryman* and **JD Hutcheson**. “Controlling the mechanical myofibroblast via Src: A potential drug discovery platform.” Podium presentation, Proceeding in Bioengineering (ASME), Naples, FL (6/2010)
8. WD Merryman* and **JD Hutcheson**. “5-HT_{2b} antagonist prevents TGF-beta₁-mediated activation of AVICs, potentially via Src tyrosine kinase.” Podium presentation, Biennial Heart Valve Meeting, Hilton Head Island, South Carolina. March 7-10, 2010.
7. **JD Hutcheson*** and WD Merryman. “5-HT_{2B} Antagonist Prevents TGF-β₁-mediated Myofibroblast Activation.” Podium presentation, BMES Conference 2009
6. WD Merryman* and **JD Hutcheson**. “Preventing Transforming Growth Factor - Beta₁ Signaling In Aortic Valve Interstitial Cells With Serotonin Antagonists.” Podium presentation, Biennial Meeting of the Society of Heart Valve Disease, Berlin, Germany. June 27-30, 2009.
5. RK Schlicher*, **JD Hutcheson**, DM Hallow, RP Apkarian and MR Prausnitz “Identifying and controlling acoustic bioeffects,” Podium presentation, 157th Meeting of the Acoustical Society of America, Portland, OR (5/09)
4. RK Schlicher*, **JD Hutcheson**, DM Hallow, MR Prausnitz. “Identifying and Controlling Acoustic Bioeffects,” Podium presentation, Acoustical Society of America Meeting (April 2009)
3. YC Kim*, SO Choi, **JD Hutcheson**, MG Allen, MR Prausnitz. “A Polymeric Electroporation Microneedle Array for Minimally Invasive and Highly Localized Electrotherapy and Electrochemotherapy.” Podium presentation, AIChE Conference 2008.
2. **JD Hutcheson***, RK Schlicher, MR Prausnitz. “Ultrasound-Mediated Cell Death,” Podium presentation, American Institute of Chemical Engineers Southern Regional Conference (Spring 2005)
1. PP Kamaev*, **JD Hutcheson**, ML Wilson, and MR Prausnitz. “Acoustic cavitation activity and bubble lifetime as markers for ultrasound’s bioeffects”. Podium presentation, Biomedical Engineering Society Meeting, Nashville, TN, USA. October 1-4, 2003.

INVITED TALKS

* indicates presenter

6. **JD Hutcheson***, C Goettsch, and E Aikawa. “A High Resolution Analysis of Matrix Vesicle-Derived Destabilizing Microcalcifications in Thinning Atherosclerotic Caps” Invited talk, The Physiological Society: Physiology 2015, Cardiff, Wales, July 2015
5. **JD Hutcheson***, C Goettsch, and E Aikawa. “Collagen density regulates matrix vesicle-induced nucleation of microcalcifications: insights into atherosclerotic plaque vulnerability” Invited talk, Microvesicles and Exosomes Seminar Series, Boston, MA, September 2014
4. **JD Hutcheson***, C Goettsch, and E Aikawa. “The role of inflammation on the formation of microcalcifications in the vessel wall” Invited talk, World Congress of Biomechanics, Boston, MA, July 2014
3. **JD Hutcheson*** and E Aikawa. “The role of matrix vesicle-derived microcalcification in plaque rupture” Invited talk, Brigham Research Institute, Cardiovascular disease, diabetes and metabolic disorders seminar, Brigham and Women’s Hospital, Boston, MA, September 25, 2013
2. **JD Hutcheson***, L Ryzhova, V Setola and WD Merryman. “5-HT2B antagonism arrests non-canonical TGF- β 1-induced myofibroblast differentiation” Invited talk, Center for Interdisciplinary Cardiovascular Sciences, Brigham and Women’s Hospital, Boston, MA, May 4, 2012
1. **JD Hutcheson***, V Setola, BL Roth, and WD Merryman. “Antagonism of the 5-HT2B receptor prevents TGF-beta1 effects in aortic valve fibroblasts.” Invited Presentation. Presenter, Cardiovascular Biology Session, Experimental Biology Conference. April 2011.

Conference Sessions Chaired

Session on Cell Mechanics, PhD Student Paper Competition, World Congress of Biomechanics, July 7, 2014.

PATENTS

U.S. Provisional Patent Application, Serial No. BWH 23092, filed September, 23, 2014, entitled “Mitochondrial Phosphate Carrier Targets for Calcification Therapy”.

U.S. Provisional Patent Application, Serial No. BWH 22528, filed November, 15, 2013, entitled “System and method for imaging of matrix vesicle calcification”.

U.S. Provisional Patent Application Serial No. 61/640,240, filed April 30, 2012, entitled “Compositions and methods for treating or preventing fibrosis”.

PROFESSIONAL MEMBERSHIPS

International Society of Applied Cardiovascular Biology (**Outreach Committee Member**, Spring 2014 – Present); American Heart Association (Member, Summer 2013 – Present); North American Vascular Biology Organization (Member, Fall 2013 – Present); Biomedical Engineering Society (Member, Fall 2010 – Fall 2012); American Association for the Advancement of Science (Member, Fall 2008 – Fall 2010); Association of Chemical Engineering Graduate Students (GT Chapter) (Member, Fall 2006 – Summer 2008, **Vice President**, Summer 2007 – Spring 2008); American Institute of Chemical Engineers (Member, Spring 2003 – Fall 2005)

STUDENTS MENTORED

Holly K. Hicks, BS, Georgia Tech undergraduate in Prausnitz Lab 2006-2007
Phillip H. Yun, BS, High school summer student in Prausnitz Lab 2006
Aria Behrouzi, BS, N.C. State undergraduate visiting Prausnitz Lab 2007
Boris Simmons, BS, UAB undergraduate in Merryman Lab 2008-2009
Travis Meyer, BS, Vanderbilt Undergraduate in Merryman Lab 2010
Corey Peak, BS, Vanderbilt Undergraduate in Merryman Lab 2010
Chelsea Stowell, BS, Vanderbilt Undergraduate in Merryman Lab 2010-2011
Stephanie C. Preston, BS, Vanderbilt Undergraduate in Merryman Lab 2011-2012
Michael J. Duplessis, M.S., High school teacher visiting Merryman Lab 2010, 2011, 2012

TEACHING EXPERIENCE

- Biomedical Engineering Graduate Mass Transport
Guest Lecturer for W. David Merryman, PhD (Spring 2012)
- Biomedical Engineering Graduate Mass Transport
Guest Lecturer for W. David Merryman, PhD (Spring 2011)
- Biomedical Engineering Undergraduate Mass Transport
Guest Lecturer for W. David Merryman, PhD (Fall 2008)
- Chemical Engineering Undergraduate Process Control Laboratory
Teaching Assistant for Larry J. Forney, PhD (Spring 2008)
- Chemical Engineering Undergraduate Senior Design
Teaching Assistant for Jim Frederick, PhD (Summer 2007)
- Chemical Engineering Undergraduate Chemical Reactor Design
Guest Lecturer for Pradeep K. Agrawal, PhD (Summer 2007)