

CURRICULUM VITAE

Kathryn M. Rafferty, Ph.D., M.E.

Contact Information

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Education:

Georgia Institute of Technology and Emory University School of Medicine, 2003-2008

Ph.D., Biomedical Engineering

University of Florida, 2001-2003

M.E., Biomedical Engineering

University of Florida, 1997-2001

B.S., cum laude, Engineering Sciences with minor in Biomechanics

Professional Experience:

University of Nevada Las Vegas, School of Life Sciences

- Associate Professor in Residence, July 2022- present
- Assistant Professor in Residence, Jan 2015- May 2022

Courses taught:

Biol 189 Fundamentals of Life Sciences
Biol 190A Introduction to Cell and Molecular Biology
Biol 300 Genetics
Biol 453 Immunology
Biol 463 Genetics of Human Disease
Biol 492 Academic Internship
Biol 702 Graduate Student Core Course

University of Cincinnati, Department of Biological Sciences

- Assistant Professor Educator, Jan 2012-Dec 2014
- Adjunct Assistant Professor, 2010-2012

Courses Taught:

Biol 2081C Genetics and Cell Biology
Biol 4091C Biotechnology Methods
Biol 301 Cell Structure and Function

Cincinnati Children's Hospital Medical Center, Heart Institute: Molecular Cardiovascular Biology

- Postdoctoral Research Fellow, Laboratory of Jeffrey Towbin, M.D., 2010-2012
- Emory University School of Medicine, Department of Biomedical Engineering
- Postdoctoral Research Fellow, Laboratory of Michael Davis, Ph.D., 2008-2010

GRANTS, AWARDS, and RECOGNITION:

Current:

- Co-PI on NSF S-STEM #2221635, “Strengthening the Skill and the Will to Succeed in STEM.” \$1,499,136; Oct 2022 – Sep 2028.
- Co-PI on NSF S-STEM #1742185, “Developing the Skill and the Will to Succeed in STEM.” \$649,407; Feb 2018 – Dec 2023.

2021:

- UNLV Foundation 2021 Distinguished Teaching Award
- Featured as A Woman in STEM by Senator Jacky Rosen

2020:

- Outstanding Undergraduate Research Mentor. Sponsor: UNLV Office of Undergraduate Research, Award Date: November 2020
- Keynote Speaker, UNLV Virtual Undergraduate Research Symposium, November 2020

2019:

- Outstanding Undergraduate Research Mentor. Sponsor: UNLV Office of Undergraduate Research, Award Date: November 2019
- Faculty Mini-Grant, “Does public presentation of course-based research projects improve student effort and project quality?” Sponsor: UNLV Office of Academic Assessment, Award date: November 27, 2019, Amount: \$384

Early Career:

- Postdoctoral Fellowship, American Heart Association Greater Southeast Affiliate, 4 year stipend
- Predoctoral Fellowship, American Heart Association Greater Southeast Affiliate, 4 year stipend
- Gandy/Diaz Teaching Assistant Fellowship, Georgia Institute of Technology, Atlanta, Georgia

SERVICE ACTIVITIES:

Ongoing:

- Founding Committee, Interdisciplinary Science Writing Minor (Summer 2022--)
- BIOL 463 Undergraduate Research Advisor, 96 students presented at the UNLV Undergraduate Research Symposium
- Academic Internship Coordinator (BIOL 492), 12 students placed in internships
- Reviewer, Spectra Undergraduate Research Journal
- Judge, UNLV Undergraduate Research Symposium (Fall 2019, Fall 2020, Spring 2021, Fall 2022, Spring 2023)
- School of Life Sciences, Undergraduate Program Coordinator, July 2018- present
- Grant Reviewer for NSF EPCoR Undergraduate Research Program (2017--)
- Faculty Instructor for Biol 702 (Fall 2018, 2019, 2020)
- Faculty Advisor, BIOS (August 2019--)
- Faculty Advisor, UNLV HOSA Student Organization (May 2018--)
- UNLV Creates Faculty Participant (Fall 2018, Fall 2019--)
- Interviewer, UNLV School of Medicine (2016--)

2023:

- Faculty Presenter at Rebel Ready Week August 23-26
- Workshop Organizer and Presenter at Rebel Preview, Adventures in Life Sciences & Geoscience April 22
- Organizer, Life Sciences Career Panel, April 21

- Mentor in Office of Undergraduate Research High School Program (REF), February

2022:

- Biol 300 Principles of Genetics Course Director (Fall 2021-Spring 2022)
- Master's Degree Thesis Committee, Richard Van, Life Sciences (2020-2022)
- Invited Presenter, UNLV Grad Academy, Research Poster Design Workshops
- Organized the 1st Life Sciences Career Panel on April 22 in collaboration with the College of Sciences

2021:

- Judge, 23rd Annual Graduate & Professional Student Association Research Forum, April
- Faculty Presenter, UNLV OUR Bridge Program, February
- Judge, Beal Bank USA Science Fair, March
- Judge, Trinity International School Science Fair, April

2019:

- SISTEM Faculty Mentor, April 3, 2019
- Rebel GradSlam Judge, October 29, 2019
- Member, Comprehensive Exam Committee, Chrisabelle Mefferd

2018:

- Member, Comprehensive Exam Committee, Joshua Sackett and Joy Imak

2017:

- Executive Leadership Committee, Go Red for Women, an American Heart Association Initiative (2017-2021)
- Member Personnel Committee, School of Life Sciences, 2017-2018

2016:

- **Faculty Senate** Priorities & New Program Committee (Elected), 2016-2019

2015:

- Member Academic Assessment Committee, UNLV School of Life Sciences. 2015-2017

PROFESSIONAL DEVELOPMENT ACTIVITIES

2022:

- Distinguished Poster Presentation and Panelist, "Toward Building Science Literacy," UNLV Best Teaching Practices Expo

2021:

- NTT Promotion 2.0: Best Practices for Portfolio Preparation, April 2021 (attendee)
- First Day Online Spring 2021. UNLV Office of Online Education, January 2021 (attendee)

2020:

- Teaching and Learning in the Diverse Classroom. Host: Cornell University. edX issued Certificate: April 2
- Clear Rubrics & Effective use of Gradebook Training Cohort. Host: UNLV Office of Online Education, August
- Making Meaningful Discussions Training Cohort. Host: UNLV Office of Online Education, July
- REMOTE: The Connected Faculty Summit, July 14-15

2019:

- DIY Fridays: How to make your own introduction videos. Host: UNLV Office of Online Education

Inclusive Practice Workshop. Host: College of Sciences, September

2018:

- Teaching for Retention Workshop Participant, UNLV Office of Faculty Development and Research and Office of The Provost, (2018-2019)
- Presenter with Honorable Mention, “Working Groups as a Classroom Management Style.” UNLV Best Teaching Practices Expo, Jan 18
- Presenter, “Working Groups as a Classroom Management Style.” Intermountain Teaching for Learning Conference, March 2-3, Boulder City, NV.

2017:

- How to Write Effective Letters of Recommendation. UNLV Office of Undergraduate Research, October, 2017.

2015:

- Presenter, UNLV Faculty Development Symposium: Promoting Learning and Completion in Degree Programs and the Classroom, University of Nevada Las Vegas, April 10.

2014:

- Presenter, Variations on the Flipped Classroom, Center for the Enhancement of Teaching and Learning, University of Cincinnati, October 28
- Faculty Senate Academic Affairs Committee (Elected), 2014-2016 term, University of Cincinnati.
- Planning Committee, University of Cincinnati Biological Sciences Department High School Outreach Symposium.
- Nominated as Outstanding Faculty Mentor by an undergraduate recipient of the Darwin T. Turner Scholarship.
- Steering Committee and Presenter, 3T: Teaching, Technology, and Techniques Conference, Clermont College, University of Cincinnati, March 8, 2014.

2013:

- Moderator, 3T: Teaching, Technology, and Techniques Conference, Clermont College, University of Cincinnati, March 9, 2013.

2012:

- Faculty Development Council Pilot Group: Formative Peer Review of Teaching, University of Cincinnati.
- Women in Science and Engineering (WISE) Faculty Mentor, University of Cincinnati. Study Title: Attitude and Self-Confidence May Predict Student Success in Science Classes.

MEMBERSHIPS:

- Member, American Education Research Association (2021--)
- Member, Society for the Advancement of Biology Education Research (2018--)
- Member, American Association for the Advancement of Science. (2016--)

TEACHING EXPERIENCE:

BIOL 463 Genetics of Human Disease (previously 473 Molecular Basis of Human Disease), University of Nevada Las Vegas

This course responds to student requests for courses that connect genetics and genomics to practical use in clinical medicine, public health, and medical research. Students investigate the mechanisms by which gene and genome variations change cell RNA & protein production, biochemistry, and function, resulting in human disease and disorders. The course is fully problem-based learning in teams. The course capstone is a research project consisting of a timeline of genetic disease that is presented at the Undergraduate Research Symposium. 96 undergraduates students have presented at the Symposium through enrollment in this course.

BIOL 453 Immunology, University of Nevada Las Vegas

Redesigned this course to include daily learning objectives and problem solving. Comparing this instructional method to a section taught concurrently using traditional lecture showed that students provided in-class work time had significantly higher positive perceptions about the course, their own interest and perceived competence in science, and comfort in the class environment.

BIOL 300/304 Molecular Genetics, University of Nevada Las Vegas

This course surveys the components of a genome and the molecular mechanisms that decode DNA into RNA or protein. In my redesign, I implemented weekly graded quizzes and group-based problem solving. I also have incorporated Science Literacy Training for student to build confidence approaching scientific literature.

BIOL 190A (previously Bio 196) Cell and Molecular Biology, University of Nevada Las Vegas

Participated in a departmental redesign of this majors introductory biology class to include in-class problem solving, concept mapping of every chapter, and learning strategy training. Student interaction with the Blackboard LMS is analyzed to intervene with low-performing students and promote their ultimate success in the course.

BIOL 189 Introduction to the Fundamentals of Life Sciences, University of Nevada Las Vegas

Implemented quality-over-quantity teaching by covering only the most essential concepts within the context of an engaging and relevant story. Also prioritized student interaction with concepts by dedicating 15 minutes of every class to completion and discussion of an in-class quiz.

BIOL 730A Graduate Student Core Course, University of Nevada Las Vegas

Developed 2 components for this graduate student “boot camp.” 1) Lectures on what motivates students to learn and how these motivations must inform the instructional practices that teachers choose to implement. 2) Best practices in making and presenting research in podium and poster presentations.

BIOL 2081C Genetics and Cell Biology, University of Cincinnati

Developed an active learning curriculum, including class pre-work, daily learning objectives, and weekly assessment quizzes. Case studies, scientific literature, and data analysis were employed consistently to maximize student interaction with real world science. Also managed and developed laboratory activities for this large enrollment course (300+ students in 12-16 lab sections/semester).

BIOL 4091C Biotechnology Methods, University of Cincinnati

Developed the curriculum an upper level laboratory course that met an industry partner need for new hires skilled in modern biotech methods. Skills taught include aseptic technique, mammalian cell culture, Western Blotting, DNA harvest, and DNA sequencing and SNP analysis.

ABSTRACTS PRESENTED:

Bernacki ML, Coliano MC, Utz J, Strong C, Rafferty K, Hilpert JC. Optimizing Student Participation in and Benefit From Brief, Digital Learning Skills Training. In: American Education Research Association Annual Meeting, April 24-27, 2022. San Diego, CA.

Rafferty KM and Bloomfield E. Working Groups as a Classroom Management Style. Intermountain Teaching for Learning Conference. Nevada State College, March 1-2, 2018

Rafferty KM, Kranias EG, Purevjav E, Towbin JA. Nebulette mutations augment cardiomyocyte calcium signaling in preclinical inherited dilated cardiomyopathy. Pediatric Academic Society Annual Meeting, Denver, Colorado, April 30-May 3, 2011.

Maiellaro-Rafferty K, Seshadri G, Slugg A, Davis ME. Oxidative Stress Regulates Cardiac Stem Cell Differentiation in a MicroRNA-Mediated Mechanism. AHA Scientific Sessions, Orlando, Florida, November 14-18, 2009.

Maiellaro-Rafferty K, Slugg A, Davis ME. Regulation of Cardiac Stem Cell Differentiation by Hydrogen Peroxide in a MicroRNA-Mediated Mechanism. Basic Cardiovascular Sciences Conference, Lake Las Vegas, Nevada, July 20-23, 2009.

Maiellaro KA, Taylor WR. Medial H₂O₂ scavenging Promotes Matrix Events that Prevent Abdominal Aortic Aneurysm. 1st Annual Frontiers in Pharmacology Graduate Symposium, Atlanta, Georgia, May 31, 2008.

Maiellaro KA, Taylor WR. Biomechanics of Early Abdominal Aortic Aneurysm Formation. 13th Annual Emory Department of Medicine Cardiology Research Symposium, June 8, 2007.

Maiellaro KA, Taylor WR, Biomechanical and Molecular Mechanisms of Early Abdominal Aortic Aneurysm Formation. Arteriosclerosis, Thrombosis, and Vascular Biology X, Chicago, Illinois, April 24-28, 2007.

Maiellaro KA, Taylor WR, Molecular Mechanisms of Early Abdominal Aortic Aneurysm Formation. Medical College of Georgia and Emory School of Medicine Graduate Research Symposium, Atlanta, Georgia. January 23, 2007.

Maiellaro KA, Tran-Son-Tay R. Microfabricated Silicon Microchannels for Cell Deformation Study. Summer Bioengineering Conference, Key Biscayne, Florida, June 27-30, 2003.

PUBLICATIONS:

Maiellaro-Rafferty K, Wansapura JP, Mendsaikhan U, Osinska H, James JF, Taylor MD, Robbins J, Kranias EG, Towbin JA, Purevjav E. Altered regional cardiac wall mechanics are

associated with differential cardiomyocyte calcium handling due to nebullette mutations. *J Mol Cell Cardiol.* 60:151-60, 2013.

Pendergrass KD, Boopathy AV, Seshadri G, Maiellaro-Rafferty K, Brown M, Davis ME. Acute Preconditioning of Cardiac Progenitor Cells with Hydrogen Peroxide Enhances Angiogenic Pathways Following Ischemia-Reperfusion Injury. *Stem Cells and Development*, 22(17):2414-24, 2013.

Washington E, O'Donnel R, Maiellaro-Rafferty K, Weiss D, Joseph G, Wan W, Gleason RL, Taylor WR. The Role of Lysyl Oxidase Family Members in the Stabilization of Abdominal Aortic Aneurysms. *AJP: Heart and Circ Phys*, 303(8):H1067-75, 2012.

Maiellaro-Rafferty K, Weiss D, Joseph G, Wan W, Gleason RL, Taylor WR. Catalase overexpression in aortic smooth muscle prevents pathological mechanical changes underlying abdominal aortic aneurysm formation. *AJP: Heart and Circ Phys*, 301(2):H355-62, 2011.

Willett NJ, Long RC Jr, Maiellaro-Rafferty K, Sutliff RL, Schafer R, Oshinski JN, Giddens DP, Guldberg RE, Taylor WR. An In Vivo Murine Model of Low-Magnitude Oscillatory Wall Shear Stress to Address the Molecular Mechanisms of Mechanotransduction--brief report. *Arteriosclerosis, Thrombosis, and Vascular Biology.* 30(11):2099-102, 2010.

Pendergrass KD, Varghese ST, Maiellaro-Rafferty K, Brown ME, Taylor WR, Davis ME. Temporal Effects of Catalase Overexpression on healing following myocardial infarction. *Circulation Heart Failure.* 4(1):98-106, 2010.

Maiellaro KA and Taylor WR. The Role of the Adventitia in Vascular Inflammation. *Cardiovascular Research.* 75:640-648, 2007.

RESEARCH EXPERIENCE:

Postdoctoral fellow in the laboratory of Jeffrey A. Towbin, M.D., The Heart Institute: Molecular Cardiovascular Biology, Cincinnati Children's Hospital Medical Center, 02/2010-02/2012

Postdoctoral research on the mechanism by which inherited mutations in cardiac Z-disc proteins lead to dilated cardiomyopathy (DCM). The goals of the research were to determine differences in both functional mechanics and molecular signaling in cardiomyocytes from nontransgenic and transgenic mice with the mutated sarcomeric protein nebullette. Data showed that DCM pathogenesis in transgenic mice begins with enhanced phosphorylation of the troponin complex, which is unexpectedly uncoupled to cardiomyocyte relaxation rate. These data provided a link between troponin phosphorylation status and cellular mechanical dysfunction.

Postdoctoral fellow in the laboratory of Michael E. Davis, Ph.D., Biomedical Engineering, Emory University School of Medicine, 08/08-01/2010

Postdoctoral research on the redox regulation of adult-derived cardiac progenitor cell differentiation (CPCs). A major lab objective was to engineer CPCs to differentiate into functional cells after myocardial infarction. The goals of this research were first, to determine how H₂O₂ effects CPC differentiation, and second, to reverse the harmful effects of H₂O₂ to promote CPC differentiation in a redox environment. To answer this question,

stem cells from the adult rat heart were treated with H₂O₂ and analyzed for specific cellular factors that promote CPC differentiation into functional cells. Data showed that H₂O₂ inhibits CPC differentiation in microRNA-mediated mechanism.

Graduate student in the laboratory of W. Robert Taylor, M.D., Ph.D. (Director, Division of Cardiology), **Biomedical Engineering, Georgia Tech and Emory University School of Medicine** 08/2003-08/2008

Dissertation research focused on defining the mechanics and biology of established aneurysms. Specific interest was how oxidative stress leads to the remodeling of the vessel matrix. My work suggested that oxidative stress potentiates vessel dilation by increasing elastin fragmentation and altering strain distribution across the aortic wall.

Graduate student in the laboratory of Roger Tran-Son-Tay, Ph.D., Biomedical Engineering, University of Florida, 05/2001-08/2003

Masters research focused on the development of silicon microfabricated flow channels for the overall lab objective to study cell deformability, migration, and relaxation. I designed geometry, fabrication protocol, and packaging set-up for a functional microchannel system.