DR. ELIZABETH A. LIPKE

Mary and John H. Sanders Associate Professor
Department of Chemical Engineering, Auburn University

EDUCATION

Ph.D.	Rice University, Department of Chemical and Biomolecular Engineering (2005)
B.S.	Johns Hopkins University, Department of Biomedical Engineering (2000)

SELECTED HONORS AND AWARDS

2015	3M Non-tenured Faculty Award
2015	Provost's Award for Faculty Excellence in Fostering Undergraduate Research and Creative Scholarship
2015	William F. Walker Merit Teaching Award
2014	National Academy of Engineering US Frontiers of Engineering Symposium
2014	Auburn Alumni Engineering Council Junior Faculty Research Award
2014	National Academy of Engineering US Frontiers of Engineering Education Symposium
2014	The Mark A. Spencer Creative Mentorship Award
2012	CAREER Award – National Science Foundation
2012	Auburn University Outstanding Graduate Mentor
2001-2003	NSF Integrative Graduate Engineering Research Training Fellowship
1998	Johns Hopkins University Provost Undergraduate Research Award

RECENT PUBLICATIONS (180+ CITATIONS)

1. Kerscher P, Kaczmarek JA, Head SE, Brazel M, Seeto W, Bhattacharya S, Kim J, Suppiramaniam V and Lipke EA. Direct Production of Human Cardiac Tissues by Pluripotent Stem Cell Encapsulation in Gelatin Methacryloyl. ACS Biomaterials Science & Engineering. 2016. In press.
2. S Pradhan, JM Clary, D Seliktar, EA Lipke. Biomaterials. A three dimensional spheroidal cancer model based on PEG-fibrinogen hydrogel microspheres. Accepted.
3. Pradhan S, Hassani I, Seeto WJ and Lipke EA. PEG-fibrinogen Hydrogels for Three-dimensional Breast Cancer Cell Culture. Journal of Biomedical Materials Research Part A. 2016. Accepted, online.
4. S Pradhan, I Hassani, JM Clary, EA Lipke. Polymeric Biomaterials for in vitro Cancer Tissue Engineering and Drug Testing Applications. Tissue Eng Part B Rev. 2016. In press.
5. P Kerscher, IC Turnbull, AJ Hodge, J Kim, D Seliktar, CJ Easley, KD Costa, EA Lipke. Direct Hydrogel Encapsulation of Pluripotent Stem Cells Enables Ontomimetic Differentiation, Growth and Maturation of Engineered Human Heart Tissues. Biomaterials. 83: 383-95 (2016). DOI: 10.1016/j.biomaterials.2015.12.011
6. AJ Hodge, J Zhong, EA Lipke. Maturation of Stem Cell-derived Cardiomyocytes Mediated by Soluble Nitric Oxide. Biotechnology and Bioengineering. 113(4):882-94 (2016). DOI: 10.1002/bit.25849
7. A Sharpe#, WJ Seeto#, BB DeWitt, SA Hashimi, DD Schwartz, EA Lipke, AA Wooldridge. Isolation of endothelial colony forming cells from peripheral blood samples collected from two sites in healthy, adult horses. American Journal of Veterinary Research. 77(10): 1157-1165 (2016). DOI: 10.2460/ajvr.77.10.1157
8. B Spearman#, AJ Hodge#, J Porter, JG Hardy, X Zhang, CE Schmidt, MC Hamilton, EA Lipke. Conductive interpenetrating networks of polypyrrole and polycaprolactone promote cardiac cell growth. Acta Biomaterialia. 28:109-20 (2015). DOI: 10.1016/j.actbio.2015.09.025
9. WJ Seeto, EA Lipke. Optical cell tracking analysis using a straight-forward approach to minimize processing time for high frame rate data. Review of Scientific Instruments, 87 (2016). DOI: 10.1063/1.4943420
10. S Pradhan, CS Chaudhury*, EA Lipke. Dual-phase, Surface Tension-based Fabrication Method for Generation of Tumor Millibeads. Langmuir, 30 (13), 3817-3825 (2014).
11. MM Salter#, WJ Seeto#, BB DeWitt, SA Hashimi, DD Schwartz, EA Lipke, AA Wooldridge. Characterization of Endothelial Colony Forming Cells from Peripheral Blood Samples of Adult Horses. American Journal of Veterinary Research. 76(2): 174-187 (2015). #Equal contributors.
12. P Kerscher, BS Bussie*, KM DeSimone*, DA Dunn, EA Lipke. Characterization of mitochondrial populations during stem cell differentiation. V Weissig, M Edeas (Eds.), Mitochondrial Medicine: Methods and Protocols. Springer (2015).
13. WJ Seeto, Y Tian*, EA Lipke. Peptide-grafted Poly(ethylene glycol) Hydrogels Support Dynamic Adhesion of Endothelial Progenitor Cells. Acta Biomaterialia. 9(9): 8279-8289 (2013).
14. N Trosper, P Kerscher, J Macadangdan, D Carson, E Lipke, D-H Kim. Micro-and Nanofabrication Approaches to Cardiac Tissue Engineering. Tissue and Organ Regeneration: Advances in Micro- and Nanotechnology. CRC (2014).

15. AJ Hodge, P Kerscher, DA Dunn, EA Lipke. Biomimetic Materials for Cardiac Regeneration and Cardiomyocyte Differentiation. In: Handbook of Biomimetics and Bioinspiration, E Jabbari, A Khademhosseini, LP Lee, D Kim ed., World Scientific Publishing Co. (2014).
16. DA Dunn, AJ Hodge, EA Lipke. Biomimetic materials design for cardiac tissue regeneration. WIREs Nanomedicine & Nanobiotechnology. 6: 15–39 (2014). doi: 10.1002/wnan.1241.
17. SA Thompson, PW Burridge, EA Lipke, M Shamblott, L Gepstein, ET Zambidis, L Tung. Engraftment of Human Embryonic Stem Cell Derived Cardiomyocytes Improves Conduction in an In Vitro Model of Cardiac Fibrosis. Journal of Molecular and Cellular Cardiology 53(1), 15–23 (July 2012, Highlighted).
18. EA Lipke, LJ Taite, JL West. Nitric Oxide Delivery for Prevention of Restenosis. In: Polymers for Vascular and Urogenital Applications, SW Shalaby, KJL Burg, C Ford, ed., CRC Press (2012).
19. W Limpitikul, N Christoforou, SA Edmonds, J Gearhart, L Tung, EA Lipke. Influence of Electromechanical Activity on Cardiac Differentiation of Mouse Embryonic Stem Cells. Cardiovascular Engineering and Tech. 1(3), 179-193 (2011).
20. D. Kim[#], EA Lipke[#], P. Kim, R. Cheong, S. Edmonds, M. Delannoy, K. Suh, L. Tung, A. Levchenko. Nanoscale cues regulate the structure and function of macroscopic cardiac tissue constructs. Proceedings of the National Academy of Sciences, 107(2), 565-570 (2010). [#]Equal contributors.
21. Seth Weinberg, E.A. Lipke, L. Tung, Electrophysiological Mapping of Excitable Cells Derived from Stem Cells. In: Stem Cells for Myocardial Regeneration (Methods in Molecular Biology) R. Lee, ed., Humana Press (2010).

Edited Proceedings

1. Mechanics of Biological Systems and Materials, Volume 5, Edited by: Barton C. Prorok, François Barthelat, Chad Korach, K. Jane Grande-Allen, Elizabeth Lipke, George Lykofatitits, Pablo Zavattieri, Proc. of the 2012 Annual Conference on Experimental and Applied Mechanics, Conf. Proc. of the Soc. for Exp. Mechanics Series 37 (2012).
2. Kerscher, P., A. J. Hodge, J. Kim, I. C. Turnbull, D. Seliktar, C. J. Easley, K. D. Costa and E. A. Lipke (2014). "Abstract 19614: Formation of 3D Cardiac Tissues From Human Pluripotent Stem Cells Using a Highly Reproducible, One-Step Encapsulation Approach." Circulation 130(Suppl 2): A19614.

Provisional Patents

1. P Kerscher *, AJ Hodge*, EA Lipke, “Encapsulation and Cardiac Differentiation of hiPSCs in 3D PEG-Fibrinogen Hydrogels.” Provisional Patent 61/902,453 filed 11/11/2013, US Patent Application No. 14/538,435 filed 11/11/2014.
2. S Pradhan*, EA Lipke, “Fabrication Method of Hydrogel Millibeads and Tumor Millibeads.” Provisional Patent Application No. 62/113,082 filed 2/6/2014.
3. EA Lipke, AA Wooldridge, WJ Seeto, AN Sharpe, “Endothelial Progenitor Cell Isolation in Horses.” Provisional Patent 62/155,041, filed 4/30/2015.
4. EA Lipke, WJ Seeto, “Novel Peptides for Supporting Endothelial Progenitor Cell Rolling and Capture and Endothelialization of Biomaterials.” Provisional Patent 62/147,215, filed 3/26/2015.

Representative Invited Seminars and Lectures (Out of 21 total)

1. Texas A&M, College Station, TX, “Biomimetic Material Support of Stem Cell Differentiation and Tissue Formation.” October 2016.
2. University of Alabama, Tuscaloosa, AL, “Engineering Tissues to Understand and Treat Disease.” October 2016.
3. 3M, St. Paul, MN, “Biomimetic Polymers for Directing Cellular Interactions and Function.” June 2015.
4. Chung Gung Memorial Hospital, Taiwan, “Guiding Stem Cell Differentiation and Tissue Formation for Cardiac and Cardiovascular Regeneration using Biomimetic Materials.” May 2015.
5. BioAlabama Annual Meeting, Birmingham, AL, “Engineering Tissues to Understand and Treat Disease.” April 2014.
6. Auburn University Research Board Webinar. “Engineering Tissues to Understand and Treat Disease.” April 2014.
7. NIH Advanced Training Course: Rehabilitative & Regenerative Medicine for Minority Health & Health Disparities, Howard University, Washington, DC, “Biomimetic Materials Design for Cardiac Tissue Regeneration and Cardiomyocyte Differentiation.” Dec. 3-7, 2013.
8. 23rd Annual Vascular Biology and Hypertension Symposium, Birmingham, AL, “Directing Pluripotent Stem Cell Derived-cardiomyocyte Differentiation using Injectable Biomaterials,” October 2012.
9. NIMH-COR Seminar, Spelman College and Morehouse College, Atlanta, GA, “Engineering Biomaterials to Direct Cell and Tissue Function.” March 2013.
10. Department of Biomedical Engineering, University of Alabama Birmingham, “Electrophysiological Characterization of Structured and Stem Cell-Derived Cardiomyocyte Monolayers for Tissue Engineering Applications,” February 2009.

REPRESENTATIVE NATIONAL AND INTERNATIONAL RESEARCH PRESENTATIONS (OUT OF OVER 70 TOTAL)

(Speaker in Bold, Lipke Advisees Indicated by *)

1. W Seeto*, Y Tian*, R Winter, F Caldwell, A Wooldridge, **EA Lipke**. Fabrication of Injectable Hydrogel Microspheres for Delivery of Encapsulated Equine Endothelial Progenitor Cells. Biomedical Engineering Society (BMES) Annual Meeting, Minneapolis, MN, 2016.
2. **P Kerscher***, IC Turnbull, AJ Hodge, J Kim, D Seliktar, CJ Easley, KD Costa, EA Lipke. Human Cardiac Tissue Production Through Direct Hydrogel Encapsulation of Pluripotent Stem Cells. Cellular and Molecular Bioengineering Meeting (BMES), New Orleans, LA, January 2016. (STAR Award)
3. **S Pradhan***, AM Smith, I Hassani*, K Henderson*, RD Arnold, B Prabhakarpandian, EA Lipke. Three-dimensional Vascularized Tumor-fibroblast Co-culture Platform for Drug-testing Applications, Biomedical Engineering Society (BMES) Annual Meeting, Tampa, FL, 2015.
4. P Kerscher*, IC Turnbull, AJ Hodge*, J Kim, D Seliktar, CJ Easley, KD Costa, **EA Lipke**. Biomimetic Materials for Directly Creating Engineered Cardiac Tissues from Pluripotent Stem Cells. Biomaterials International, Kenting, Taiwan. June 2015.
5. **S Pradhan***, JC Clary*, EA Lipke. A tissue-engineered 3D breast cancer model based on PEG fibrinogen hydrogel microspheres. TERMIS- North America Annual Meeting 2013, Atlanta, GA, November 2013.
6. SS Chang*, AJ Hodge*, P Kerscher*, **EA Lipke**. Directing Pluripotent Stem Cell Differentiation Using PEG-based Hydrogel Microspheres. NHLBI Symposium on Cardiovascular Regenerative Medicine, September 2013.
7. **P Kerscher***, BS Bussie*, AJ Hodge*, EA Lipke. Engineering a 3D Model of the Developing Human Heart for In Vitro Drug Testing. International Society for Stem Cell Research 11th Annual Meeting, Boston, MA, June 2013.
8. **W Grove*,** DA Dunn*, EA Lipke. Ablation of the HCN4 Ion Channel in Differentiating Human Induced Pluripotent Stem Cell-Derived Cardiomyocytes Via Zinc Finger Nuclease Mutation. ISSCR Annual Meeting, Japan, June 2012.

REPRESENTATIVE AWARDS TO STUDENT RESEARCHERS (OUT OF OVER 40 STUDENT AWARDS WHILE AT AU)

2016	Ben Spearman – National Science Foundation Graduate Research Fellowship
2016	Jennifer Kaczmarek, Sara Head –Goldwater Scholarship Awardees
2014	Jacob Clary – National Science Foundation Graduate Research Fellowship
2014	Blakely Bussie – The Mark A. Spencer Creative Mentorship Award
2014	Shantanu Pradhan – 1st (Ph.D.), Petra Kerscher – 2nd (Ph.D.), Blakely Bussie – 3rd (Undergraduate), state-wide AL-EPSCoR Science & Technology Open House Poster Competition
2013	Ben Spearman – 3rd place poster in Biotechnology Division at national AIChE 2013 Annual Fall Meeting
2013	Alexander Hodge – 1st place Graduate Oral Presentation, AU Research Week
2013	Shantanu Pradhan – 1st place Graduate Poster Presentation, AU Research Week
2012	Petra Kerscher, Shantanu Pradhan – Engineering Research Showcase Honorable Mention
2012	Bianca Williams – National Science Foundation Graduate Research Fellowship
2012	Alexander Hodge – 1st place Graduate Oral Presentation, AU Research Week
2012	Petra Kerscher – 1st place Graduate Poster Presentation, AU Research Week
2012	Wesley Grove – 1st place Undergraduate Oral Presentation, AU Research Week
2012	Yangzi (Isabel) Tian – 3rd place and People's Choice Award NYU Polytech 2012 Inno/Vention Competition.
2011	Bianca Williams – Honorable Mention Goldwater Award

POSTDOCTORAL FELLOWS MENTORED WHILE AT AUBURN UNIVERSITY

1. Dr. David Dunn, May 2010- June 2013. Currently faculty at SUNY-Oswego.
2. Dr. Aaron Seeto, December 2014- present.

GRADUATE STUDENTS MENTORED WHILE AT AUBURN UNIVERSITY

1. Samuel Chang, "Differentiation of Mouse Embryonic Stem Cells Using PEG-Fibrinogen Hydrogel Microspheres," M.S. August 2012. Researcher at MD Anderson Cancer Center with Dr. Garth Powis.
2. Wen (Aaron) Seeto, "Peptide Grafted Poly(Ethylene Glycol) Hydrogel as Biomaterial for Endothelial Colony Forming Cells," M.S. August 2012. Ph.D. December 2014.
3. Zhongliang Lu, "Design of an Automated Pancreas Islet Isolation Unit." M.ChE. November 2010.
4. Alexander Hodge, "Controlled Electrophysiological Maturation of Stem Cell-Derived Cardiomyocytes." Ph.D. May 2016. Employed at Thermo/Fisher in the Bioreactors Division.
5. Shantanu Pradhan, "Three-dimensional Tissue-engineered Cancer Models for Tumorigenic Studies and Drug Testing Applications." Ph.D. August 2016. Postdoctoral fellow at the University of Delaware.

6. Petra Kerscher, "Engineering a Three-dimensional Cell Culture Model of the Developing Human Heart." Ph.D. August 2016. Employed at Merck in Stem Cell Engineering.
7. Yuan Tian, Ph.D. student, "Elucidation of Receptor-ligand Interactions Necessary to Support Endothelialization of Biomaterials Under Shear." Chemical Engineering. Anticipated December 2018.
8. Iman Hassani, Ph.D. student, "Investigating the Role of the Tumor Microenvironment in Cancer Progression." Chemical Engineering. Anticipated December 2018.
9. Morgan Ellis, Ph.D. student, "Creating 3D human cardiac models using hiPSCs to study congenital heart disease." Chemical Engineering. Anticipated December 2018.
10. Ferdous Finklea, Ph.D. student, "Manufacturing of hiPSC-derived Cardiomyocytes for Drug Testing and Regenerative Medicine." Chemical Engineering. Anticipated December 2018.

UNDERGRADUATE RESEARCHERS MENTORED WHILE AT AUBURN UNIVERSITY

Twenty-two undergraduate researchers mentored while at Auburn University. Eight completed Honors Theses. Six awarded AU Undergraduate Research Fellowships. Two were award CMB Undergraduate Research Fellowships. Three were awarded NSF Graduate Fellowships. Two were awarded Goldwater Scholarships. Two have written first author research publications. Lipke Lab undergraduate researchers have given 23 local/regional and 12 national/international presentations of their research.

PROFESSIONAL LEADERSHIP AND INVOLVEMENT

National Leadership Positions in Professional Societies:

2016-2019 AICHE Materials Engineering & Sciences Division 2nd Vice- Chair (2016-17), Vice-Chair, Chair thereafter.
2013-2015 AICHE Materials Engineering & Sciences Division Director.
2011-2013 AIChE Biomaterials Area Chair (2012-2013), Vice-chair (2011-2012).
2013-present AIChE SIOC W^2R^2 Task Force, AIChE SIOC USA Science and Engineering Fair Planning Committee.
2010-2013 AIChE Women's Initiative Committee: Past Chair (2012-2013), Chair (2011-12), Vice-chair (2010-11).
2011-2013 Society for Biomaterials: Engineering Cells & Their Microenvironments Special Interest Group Treasurer

National Symposium and Session Chair:

2011, 2013 Society for Biomaterials Annual Meeting, Symposium Co-organizer.
2010-2012 Biomedical Engineering Society, Session Co-Chair.
2010-present AIChE Annual Meeting, Session Chair.

National and International Reviewer:

2009- present: NSF, American Heart Association, Annals of Biomedical Engineering, ACS Nano, Acta Biomaterialia, Biomaterials, Journal of Engineering in Medicine, Tissue Engineering, Soc. for Biomaterials, Biomedical Engineering Soc.

2010 Research Council of Canada Collaborative Research and Development: Natural Sciences and Engineering Grant

2012 Portuguese Foundation for Science and Technology (FCT), 2013 United Kingdom Medical Research Council

Selected Auburn University Committees: Health Sciences Initiative Task Force (2011-2012), E-Day Chemical Engineering Co-coordinator (2011, 2012), Chemical Engineering Graduate Recruiting Committee (2011-2015, Chair 2013, 2014), College of Engineering Undergraduate Research Committee (2015), CIRTL Steering Committee (2015-2016).

SPECIAL RESEARCH ACTIVITIES: INTEGRATION OF RESEARCH, EDUCATION, AND OUTREACH

Tissue Engineering Education: Developed CHEN 5970/6970/6976 Cell and Tissue Engineering course, established "Your Healthy Heart" for Auburn University Getting Under the Surface (GUTS) program (2012) and Saturday Youth Experiences in Science (Y.E.S.) camp (2011) for 4th-6th grade students, created "Exploring Phase Transitions" activity for kindergarten and pre-K students (2012, 2014), provided "Engineering Tissues to Understand and Treat Disease" presentation and discussion for CMB Teaching Enhancement Awards HS students and teachers (2011, 2013), spoke to Auburn Rotary Club about stem cells and tissue engineering research (2012), provided information for Opelika-Auburn News front page feature story on Lipke Lab tissue engineering research (2013).

National Workshop Co-organizer: AIChE Women's Initiative Committee Workshops (2011, 2012, 2013). Women Undergraduates in Chemical Engineering: Graduate School Panel and Industrial Career Opportunities, Women Graduate Students and Postdoctoral Fellows in Chemical Engineering: Developing Your Career in Industry or Academia, Women Assistant Professors in Chemical Engineering: Developing Your Career.

National Outreach Co-organizer: USA Science and Engineering Fair AIChE Organizing Committee (2013-present), worked on event planning and coordinated hands-on activity for over 600 participants at 2014 AIChE booth, AIChE Annual Meeting Fall Outreach Event Committee (2014), coordinated hands-on activity for middle school students at 2014 event.

Invited Guest Faculty: NIH Advanced Training Course: Rehabilitative & Regenerative Medicine for Minority Health & Health Disparities, Howard University, Washington, DC. Dec. 3-7, 2013.

SELECTED GRANTS AND CONTRACTS

Ongoing research grants:

1. "CAREER: Injectable Biomimetic Scaffolds to Direct Stem Cell-Derived Cardiomyocyte Differentiation," National Science Foundation, $400,000, 7/1/2012-6/30/2017, PI: Lipke.
2. "SynVivo-Tumor: A Physiological 3D model of the tumor microenvironment," NIH-NCI Phase II SBIR, $325,000, 10/1/2016-9/30/2018, PI: Prabhakar Pandian (CFDRC), Co-investigator/Subcontract PI: Lipke.
3. "Elucidation of Receptor-ligand Interactions Necessary to Support Endothelialization of Biomaterials Under Shear," National Scientist Development Grant, American Heart Association, $308,000, 1/1/2014-12/31/2017, PI: Lipke.
4. "Microenvironmental Stimulation of Obesity-linked and Health Disparity-Associated Patient-derived Colon Cancer Tumor Growth," AURIC Major Research Grant, $199,997, 8/1/2015- 7/31/2017, Co-PIs: Greene, Lipke.
5. "Microsphere encapsulated EPCs and wound vascularization," Grayson-Jockey Club Research Foundation, $76,226, 5/1/2015-4/30/2017, PI: Wooldridge, Co-investigators: Lipke, Caldwell.
6. "Vascularization of hydrogels cultures with endothelial colony forming cells in the horse," College of Veterinary Medicine, Animal Health and Disease, 2/2013-2/2015, $50,000. PI: Wooldridge, Co-PIs: Lipke, Caldwell.
7. AL-EPSCoR Graduate Research Scholars Program fellowship, Awarded to: Alexander Hodge, 9/1/2012-8/31/2013, Shantanu Pradhan, 9/1/2013-8/31/2014, Petra Kercher, 8/16/2015-8/15/2016. Supervisor: E.A. Lipke, ~$75,000 (for student stipends).
8. "Auburn Undergraduate Research Fellowship" for Jordan Hamilton, James Morris, Bianca Williams, John Porter, Blakely Bussie, Jennifer Kaczmarek, Nidhi Goel, Sara head. 2009-2010, 2010-2011 (2), 2012-2013, 2013-2014 (2), 2015 (1), 2016 (2). Supervisor: Lipke, $38,500 (for student stipends and allowances).
9. "Auburn University Doctoral Fellowships in Chemical Engineering," US Department of Education, $533,064, 8/16/2012-8/15/2015, PI: R. Chambers, Co-PIs: V.A. Davis, E.A. Lipke, J. Wang.

Recently completed research grants:

10. "SynVivo-Tumor: A Physiological 3D model of the tumor microenvironment," NIH-NCI Phase 1 SBIR, $65,000, 9/14/2014-6/11/2015, PI: Prabhakar Pandian (CFDRC), Co-investigator/Subcontract PI: Lipke.
11. "Engineering a three-dimensional cell culture model of the developing human heart," American Heart Association, GSA Predoctoral Fellowship, $50,360, 1/1/2013-12/31/2014, PI: Petra Kerscher, Advisor: Lipke.
12. "Research Infrastructure Improvement (RII): Enhancing Alabama's Research Capacity in Nano/Bio Science and Sensors," National Science Foundation, $3,000,000, 9/1/2008 – 8/31/2013. PI: D. Ila, Co-PI's: K. Boykin, M. Hosur, F. Bartol, C. Lawson. Lipke's portion for postdoctoral and graduate fellowship support: $130,000.
13. "Investigating the Role of Fibrinogen in the Cancer-related Angiogenic Process Through a Novel Tissue-engineered Breast Cancer Model," AURIC Seed Grant, $19,940, 5/1/20313-4/29/2014. PI: Lipke.