Megan Farrell

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EDUCATION

PhD, Bioengineering, University of Pennsylvania December 2013
Advisor: Dr. Robert L. Mauck, PhD
Title: Cartilage Tissue Engineering with Heterogeneous and Clonal Mesenchymal Stem Cell Populations: Multi-Scale Analysis of Maturation, Stability, and Response to Environmental Stressors

BS, Biomedical Engineering, Rensselaer Polytechnic Institute May 2008
Concentration: Biomechanics
Minor: Management and Technology

RESEARCH EXPERIENCE

Dissertation Research August 2008-Present
Dr. Robert L. Mauck, University of Pennsylvania, Philadelphia, PA
Mesenchymal stem cell and chondrocyte based cartilage tissue engineering; Hypoxia glove-box culture; Macro- and micro-scale mechanical testing; Zeiss and Olympus confocal imaging; Solidworks CAD; Vic2D digital image correlation; MatLab high throughput image processing (both 2D and 3D images); Volocity image analysis software (3D); Histology and immunohistochemisty; Biochemical content quantification

Undergraduate Research May 2007-May 2008
Dr. Jan P. Stegemann, Biomedical Engineering, Rensselaer Polytechnic Institute, Troy, NY
Confocal, multiphoton, and scanning electron microscopy
Fabrication of gelatin microsphere / collagen hydrogel bead / stem cell composite for use as cell and drug delivery vehicle for bone repair

HONORS AND AWARDS

Bioengineering in Ireland Travel Grant	2013
NSF Graduate Research Fellowship – Honorable Mention	2010
Penn Graduate and Professional Student Assembly Travel Grant	2009, 2011, 2013
Penn Center for Musculoskeletal Disorders Poster Prize Recipient	2010
Association for Women in Science Travel Grant	2009
summa cum laude	2008
Tau Beta Pi Engineering Honor Society	2008
RPI Dean's List	2004-2008
Rensselaer Medal (Scholarship)	2004-2008
SWE Dorothy M. and Earl S. Hoffman National Scholarship	2004-2008
Rensselaer Alumni Scholarship	2004-2008

FULL LENGTH PEER REVIEWED MANUSCRIPTS

Farrell MJ, Chiaro JA, Shin JI, Pacifici M, Mauck RL. Pro-Chondrogenic Action of RAR Inverse Activation for Stem Cell Based Cartilage Engineering. (*in preparation*)

Farrell MJ, Dunagin M, Martin JM, Cosgrove BD, Raj A, Mauck RL. Single-Cell Micro-Mechanical and Molecular Analyses Reveal Persistent Heterogeneity in Clonal Mesenchymal Stem Cell Populations. (*in preparation*)

Farrell MJ, Shin JI, Smith LJ, Mauck RL. Functional Consequences of Glucose and Oxygen Deprivation on Engineered Mesenchymal Stem Cell-Based Cartilage Constructs. (*in review*)

Farrell MJ, Fisher MB, Huang AH, Shin JI, Farrell KM, Mauck RL. Functional Properties of MSC-Based Engineered Cartilage are Unstable with Very Long Term In Vitro Culture. 2013, *Journal of Biomechanics*, doi: 10.1016/j.jbiomech.2013.10.030. [Epub ahead of print]

Farrell MJ, Comeau ES, Mauck RL. Mesenchymal Stem Cells Produce Functional Cartilage Matrix in 3D Culture in Regions of Optimal Nutrient Supply. 2012, *European Cells and Materials*, 23:425-40

Erickson IE, Kestle SR, Zellars K, **Farrell MJ**, Kim M, Burdick JA, Mauck RL. High Stem Cell Seeding Densities in Hyaluronic Acid Hydrogels Produce Engineered Cartilage with Native Tissue Properties. 2012, *Acta Biomaterialia*, 8(8): 3027-34

Huang AH, **Farrell MJ**, Kim M, Mauck RL. Long-term Dynamic Compressive Loading Improves the Mechanical Properties of Mesenchymal Stem Cell-Laden Hydrogels. 2010, *European Cells and Materials*, 19:72-85.

Solorio L, Zwolinski C, Lund AW, **Farrell MJ**, Stegemann JP. Gelatin Microspheres Crosslinked with Genipin for Local Delivery of Growth Factors. 2010, *Journal of Tissue Engineering and Regenerative Medicine*, 4(7):514-23.

BOOK CHAPTERS AND REVIEWS

Farrell MJ and Mauck RL. Advancing Articular Cartilage Repair through Engineering from Materials and Cells to Clinical Translation. In: Biomaterials and Regenerative Medicine. Ed. Ma PX. (*in press*)

Huang AH, **Farrell MJ**, Mauck RL. Mechanics and Mechanobiology of Mesenchymal Stem Cell-Based Engineered Cartilage. 2009, *Journal of Biomechanics*, 43(1): 128-36

ABSTRACTS AND CONFERENCE PROCEEDINGS

Farrell MJ, Cosgrove BD, Mauck RL. Micromechanical Assessment of Chondrogenic Stem Cell Heterogeneity. *60th Annual Meeting of the Orthopaedic Research Society*. New Orleans, LA, March 2014.

Cosgrove BD, **Farrell MJ**, Dunagin M, McLeod CM, Cote AJ, Raj A, Mauck RL. Inherent and Emergent Heterogeneity in Clonal Stem Cell Populations. *60th Annual Meeting of the Orthopaedic Research Society*. New Orleans, LA, March 2014. (*podium*)

Pfeifer CG, Kim M, **Farrell MJ**, Pacifici M, Mueller MB, Mauck RL. Attenuation of MSC Hypertrophy in 3D Culture via Treatment with a Retinoic Acid Receptor Inverse Agonist. *60th Annual Meeting of the Orthopaedic Research Society*. New Orleans, LA, March 2014.

Cosgrove BD, McLeod CM, **Farrell MJ**, Guvendiren M, Burdick JA, Mauck RL. Heterogeneous Traction Force Distributions in Expanded MSC Clonal Populations. *Biomedical Engineering Society Meeting*. Seattle, WA, September 2013.

Farrell MJ, Shin JI, Mauck RL. Functional Consequences of Glucose and Oxygen Deprivation in Engineered MSC-Based Cartilage Constructs. *ASME 2013 Summer Bioengineering Conference*. Sunriver, Oregon, June 2013. (*podium*)

Farrell MJ, Chiaro JA, Shin JI, Mauck RL. RAR Inverse Activation is Highly Pro-Chondrogenic for Stem Cell Based Cartilage Engineering. *Bioengineering in Ireland 19*. County Meath, Ireland, January 2013. (*podium*)

Farrell MJ, Fisher MB, Soegaard N, Farrell KM, Mauck RL. Mesenchymal Stem Cell-Based Cartilage is Unstable in Very Long Term In-Vitro Culture. *59th Annual Meeting of the Orthopaedic Research Society*. San Antonio, TX, February 2013.

Kim M, **Farrell MJ**, Burdick JA, Mauck RL. Depth-Dependent Properties of a Tri-Layered Hyaluronic Acid Hydrogel Construct with Zonal Co-Culture of Chondrocytes and MSCs. *59th Annual Meeting of the Orthopaedic Research Society*. San Antonio, TX, February 2013.

Farrell MJ, Farrell KM, Riggin CN, Mauck RL. Mesenchymal Stem Cell Death in Three-Dimensional Agarose Culture for Cartilage Tissue Engineering Applications: Progression, Factors, and Prevention. *Northeast Bioengineering Conference*. Philadelphia, PA, March 2012.

Farrell MJ, Cosgrove BD, deVries S, Raj A, Mauck RL. Multi-Scale Analysis of Heterogeneity in Mesenchymal Stem Cell Chondrogenesis. *58th Annual Meeting of the Orthopaedic Research Society.* San Francisco, CA, February 2012.

Farrell MJ, Comeau ES, Mauck RL. Dynamic Culture Improves Mechanical Functionality of MSC-Laden Tissue Engineered Constructs in a Depth-Dependent Manner. *ASME 2011 Summer Bioengineering Conference*. Nemacolin Woodlands Resort, PA, June 2011. *(podium)*

Farrell MJ, Comeau ES, Nerurkar NL, Huang AH, Mauck RL. Depth-Dependent Mechanical Properties of MSC-Laden Engineered Cartilage Constructs. *57th Annual Meeting of the Orthopaedic Research Society.* Long Beach, CA, January 2011. (*podium*)

Farrell MJ, Comeau ES, Huang AH, Burdick JA, Mauck RL. Tunable and Depth-Dependent Mechanics of Agarose/Poly(Ethylene Glycol) Diacrylate Interpenetrating Networks. *57th Annual Meeting of the Orthopaedic Research Society.* Long Beach, CA, January 2011. *(podium)*

Farrell MJ, Zachry TL, Mauck RL. Micromechanical Deformation of Chondrogenic Mesenchymal Stem Cells in 3D Hydrogels is Modulated by Time in Culture and Matrix Connectivity. *ASME 2010 Summer Bioengineering Conference*. Grande Beach Resort, Naples, Florida, June 2010.

Farrell MJ, Perreira J, Mauck RL. Micromechanical Heterogeneity of Chondrogenic Mesenchymal Stem Cell Subpopulations in 3D Culture. *56th Annual Meeting of the Orthopaedic Research Society*. New Orleans, LA, March 2010.

Huang AH, **Farrell MJ**, Mauck RL. Dynamic Compression Initiated After Chondrogenesis Improves Mechanical Properties of Mesenchymal Stem Cell Seeded Hydrogel Constructs. *56th Annual Meeting of Orthopaedic Research Society*. New Orleans, LA, March 2010.

Erickson IE, Kestle SR, **Farrell MJ**, Burdick JA, Mauck RL. Macromer Density Mediates Mesenchymal Stem Cell Response to Dynamic Compression in Photo-Crosslinked Hyaluronic Acid Hydrogels. *56th Annual Meeting of the Orthopaedic Research Society*. New Orleans, LA, March 2010.

Huang AH, **Farrell MJ**, Mauck RL. Delayed Dynamic Compression Improves the Mechanical Properties of MSC-Laden Constructs. *Biomedical Engineering Society Meeting*. Pittsburgh, PA, October 2009.

PROFESSIONAL ACTIVITIES

Reviewer	Acta Biomaterialia
Reviewer	Annals of Biomedical Engineering
Member	American Society of Mechanical Engineers (Student Member)

TEACHING ASSISTANTSHIPS

University of Pennsylvania, Department of Bioengineering Fall Semesters 2010-2012
Engineering Principles of Human Physiology

Rensselaer Polytechnic Institute, Department of Biology Fall 2007
Introduction to Biology Laboratory

VOLUNTEER ACTIVITIES

Penn BETA Day 2013
Introduced bioengineering concepts to Philadelphia middle school students through demonstrations and hands on activities

Perry Outreach Program (Philadelphia Session) 2011
Instructed in hands on program for high school girls interested in orthopaedics, medicine, and engineering

Philly Cares Day 2009
Painted interior of a West Philadelphia middle school

Discover Engineering Day (RPI) 2007
Instructed in hands on program for middle school girls interested in engineering