

# **KRISTIN S. MILLER, Ph.D.**

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Tulane University

Department of Biomedical Engineering

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## **EDUCATION**

### **Yale University**

NIH T32 Postdoctoral Fellow, Biomedical Engineering

Advisor: Jay D. Humphrey, Ph.D.

New Haven, CT

7/2012 – 7/2014

### **University of Pennsylvania**

Ph.D., Bioengineering, Advisor: Louis J. Soslowsky, Ph.D.

*Thesis: Collagen Fiber Re-Alignment and Uncrimping in Response to Loading: Determining Structure-Function Relationships Using a Developmental Tendon Mouse Model*

Philadelphia, PA

August 2012

### **Texas A&M University**

B.S., Biomedical Engineering. Magna Cum Laude

College Station, TX

May 2007

## **HONORS AND AWARDS**

- University of Pennsylvania Bioengineering Symposium Poster Competition, 1<sup>st</sup> Place, 2012
- Penn Center for Musculoskeletal Disorders Symposium Poster Competition, 3<sup>rd</sup> Place, 2011
- Penn Center for Musculoskeletal Disorders Symposium Poster Competition, 1<sup>st</sup> Place, 2010
- ASME Summer Bioengineering Conference Masters Poster Competition, 1<sup>st</sup> Place, 2010
- Honor Societies: Tau Beta Phi, Phi Kappa Phi, Alpha Eta Mu Beta, Golden Key

## **ARCHIVED JOURNAL PUBLICATIONS**

### ***Published***

1. **Kristin S. Miller**, William A. Hyman. A Comprehensive Guide to the Quality System Regulation Preamble: A thorough understanding of FDA quality system regulation is crucial for medical OEMs. Medical Device and Diagnostic Industry. January 2008.
2. Spencer P. Lake, **Kristin S. Miller**, Dawn M. Elliott, Louis J. Soslowsky: Effect of fiber distribution and realignment on the nonlinear and inhomogeneous mechanical properties of human supraspinatus tendon under longitudinal tensile loading. *Journal of Orthopaedic Research* 27(12):1596-1602. 2009.
3. Spencer P. Lake, **Kristin S. Miller**, Dawn M. Elliott, Louis J. Soslowsky: Tensile properties and fiber alignment of human supraspinatus tendon in the transverse direction demonstrate inhomogeneous, nonlinearity, and regional anisotropy. *Journal of Biomechanics* 43(3):727-32. 2010.
4. **Kristin S. Miller**, Lena Edelstein, Brianne K. Connizzo, Louis J. Soslowsky: Effect of Preconditioning and Stress Relaxation on Local Collagen Fiber Re-Alignment: Inhomogeneous Properties of Rat Supraspinatus Tendon. *Journal of Biomechanical Engineering* 134(13):031007. 2012.
5. Stephen J. Thomas, **Kristin S. Miller**, Louis J. Soslowsky: The Upper Band of the Subscapularis Tendon in the Rat has Inferior Mechanical Properties. *Journal of Shoulder & Elbow Surgery* 21(12):1687-93. 2012.

6. **Kristin S. Miller**, Brianne K. Connizzo, Louis J. Soslowsky: Collagen Fiber Re-Alignment in a Neonatal Developmental Mouse Supraspinatus Tendon Model. *Annals of Biomedical Engineering* 40(5):1102-1110. 2012.
7. David P. Beason, Andrew F. Kuntz, Jason E. Hsu, **Kristin S. Miller**, Louis J. Soslowsky: Development and Evaluation of Multiple Tendon Injury Models in the Mouse. *Journal of Biomechanics* 45(8):1550-1553. 2012.
8. **Kristin S. Miller**, Brianne K. Connizzo, Elizabeth Feeney, Jennica J. Tucker, Louis J. Soslowsky: Examining Difference in Local Collagen Fiber Crimp Frequency Throughout Mechanical Testing in a Developmental Mouse Supraspinatus Tendon Model. *Journal of Biomechanical Engineering* 134(4):041004. 2012.
9. **Kristin S. Miller**, Elizabeth Feeney, Brianne K. Connizzo, Louis J. Soslowsky: Characterizing Local Collagen Fiber Re-Alignment and Crimp Behavior Throughout Mechanical Testing in a Mature Mouse Supraspinatus Tendon Model. *Journal of Biomechanics* 45(12):2061-2065. 2012.
10. **Kristin S. Miller**, Yong-Ung Lee, Yuji Naito, Christopher K. Breuer, Jay D. Humphrey: Computational Model of the In Vivo Development of a Tissue Engineered Vein from an Implanted Polymeric Construct. *Journal of Biomechanics* 47(9):2080-2087. 2014.
11. Brooks V. Udelsman, Ramak Khosravi, **Kristin S. Miller**, Ethan W. Dean, Matthew R. Bersi, Kevin Rocco, Tai Yi, Jay D. Humphrey, Christopher K. Breuer: Characterization of Evolving Biomechanical Properties of Tissue Engineered Vascular Grafts in the Arterial Circulation. *Journal of Biomechanics* 47(9):2070-2079. 2014.
12. **Kristin S. Miller**, Ramak Khosravi, Christopher K. Breuer, Jay D. Humphrey: A Hypothesis-Driven Parametric Study of Effects of Polymeric Scaffold Properties on Tissue Engineered Neovessel Formation. *Acta Biomaterialia* 11(1):283-294. 2015.
13. Thomas A. Sorrentino, Lara Fourman, Jacopo Ferruzzi, **Kristin S. Miller**, Jay D. Humphrey, Sara Roccbianca: Local Versus Global Mechanical Effects of Glycosaminoglycans in Carotid Arteries. *ASME J Biomech Eng* 137(4):041008. 2015.
14. Ramak Khosravi, **Kristin S. Miller**, Cameron A. Best, Yushane C. Shih, Yong-Ung Lee, Tai Yi, Christopher K. Breuer, Jay D. Humphrey: Biomechanical Diversity Despite Mechanobiological Stability in Tissue Engineered Vascular Grafts Two Years Post-Implantation. *Tissue Eng A* 21(9-10):1529-38. 2015.
15. Liu Liu, Shreya Kashyap, Brennah Murphy, Rebecca Budish, Emma H. Trimmer, Margaret Zimmerman, **Kristin S. Miller**, Mark C. Chappell, Sarah H. Lindsey: Activation of the G protein-coupled estrogen receptor ameliorates salt-induced vascular remodeling. *J Pharma Exp Thera (In review)*.

#### **BOOK CHAPTERS**

1. **Kristin S. Miller**, Jason E. Hsu, Louis J. Soslowsky. (2011) Materials in Tendon and Ligament Repair. IN:P. Ducheyne, K.E. Healy, D.W. Hutmacher, D.W. Grainger, C.J. Kirpatrick (eds.) *Comprehensive Biomaterials*, vol. 6, pp.257-279 Elsevier.

#### **CONFERENCE PROCEEDINGS/ABSTRACTS**

1. Cody Schoener, **Kristin S. Miller**, Matthew Westfall, Neil Markwardt: Exercise System for the Crew Exploration Vehicle. *Houston Society for Engineering Medicine and Biology 2007: 14<sup>th</sup> Annual Houston Conference*. February 8-9, 2007.
2. Spencer P. Lake, **Kristin S. Miller**, Louis J. Soslowsky, Dawn M. Elliott: Fiber Alignment under Load Contributes to Human Supraspinatus Tendon Nonlinearity and Inhomogeneity, *Trans Orthop Res Soc* 34: 2009.

3. Spencer P. Lake, **Kristin S. Miller**, Jennifer A. Kadlowec, Dawn M. Elliott, Louis J. Soslowsky: Inhomogeneous and Nonlinear Transverse Tensile Properties and Fiber Alignment of Human Supraspinatus Tendon. 2009. ASME Summer Bioengineering Conference, Lake Tahoe, CA.
4. Jennifer A. Kadlowec, Spencer P. Lake, **Kristin S. Miller**, Louis J. Soslowsky, Dawn M. Elliott: A Hyperelastic Model with Distributed Fibers to Describe Human Supraspinatus Tendon Tensile Mechanics. 2009. ASME Summer Bioengineering Conference, Lake Tahoe, CA.
5. **Kristin S. Miller**, Lena Edelstein, Louis J. Soslowsky: Effect of Preconditioning on Collagen Fiber Recruitment: Inhomogeneous Properties of Rat Supraspinatus Tendon. 2010. ASME Summer Bioengineering Conference, Naples, FL.
6. **Kristin S. Miller**, Stephen J. Thomas, Nicholas A. Trasolini, Louis J. Soslowsky: The Upper Band of the Subscapularis Tendon in the Rat has Inferior Mechanical Properties, *Trans Orthop Res Soc* 36: 2011.
7. David P. Beason, Andrew F. Kuntz, Jason E. Hsu, **Kristin S. Miller**, Louis J. Soslowsky: Development and Evaluation of Multiple Tendon Injury Models in the Mouse, *Trans Orthop Res Soc* 36:919, 2011.
8. **Kristin S. Miller**, Brianne K. Connizzo, Jennica J. Tucker, Elizabeth Feeney, Nicholas A. Trasolini, Louis J. Soslowsky: Local Differences in Collagen Fiber Crimp Throughout Mechanical Testing in a Mouse Supraspinatus Tendon Model, *Trans Orthop Res Soc*, 37:1290, 2012
9. **Kristin S. Miller**, Brianne K. Connizzo, Jennica J. Tucker, Louis J. Soslowsky: Collagen Fiber Re-Alignment in a Neonatal Developmental Mouse Supraspinatus Tendon Model, *Trans Orthop Res Soc*, 37:1289, 2012
10. **Kristin S. Miller**, Brianne K. Connizzo, Elizabeth Feeney, Louis J. Soslowsky: Collagen Fiber Re-Alignment and Mechanical Properties in a Mouse Supraspinatus Tendon Model: Examining Changes with Age and Location. 2012, ASME Summer Bioengineering Conference, Fajardo, Puerto Rico.
11. Chi Liu, Chung Chang, Mitchel R. Stacy, **Kristin S. Miller**, Alda Bregasi, Donald Dione, Zhenwu Zhang, Albert Sinusas: Feasibility of Quantifying Intramyocardial Blood Volume using SPECT/CT. 2013, Society of Nuclear Medicine and Molecular Imaging, Vancouver, BC, Canada.
12. Brooks V. Udelsman, Ramak Khosravi, Ethan W. Dean, Kevin Rocco, **Kristin S. Miller**, Tai Yi, Jay Humphrey, Christopher K. Breuer: Characterization of the Biomechanical Properties of Tissue Engineered Vascular Grafts Implanted in the Arterial Circulation. 2013, New England Surgical Society.
13. **Kristin S. Miller**, Brooks V. Udelsman, Yong-Ung Lee, Yuji Naito, Christopher K. Breuer, Jay D. Humphrey: Computational Growth and Remodeling Model for Evolving Tissue Engineered Vascular Grafts in the Venous Circulation. 2013, ASME/FDA Annual Frontiers in Medical Devices, Applications of Computer Modeling and Simulation, Washington, DC.
14. **Kristin S. Miller**, Ramak Khosravi, Christopher K. Breuer, Jay D. Humphrey: Evaluating the Growth Potential of Tissue Engineered Vascular Grafts: Role of Vasoactivity and Functional Endothelium to Altered Mechanical Stimuli. 2015, Biomedical Engineering Society, Cell Molecular Bioengineering Special Interest Group, St Thomas, USVI.

#### Invited

15. **Kristin S. Miller**, Christopher K. Breuer, Jay D. Humphrey. Hypothesis-Driven Parametric Study to Demonstrate the Predictive Capability of a Computational Model of In Vivo Tissue Engineered Vascular Grafts. 2014, World Congress of Biomechanics, Boston, MA.
16. Ramak Khosravi, **Kristin S. Miller**, Cameron A. Best, Yushane C. Shih, Yong-Ung Lee, Tai Yi, Christopher K. Biomechanical Characterization of Tissue-Engineered Vascular Grafts: Using a

Murine Model to Understand Venous Adaptations and Remodeling. 2014, World Congress of Biomechanics, Boston, MA.

## **SELECTED PRESENTATIONS/SEMINARS**

- University of Pennsylvania, Orthopaedic Bioengineering Seminar – 5/2008, 8/2009, 8/2010
- University of Pennsylvania, Leadership Techniques and Training – 9/2010
- Yale University, Translational Research Imaging Center Seminar – 8/2012,1/2013,8/2013,5/2014
- Tulane University, Pharmacology – 11/2014

### **Invited**

- Messiah College, Department of Engineering – 1/2014
- Virginia Tech, Department of Engineering Science and Mechanics – 2/2014
- Georgia Tech, School of Mechanical Engineering – 2/2014
- Tulane University, Department of Biomedical Engineering – 3/2014
- Baylor University, Department of Mechanical Engineering – 3/2014
- University of North Carolina Charlotte, Department of Mechanical Engineering – 3/2014
- University of Arkansas, Department of Biomedical Engineering – 4/2014

## **TEACHING EXPERIENCE/TRAINING**

### **Biofluid Mechanics, BMEN 3440, Tulane University**

Fall 2014

#### **Guest Lectures**

- BMEN 2310, Tulane University – Fall 2014
- BMEN 4031, Tulane University – Fall 2014
- BENG 353, Yale University – Fall 2013

### **Yale Scientific Teaching Fellows, Yale University**

Fall 2013

- Training in scientific teaching, active learning, assessment, diversity, backwards course design, and choosing teaching methods based on evidence
- Developed teaching materials that address challenging teaching issues in undergraduate science courses and engage students in thinking and behaving like scientists
- Created resources to highlight diversity in science

### **Department of Bioengineering, University of Pennsylvania**

2010, 2011

Teaching Assistant, *Engineering Principles of Human Physiology*

- Held office hours, advised students and graded course work and exams

## **MENTORING & ADVISING**

1. Lena Edelstein - Laboratory technician, University of Pennsylvania  
*Effect of preconditioning and stress relaxation on collagen fiber re-alignment of rat supraspinatus tendon*
2. Nicholas Trasolini – Undergraduate student, University of Pennsylvania  
*Quantifying collagen fiber crimp in situ in a developmental tendon mouse model*
3. Steve Thomas - Postdoctoral Fellow, University of Pennsylvania  
*Evaluating mechanical properties and collagen fiber re-alignment in rat subscapularis tendon*
4. Jennica Tucker – Laboratory technician, University of Pennsylvania

- Quantifying collagen fiber crimp throughout mechanical testing in murine tendon model*
5. Brianne Connizzo – Graduate student, University of Pennsylvania  
*Collagen Fiber Re-Alignment and Uncrimping in Response to Loading in murine models*
  6. Brian Lee – Undergraduate student, University of Pennsylvania  
*Comparison of collagen fiber alignment measurements during mechanical testing: Ultrasound and cross-polarizer; Crimp quantification program*
  7. Katie Reuther – Graduate student, University of Pennsylvania  
*Effect of overuse activity following an isolated supraspinatus tendon tear on adjacent intact tendons in rat model*
  8. Elizabeth Feeney – Undergraduate student, University of Pennsylvania  
*Collagen Fiber Re-Alignment and Uncrimping in Response to Loading in murine models*
  9. Chris White – Visiting medical student, Yale University  
*Scanning electron microscopy to examine elastic fibers in response to hypo-osmotic swelling*
  10. Brooks Udelsman - Medical student, Yale University  
*Characterization of Evolving Biomechanical Properties of Tissue Engineered Vascular Grafts in the Arterial Circulation*
  11. Ramak Khosravi - MD/Ph.D. student, Yale University  
*Characterization of Evolving Biomechanical Properties of Tissue Engineered Vascular Grafts in the Arterial Circulation*
  12. Sisira Gorthala – Undergraduate student, Yale University  
*Injection of alginate hydrogel to reverse left ventricular remodeling post myocardial infarction in a porcine model*
  13. Jonas Schwan – Graduate student, Yale University  
*Role of matrix metalloproteinases on left ventricular remodeling post myocardial infarction and correlations to mechanical function*
  14. Lara Fourman – Undergraduate student, Yale University  
*Role of hypo-osmotic swelling on carotid artery elastic lamella structure*
  15. Celestine Shih - Medical student, Yale University  
*Effect of polymer physiochemical properties on the inflammatory-mediated remodeling of tissue engineered vascular grafts*
  16. Derek Bivona – Undergraduate student, Tulane University  
*Residual strain in the women's reproductive system*
  17. Ben Sonin – Undergraduate student, Tulane University  
*An efficient framework for optimization and parameter sensitivity analysis in growth and remodeling computations of neovessel formation from an implanted polymeric construct*
  18. Katy Robison – Undergraduate student, Tulane University  
*Characterization of Evolving Biomechanical Properties of Murine Vagina Postpartum*
  19. Victoria Morris – Undergraduate student, Tulane University  
*Characterization of Evolving Biomechanical Properties of Murine Cervix during Normal and Abnormal Parturition*
  20. Jonathan Nguyen – Undergraduate student, Tulane University  
*Construction of a planar biaxial mechanical testing device for vaginal tissue: Assessment of anisotropy in pelvic organ prolapse*
  21. Taylor McCrady – Undergraduate student, Tulane University  
*Sex-differences in infraspinatus tendon in overhead throwing motion athletes*

22. Kat Brocker – Undergraduate student, Tulane University  
*Histomorphometric analysis of murine cervix during estrus cycle*

## **SERVICE**

### Manuscript Reviewer

- Annals of Biomedical Engineering
- Biomechanics and Modeling in Mechanobiology
- International Journal of Plasticity
- Journal of Biomechanics
- Journal of Biomechanical Engineering

### Society Memberships

- American Society of Mechanical Engineers
- Biomedical Engineering Society
- Sigma Xi Research Society