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Life Sciences & Bioengineering Center

Faculty & Staff

Kristen L. Billiar

Associate Professor
Faculty Listing
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Related Information

- Personal webpage
- Tissue Mechanics and Mechanobiology Lab
- Teaching
- Advising

Educational Background

- B.S., Cornell University, 1991
- M.S.E., University of Pennsylvania, 1992
- Ph.D., University of Pennsylvania, 1998

Research & Teaching Interests

Biomechanics of soft tissues and biomaterials; wound healing; tissue growth and development; functional tissue engineering and regenerative; medicine

IQP Advising Interests

Impact of new technologies

Research

Our research goal is to broaden the understanding of the influence of mechanical stimulation on the growth, development, and healing of connective tissues. We utilize engineered three-dimensional constructs as model systems to study the effect of multiaxial stimulation on the

cell physiology, matrix biochemistry, and biomechanics of soft tissues and biomaterials. Changes in cell phenotype are assessed by physiological, histological, and biochemical markers. Biomechanical evaluation includes sub-failure and failure micro-mechanical characterization and constitutive modeling. We are also studying the mechanics and composition of native collagenous connective tissues and how they are affected by processing prior to being used as implantable biomaterials. Knowledge gained from these studies will be applied to the study of normal and pathological tissue growth and development, wound healing, and the creation of bioartificial tissues in vitro (i.e., functional tissue engineering and regenerative medicine). Keywords: soft tissue mechanics, biomechanics, biomaterials, biopolymer, biaxial testing, tensile strength, mechano-biology, mechanical stimulation, mechanotransduction, tissue engineering, wound healing, extracellular matrix, ECM, growth, and remodeling.

Recent Publications

- Pai, S., Dunn, R., Babbitt, R., Strom, H., Lalikos, J., Pins, G., and Billiar, K.L. "Characterization of Forces on the Sternal Midline Following Median Sternotomy in a Porcine Model," J. Biomech. Eng. 2008, 130, 051004
- Marturano, J., Cleveland, B., Byrne, M., Wixted, J., Billiar, K., “An improved device for repeatable murine femur fracture for bone healing studies,” Journal of Biomechanics, 41(6), pp. 1222-8, 2008.
- Pai, S., Gunja, N., Dupak, E., McMahon, N., Roth, T., Lalikos, J., Dunn, R., Francalancia, N., Pins, P., Billiar, K.L.., “A Mechanical Study of Rigid Plate Configurations for Sternal Fixation,” Annals of Biomedical Engineering, 2007 May;35(5):808-16.
- Grouf, J., Throm, A., Balestrini, J., Bush, K., and Billiar, K.L., “Epidermal growth factor in fibrin-based tissue equivalents promotes tissue strength and remodeling without adverse contractility,” Tissue Engineering, 2007 Apr;13(4):799-807.
- Coburn, J., Brody, S., Billiar, K.L., Pandit, A., “Biaxial Mechanical Evaluation of Cholecyst-Derived Extracellular Matrix: A Weakly-anisotropic Potential Tissue Engineered Biomaterial,” Journal of Biomedical Materials Research, 2007 Apr;81(1):250-6 .

View detailed list

Years of Service at WPI

- Associate Professor, Worcester Polytechnic Institute, 2008-present
- Assistant Professor, Worcester Polytechnic Institute, 2002-2008

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