

## NANO-BME Seminar

**Time: 4:00PM Thursday, Mar 30**

**Location: EEP 253 and <https://sdsmt.zoom.us/j/99157370492>**

**4:00-4:20PM**

### **Bilayer Silk Fibroin Membranes and Their Uses in Wound Dressing Applications**

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Silk fibroin (SF) is desirable in the field of tissue engineering due to its physical and chemical properties. The material exhibits good toughness and elasticity, and allows for good cell adhesion and growth<sup>1</sup>. The material also does not exhibit cytotoxicity or cause foreign body responses<sup>2</sup>. SF can also be combined with other materials such as poly(caprolactone) (PCL)<sup>3-4</sup>, poly(vinyl acetate) (PVA<sub>c</sub>)<sup>4</sup>, hyaluronic acid (HA)<sup>3</sup>, or amniotic membrane (AM)<sup>1</sup> in the form of a bilayer membrane. This allows the wound dressing to mimic the structure of the epidermis and dermis layers of the skin<sup>5</sup>. The top layer is made of SF, and it prevents the dehydration and the penetration of bacteria of the wound site<sup>1</sup>. The bottom layer varies in its construction, but aims to promote re-epithelialization and anti-inflammatory responses<sup>5</sup>. The materials that make up the bottom layer generally exhibit low mechanical strength and a high degradation rate. Based on the results of cell scratch models, cytotoxicity assays, and the analysis of the bacterial penetration, the scar evaluation index, and the epidermal thickness index, the viability of bilayer silk fibroin membranes in wound dressing applications is shown to have potential in the field of tissue engineering.

#### **References**

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**4:20-4:40PM**

## **Relationship Between Lower Extremities and Foot Alignment**

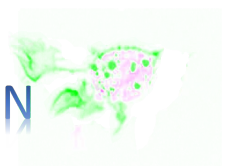
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This literature review contains biomechanical studies aiming to reduce lower back pain by analyzing patient lower extremity alignment. In searching for an answer to chronic back pain, scientists have been looking for answers to potential changes in factors influencing the spine. There is much discussion over the impacts of foot alignment on the angle relating to the spinal column (1). The variety of biomechanical technologies used in analyzing this relationship are vast, including 3D ultrasound motion systems (2). Other impacted regions due to foot alignment involve the pelvis (3). Studies on solutions involving shoe inserts designed specifically for the patient have been proven effective in reducing low back pain (4,5). Other studies aim to find analysis techniques that properly evaluate foot alignment in relation to patient back pain. These studies show the positive affects on lower back pain when foot alignment is corrected.

### **References**

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- (2) Farokhmanesh, K., Shirzadian, T., Mahboubi, M., & Shahri, M. N. (2014). Effect of foot hyperpronation on lumbar lordosis and thoracic kyphosis in standing position using 3 dimensional ultrasound-based motion analysis system. *Global journal of health science*, *6*(5), 254–260.
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**4:40-5:00PM**

## **Development of a Physiologically-Relevant In Vitro Angiogenesis Platform**

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The current standard for investigating fundamental biological mechanisms and performing biomedical testing is cell culture and animal models. Two-dimensional cell culture has been pivotal in advancing our understanding of biological processes, however, cellular response in a 2D environment often differs from an in vivo response. The purpose of the animal model is to serve as a medium for investigating the interactions between a complex system with a device, drug, or biological modification, which may overcome the challenges discussed in 2D cell culture. However, evidence indicates that the results from animal models cannot confidently predict human outcomes either. The challenge behind this extrapolation is attributed to genetic, immunologic, and cellular differences between animals and humans. These hurdles incentivize the development of standardized, physiologically-relevant, in vitro models using human cells cultured in three-dimensional hydrogel systems that may provide a reservoir for data collection surrounding human cell responses. Our goal is to develop a physiologically-relevant, in vitro angiogenesis model that will be expanded to applications in exposure assays, biological materials characterization, and drug delivery.

