

## Research Scholarship Final Report

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Tissue reconstruction may be required to correct tissue defects and damage caused by tumor resection, trauma or congenital defects. Limitations to current clinical treatment for tissue defects include tissue availability, difficulty in transfer of the tissue, and donor site morbidity. Engineered tissues could be used as alternative to traditional surgical methods to repair, restore or replace damaged tissue. In addition to applications for tissue reconstruction, engineered tissues provide controlled conditions for studying cell-extracellular matrix interactions in 3-dimensional environments that more closely approximate *in vivo* conditions.

Marcella Schmidt, a doctoral student in biomedical engineering, under the guidance of Dr. Eric Brey is focusing on engineering biomaterials from natural sources for use in tissue regeneration. For tissue regeneration it is important that the biomaterial mimic the natural structures and functions of the extracellular matrix in healthy tissue. The extracellular matrix has several functions including providing mechanical support for cell attachment, regulating cell behavior, providing structural support for tissue renewal, and storage and presentation of regulatory molecules. The complexity of the extracellular matrix makes it difficult to recreate using synthetic materials. An advantage of using naturally derived biomaterials is that the components extracted from the natural source remain in their natural biologically active state both chemically and structurally. These components better recapitulate the natural extracellular matrix composition and structure of the tissue.

In developing a clinically useful biomaterial it is important for the material to enhance the tissue's own efforts to regenerate and repair itself. Schmidt's research includes evaluating the ability of tissue derived materials to support cell growth, promote cell differentiation, and stimulate vascularized tissue growth. She has extracted and assembled gels from a variety of tissue types and sources. The extracts composition varies depending upon the type of tissue used for the extraction, her research has worked toward quantifying differences in composition among the different tissue sources.

She is also investigating the relationship between the chemical and physical properties of these various tissue derived materials and cell behavior in order to further understand the similarities and differences among the gels in terms of regulating cell function. Schmidt has cultured cells on these materials creating a 3-dimensional cell culture environment to investigate cell attachment, cell proliferation and cell response to the gels. Cell interaction with the gels provides valuable information that can be used to optimize their therapeutic potential.