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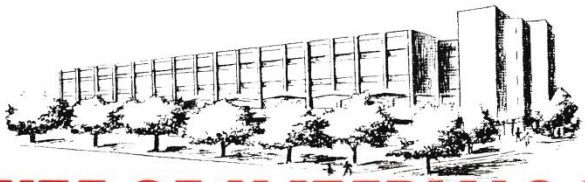

INSTITUTE OF MATERIALS SCIENCE

POLYMER PROGRAM SEMINAR

"Engineering the 3D Liver Microenvironment"

Prof. Padma Rajagopalan
Virginia Tech

Friday, April 22, 2016
11:10 AM, IMS Room 20

ABSTRACT

The liver plays a critical role in metabolism, biotransformation and detoxification. The design of *in vitro* models that mimic the stratified multi-cellular hepatic structure continues to be challenging. Hepatic cells rapidly lose their functions in culture, underscoring the need to recreate their microenvironment found *in vivo*. We have assembled a novel 3D organotypic liver model incorporating three different primary cell types (hepatocytes, liver sinusoidal endothelial, and Kupffer cells) and a polymeric membrane that mimics the Space of Disse. The polymeric membranes are free-standing, optically transparent, and derived from self-assembled multilayers. The mechanical properties of the polymeric membranes can be varied to mimic basement membranes that exhibit a wide range of physical properties. In our studies, only the 3D liver models simultaneously maintained hepatic phenotype and elicited proliferation while achieving cellular ratios found *in vivo*. Ongoing investigations using these liver models are focused on understanding inter-cellular communications between hepatic parenchymal and non-parenchymal cells, and, responsiveness to toxicants.

Chronic liver diseases, often associated with alcoholism, hepatitis and other health conditions can lead to hepatic fibrosis and eventually cirrhosis. As hepatic fibrosis occurs, an abundance of extracellular matrix proteins are produced. This buildup of proteins causes changes in the liver microarchitecture and can result in a six-fold increase in liver stiffness. We are designing biomaterial substrates that mimic fibrotic liver tissues. We are investigating the effects of substrate elasticity on liver endothelial cell function. Our results demonstrate changes in endothelial cell fenestrae diameter and changes in phenotypic markers.

**For further information, please contact YoungHee Chudy at younghee.chudy@uconn.edu.*

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