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**Hosted by**

***University of Southern California  
University of California at Los Angeles  
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Steven George, PhD, University of California at Irvine  
Timothy Deming, PhD, University of California at Los Angeles**

#### **P4.161. A Three Dimensional Hydrogel Cell Culture System For Modeling The Blood Brain Barrier.**

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The blood brain barrier (BBB) is a complex polarized tissue that is formed by the interactions of endothelial cells with neurons, astrocytes, and microglia. This complexity has impeded development of in vitro model systems that accurately represent the permeability and transport properties of brain microvasculature, typically measured indirectly by trans-endothelial resistance. We present a novel hydrogel based system for modeling the blood brain barrier. This system recapitulates three-dimensional tissue organization at cell densities (~100k cells/microL) and ratios similar to those found in rat cortex. Three-dimensional hydrogels were formed in a flow chamber mounted on a microelectrode array. Peptide (GGGGRGDY)-modified alginate (0.5%) cell constructs of neurons, astrocytes, and microglia were formed and then endothelial cells added to form a monolayer on the hydrogel surface. Encapsulated cells can make contacts with the endothelial cells. This system permits controlled pulsatile flow for long-term culture, controlled drug delivery, and regular impedance measurements. BBB development and integrity was monitored by trans-endothelial impedance and three-dimensional morphological observations and measurements to describe cell-to-cell interactions and endothelial tight junction formation. We propose this system is capable of more closely approximating the tissue organization and electrical properties of the intact BBB.