Biomaterial Interfaces
Room: Hall D - Session BI-ThP

Biomaterial Interfaces Poster Session

BI-ThP2 Electroassembled Cell Populations in Microfluidic Gradient Generators for Biomolecule Screening, ***Chris Wolfram***, University of Maryland, College Park, *X. Luo*, The Catholic University of America, *H.C. Wu, C.Y. Tsao, M. Guo, G.W. Rubloff, W.E. Bentley, H. Sintim*, University of Maryland, College Park

Laminar flow at the microscale has led to the development of novel new methods for the generation of stable, highly controllable gradients in microfluidic devices. These well-characterized devices have enabled the study of bacterial behavior in complex microenvironments, as well as quantifying the strength of their response to varying concentrations of small molecules. However, flow-based gradient generators subject bacterial cells to shear stress which can attenuate any observed response and make single cell tracking difficult. Static gradient generators eliminate this effect, but the established gradient decays as a function of time due to diffusion. Entrapping cell populations in hydrogels protect them from turbulent environmental conditions, allowing for the use of flow. Additionally, spatially constraining these cells in an array subjects individual cells to the same local concentration without continual gradient deterioration.

The use of electroaddressable hydrogels has been previously demonstrated as a platform for biofabricating “model biofilms.” Entrapping populations of *E. coli* in these stimuli-responsive polysaccharide hydrogels enables bacterial signaling interrogation in microfluidic environments with high precision. This technique is integrated within a flow-based microfluidic gradient generator as a device for probing the comparative effects of signaling molecules and nutrients on *E. coli*. The entrapped cells express fluorescent proteins when exposed to a molecule of interest, dependent on the concentration of this molecule. This platform is used for screening the effects of several small molecules on bacterial populations through expression of fluorescent proteins, while mitigating interference from flow-based shear stress or gradient-flattening from diffusion. A concentration-dependent fluorescent response to the interkingdom signaling molecule Autoinducer-2 is demonstrated.

Authors Index

Bold page numbers indicate the presenter