

Nayar Prize II Phase I Quarterly Progress Report

January 2017

Project: Microfluidic Drug-Microbiota Interaction Platform

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Progress Summary of Nayar Prize II Phase I

In the first three months of being selected as a Phase II finalist for the Nayar Prize, our group has made extraordinary efforts to advance rapidly toward the milestones. Our overall project goals are to study the role microbiota play in influencing drug metabolism. To facilitate study of interactions between the large number of potential combinations of drugs and microbiota, we are developing a microfluidic platform to carry out the study in high-throughput. We have made progress on a number of areas related to our Phase I milestone of a customizable microfluidic platform including: 1) construction of a first generation of microfluidic devices with biomembranes and 2) establishment of gut cells in the biomembrane device. Work in these areas has already led to the submission of two conference abstracts.

1) Construction of microfluidic device with biomembranes. We have developed novel microfluidic devices that incorporate micrometer resolution thick membranes that are synthesized out of extracellular matrices. These extracellular matrices, which are supplied as a liquid, were coated on a glass slide and freeze-dried. The resulting sheet was peeled off and sandwiched between two fluidic layers to form a two-chamber microfluidic device using a novel device fabrication method. The collagen fibrils can be seen clearly in the device (**Figure 1**).

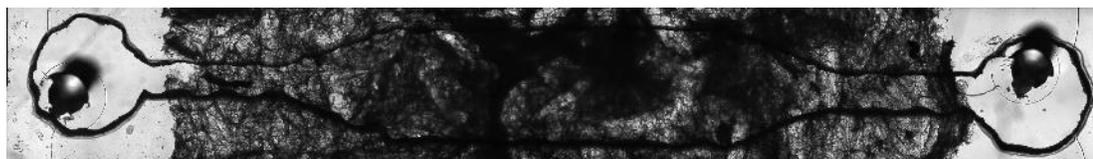


Figure 1. A two-layer microfluidic device with a sandwiched collagen membrane.

impact

2) Establishment of gut cells in the device. We have successfully cultured gut cells on the membrane in the device. Cells cultured on the membrane have excellent viability for extended periods of time, which is extremely valuable and promising for our future studies.

Abstracts Submitted

1. Chengyao Wang, Nida Tanataweethum, Genoveva Murillo, Rajendra Mehta, Abhinav Bhushan, "A novel microfluidic device with an extracellular matrix based membrane," Experimental Biology, Chicago, IL April 2017.
2. Tung Nguyen, Abhinav Bhushan, "A simple, multilayer PET microfluidic device to reduce hydrophobic molecule absorption," Pittcon, Chicago, IL March 2017.