

## Nayar Prize II Phase I Quarterly Progress Report (Q3) July 2017

**Project:** Microfluidic Drug-Microbiota Interaction Platform

**Team:** Abhinav Bhushan, Rajendra Mehta, Genoveva Murillo

**Postdoctoral:** Sonali Karnik

**Students:** Kihwan Kim, Tung Nguyen, Chengyao Wang, Rongfei Wu

### Progress Summary

Since April, we have made significant progress on the construction and testing of the microfluidic intestinal platform. 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 several areas related to our phase I milestone of a customizable microfluidic platform including: 1) construction of microfluidic devices with biomembranes and 2) establishment of intestine cells in the device. Another poster was presented at a national conference, Experimental Biology, where the work received very positive feedback. We have now isolated and cultured primary colon and jejunum cells from animal (mouse) and human (from a Crohn's patient) intestinal tissue (Figure 1). Primary cells are more representative of physiology than cell lines. These cells traditionally are grown as 3D organoids, which have the multicellular form of the organ but lack many features that are critical for organ function, such as vascular perfusion. We have been successful in growing the organoids in our devices and are now transitioning to culture of layers of stems cells that are derived from these organoids.

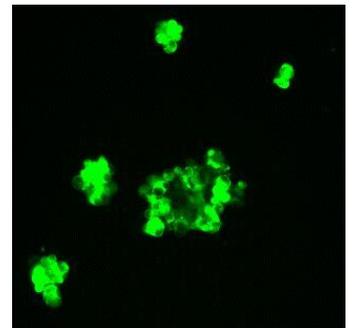


Figure 1. Primary intestinal colon cells in the microfluidic device. The green color indicates live cells.

#### Poster Presented:

Tung Nguyen, Abhinav Bhushan, "A simple, multilayer PET microfluidic device to reduce hydrophobic molecule absorption," Pittcon, 2017. This work won First Prize at the Kilpatrick symposium 2017.

#### Poster Presented:

Chengyao Wang, Nida Tanataweethum, Genoveva Murillo, Rajendra Mehta, Abhinav Bhushan, "A novel microfluidic device with an extracellular matrix-based membrane," Experimental Biology, 2017.