A Long-lived Organ-on-chip Model of the Human Vasculature

Team 18: **Tyler Crawford, Krishna Kotak, Vien Tran**
Technical Advisors: **Robert Gaibler (Draper), Corin Williams (Draper)**

Organ on a chip (OOC) technology offers an accurate and responsive model of natural human physiology. This technology has gained interest recently for its ability to enhance drug discovery at preclinical stages for the testing of new drugs. Draper has developed PREDICT96, a unique high-throughput OOC platform that is capable of supporting vascular models under physiologically relevant fluid shear stress. Although the PREDICT96 has a longer viability and function compared to the static culture system, the lifespan has not been tested for longer than two weeks. The goal of this project is to test the current lifetime limits and then improve the model with enhanced longevity to 2-3 months. To extend the model's lifetime, we will target its barrier function by co-culturing primary human coronary endothelial and smooth muscle cells, exposing the endothelial layer to high fluid shear stress, and adding various factors. To test if the model is able to respond and recover from drug perturbations, an anti-inflammatory drug is added and the response is physically and chemically characterized. Early results from trans-epithelial electrical resistance measurements and LIVE/DEAD staining have elucidated that co-cultured high shear stress devices contained more viable cells with a stronger barrier. Other factors, such as forskolin, were also shown to improve barrier function.