

Oxygen Modulation via Microfluidic Devices

Oxygen is a key but under-studied metabolic variable. It influences biological phenomena as diverse as developmental biology, stem cell differentiation, liver zonation, angiogenesis, proliferation, migration, metabolism, cancer biology, and apoptosis. Yet current methods to modulate oxygen are crude and inefficient. Our lab has developed a suite of devices which can rapidly alter oxygen conditions surrounding cells in both position and time.[1-3]. Moreover, because the new tools are easy to use and designed for standard culture formats such as multiwell plates, Boyden chambers, and 3D cell cultures, there should be little barrier to their dissemination and broad use.

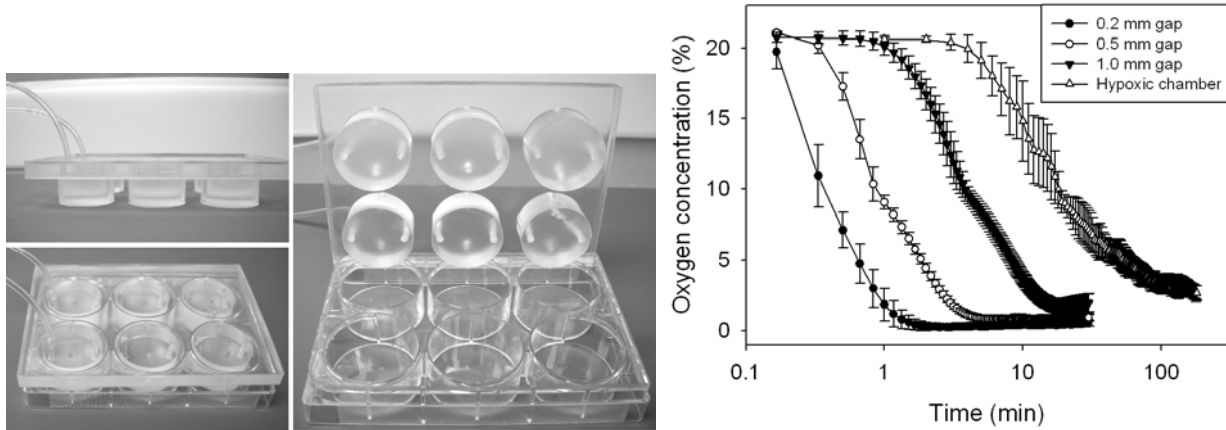


Figure 1. Image of an oxygen delivery system for multiwell plates and plots of oxygen dynamics in this system.

Specific tasks of the REU fellows include the design, fabrication, and testing of various bioMEMS devices. In addition, the REU fellows will be exposed our other projects which are mainly focused on disseminating devices to other laboratories. The REU fellow activities will be performed alongside graduate students who are pursuing their PhD degrees in this area.

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1. Oppegard, S.C., A.Blake, J.C. Williams, and D.T. Eddington, *Precise Control over the Oxygenation Conditions within the Boyden Chamber with a Microfabricated Insert*. Lab on a Chip, 2010(In Press).
 2. Lo, J.F., E. Sinkala, and D.T. Eddington, *Oxygen gradients for open well cellular cultures via microfluidic substrates*. Lab on a Chip, 2010(In Press).
 3. Oppegard, S.C., K.-H. Nam, J.R. Carr, S.C. Skaalure, and D.T. Eddington, *Modulating Temporal and Spatial Oxygenation over Adherent Cellular Cultures*. PLoS ONE, 2009. 4(9): p. e6891.