MONASH
ENGINEERING

MONASH University

Faculty of Engineering
Summer Research Program 2022-2023

Project Title: Dynamic microfluidic cell culture platforms

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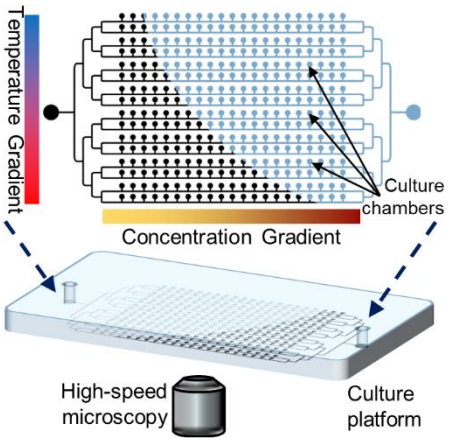
Objective

This project aims to develop a dynamic microfluidic cell culture platform that closely mimics the geometry and physiochemical features of the *in vivo* environment, including fluid flow and peristaltic motions. The platform will be applied to study embryo and epithelial cell culture conditions, to identify stage-specific conditions for the optimal cell health and growth as well as embryo development.

Project Details

Infetility is on the rise in Australia affecting one in six couples. The treatments currently available have plateaued in their effectiveness at a success rate of 33%. Engineers can build the tools to improve effectiveness of these clinical processes. One approach we are investigating is more colosely mimicing *in vivo* conditions in an *in vitro* environment. This requires increasing understanding of the biological process and optimisation of the systems used to mimic them.



By creating a network of branching microchannels, each with multiple culture chambers we can enabling over 20 data points at a time. Pressure driven deformation will give rise to time-dependant flow variation. The platform will be equipped with an environment chamber to control temperature and humidity. The device will be loaded with culture media and cells will be placed in culture chambers. The functionality of the platform will be optimized with respect to media composition, oxygen level, CO2 concentration, flow velocity, and peristaltic motion. Such a platform is capable of closely mimicking the geometry and physiochemical features of the *in vivo* environment, while providing a quantitative tool for monitoring the optimal culture microenvironment.

Prerequisites

Background in fluid mechanics (MEC2404 or CHE2161), and interest in fluid mechanics, experimentation, microscopy, and cell biology.

Additional Information

Applicants may be required to attend an interview, and for more information please contact Prof. Adrian Neild (Adrian.Neild@monash.edu).