

Project Title

A Novel Organ-in-Chip Platform for Gynaecological Sarcomas

Supervisor(s)

Professor Darryl Overby

Dr Paul Huang

Project Description

Gynaecological sarcomas account for 3-4% of all gynaecological cancers, with ~280 women diagnosed annually and a 5-year relative survival rate of <50%. To study gynaecological sarcomas, the Huang lab uses patient-derived xenografts (PDXs) grown in mice. PDXs, though useful for many applications, neglect the tumour microenvironment (TME), which includes tissue structure and stromal and immune cells resident within a patient's tumour that influence how cancer cells grow, metastasise and respond to drugs.

To capture the TME, the Overby lab developed an organ-in-chip device to preserve the viability of tissue explants over several days. The explant is placed within a microchannel designed to achieve self-sealing between the explant and channel wall. With a pressure drop, flow is driven through (not around) the explant to supply internal cells with oxygen and nutrients.

In this project, the student will adapt the current organ-in-chip design to accommodate explants from gynaecological sarcomas, using PDXs from mice before incorporating primary human tumour explants. The aims are to:

1. Re-engineer the organ-in-chip platform for gynaecological sarcoma explants
2. Determine how perfusion preserves explant viability and function
3. Demonstrate a chemotherapeutic response within the explant during perfusion and compare this response against patient-derived spheroid/organoids and precision-cut tumour slices.