

Project Title	Self-assembled vascularised organoid-on-chip models to study the shedding of tumour DNA into circulation
Supervisor(s)	Professor Nicola Valeri Dr Sam Au
Project Description	<p>The shedding of cell-free tumour DNA (ctDNA) by tumours provides a promising biomarker for diagnosis and monitoring/shaping treatment. There is however great variability amongst tumours in their ability to shed detectable amounts of ctDNA into circulation and we do not understand to what extent vascularisation of tumours and hemodynamics affects this. This is particularly true after post-operative excision of tumours when the detection of residual tumour cells is both important yet more challenging due to reduced tumour mass.</p> <p>In this project, the student will develop microfluidics devices that culture patient derived organoids (PDOs) with controllable levels of spontaneous self-assembled vascularisation (no, low, moderate or high degrees of vasculature). Building upon organoid hydrogel devices in the Au Lab, the student will co-culture PDOs provided by the Valeri group with human vascular endothelial cells in the presence or absence of vascular endothelial growth factor to promote the self-assembly of microvessels that interface with on-chip microchannels. These interconnected vasculature networks will allow the simultaneous feeding of organoids and the collection of media effluent for detection of shed ctDNA over days-week and to correlate ctDNA shedding to vasculature network resistance.</p> <p>This project will give us a quantitative understanding of how the degree of tumour vascularisation affects our ability to detect ctDNA and may help us guide our treatment and management of the disease.</p>