

**Project Title** An Organ-in-Chip Platform for Targeted Intra-Tumour Drug Delivery using Acoustic Cluster Therapy (ACT)

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**Project Description** Physical barriers in a tumour limit drug delivery. To penetrate these barriers, the Bamber laboratory developed ACT, which uses microbubbles and ultrasound to permeabilise blood vessels and enhance drug delivery. With Prof. Banerji, ACT has progressed to Phase I/II trials. The challenge is how to fully leverage/optimize ACT to maximise drug delivery. Optimisation requires EPS approaches to understand the mechanism of permeabilisation and to guide selection of ultrasound parameters, cavitation nuclei and therapeutic dose.

The Overby lab developed an organ-in-chip platform capable of preserving the viability of human tumour explants over several days. This platform has the advantage of maintaining the native microenvironment and offers the opportunity to investigate a range of experimental variables under controlled conditions. During perfusion, a portion of the flow passes through vasculature within the explant. The goal of this project is to leverage the organ-in-chip platform to investigate and optimise the mechanism of ACT to improve cancer drug delivery within tissue.

The aims of this project are to:

1. Confirm intravascular microbubble delivery within perfused explants
2. Re-engineer the organ-in-chip platform for ultrasound compatibility
3. Demonstrate drug delivery within explants using ACT

Tissue will be from cadaveric mice used for other projects following humane culling.