Microfluidic devices are fabricated using polydimethylsiloxane (PDMS) based soft lithography. This method utilises equipment widely available in an academic research environment and produces devices with sufficient resolution for common microfluidic research[3].

Simulation

To complement our experimental work we have developed a statistical computational model that aims to emulate the experimental system. This model can be used to make qualitative predictions about the survival rates of bacteria in micro-environments of different sizes.

3. Results

Experimental

We have designed and fabricated a microfluidic device that produces a large array of monodisperse droplets within which we can image bacterial growth using a microscope. Droplets size can be easily controlled with droplet diameter ranging from 50-400µm.

Simulation

Based on simple computer simulations we hypothesise that when bacteria are loaded into small droplets, at a fixed antibiotic concentration, variation in the number of bacteria loaded into each droplet will result in a greater percentage of bacteria surviving, when compared to an equivalent experiment being conducted in the macroscopic bulk. If this can be verified experimentally, it could fundamentally change how we conduct antibiotic research.

4. Moving Forward

We plan to test the simulation predictions experimentally; measuring growth curves of bacterial colonies trapped in microfluidic droplets. Beyond this, we hope to increase the complexity of the computational model such that it can make testable, quantitative predictions.