

Jacob Carter-Gibb: Civil Engineering

Mentor: Connie Chang -- Chemical & Biological Engineering

Microfluidic particles as a tool for monitoring oxygen levels in biofilms in magnetic resonance microscopy

Microfluidics is a rapidly growing field with many biological applications that have not yet been fully utilized. This project aims to create biologically compatible microparticles that, when used with nuclear magnetic resonance (NMR), will allow researchers to monitor the oxygen during the growth of biofilms. The goal of this project will be to make double emulsions (drops within drops) of fluorinated oil encapsulated by a biologically compatible shell made of a hydrogel, such as agarose, that will serve as a surface for the biofilm to grow. To accomplish this, microfluidic devices will be used to create these particles quickly and in large numbers, at the rate of hundreds of thousands in minutes. A secondary goal will be to fine tune the devices to allow custom sizes of the agarose shells and the fluid encapsulated. Future research will include tuning these microparticles to better understand the diffusion of oxygen through biofilms as they grow, which will allow us to understand the role of oxygen in chronic wound biofilms. The hypothesis of this experiment is that the particles that we create for use in NMR will function better and provide a higher resolution than the polydisperse, or varying in droplet size, basic emulsion system currently being used.

Acknowledgements: Devin Figgins (MSU Graduate Student) - Chemical & Biological Engineering