

DEPARTMENT OF INTERNAL MEDICINE
COLLEGE OF MEDICINE

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2025

PROJECT TITLE: In silico simulations of ultrasound propagation for treating Deep Vein Thrombosis

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Project Description

Deep vein thrombosis is a common pathology where the large veins of the leg can become blocked by thrombi (blood clots) and blood does not circulate properly. In severe cases it can lead to significant pain, amputation, and potentially death if the thrombus migrates to the lungs. Histotripsy is a therapeutic form of ultrasound that focuses mechanical energy to a small location in the body. The focused ultrasound can mechanically disrupt the tissue (i.e., liquify it). Our team (which spans the University of Cincinnati, the University of Chicago, and Virginia Tech University) has demonstrated that histotripsy can accelerate blood flow return in pre-clinical models. However, in these past studies, it was observed that aberration of the ultrasound (i.e., defocusing of the waves due to tissue variations) can significantly impede treatment. This project will use coding and in silico models to simulate ultrasound propagation and develop techniques to re-focus ultrasound waves in a manner that accounts for variations in tissue. This project will use MATLAB or Python to perform the simulations.