PROJECT TITLE: Chronic thrombus ablation with histotripsy and thrombolytics

Project Description

Our long-term objective is to develop an image-guided strategy to treat chronic deep vein thrombosis (DVT) using a combination of histotripsy, a type of high amplitude, pulsed therapeutic ultrasound and catheter-directed thrombolytics. Our overall hypothesis is that the mechanical action of histotripsy-induced bubble clouds enhances intravenous thrombolysis. Furthermore, histotripsy-triggered rt-PA delivery from a thrombus-targeted echogenic drug delivery vesicle will increase treatment specificity and will improve the outcomes for DVT patients. In vitro studies will be performed at UC in a flow phantom to correlate treatment efficacy with maps of bubble activity. Preclinical studies of thrombolytic efficacy in the porcine animal model of DVT will be performed in the CCHMC interventional radiology catheter laboratory for animal studies. The WISE student will help develop an image-guidance system to monitor histotripsy therapy progress using a research ultrasound imaging platform (Vantage, Verasonics, Kirkland, WA, USA) to collect passive cavitation images, B-mode images, and duplex Doppler images. Training will include familiarity with databases for scientific literature review, general lab safety training, wet lab skills, Matlab control of dedicated data acquisition, instrumentation, and analysis, and nanoparticle characterization techniques.