Project Title: Ultrasound-enhanced thrombolysis for the treatment of stroke

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Project Description

Combined ultrasound and tissue plasminogen activator (rt-PA) therapy, or sonothrombolysis, has been shown to improve recanalization in patients with acute ischemic stroke. Effective methods of enhancing clot dissolution (thrombolysis) have been examined in an attempt to reduce the risk of hemorrhagic events. In our ongoing studies, we have demonstrated that significant enhancement of thrombolysis correlates with the presence of stable cavitation and this type of gentle bubble activity can be sustained using an intermittent infusion of a contrast agent. In addition, we have demonstrated encapsulation and ultrasound-triggered release of nitric oxide and other bioactive gases to promote vasodilation, and neuroprotection. The WISE student will investigate the potential of echogenic liposomes to deliver rt-PA and nitric oxide, a bioactive gas, in a porcine arterial thrombus model. Successful completion of the proposed studies will elucidate the utility and potential risks of ultrasound-enhanced thrombolysis and ultrasound-mediated delivery of vasodilatory or cytoprotective gases and will provide important new information to assist the design of targeted agents to improve thrombolysis and neuroprotection in acute stroke treatment. Training will include Institutional Care and Animal Use and Institutional Review Board training modules, 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.