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Effects of viscosity on endothelial cell damage under acoustic droplet vaporization ROBINSON SEDA, RAHUL SINGH, DAVID LI, JOHN PITRE, ANDREW PUTNAM, J. BRIAN FOWLKES, JOSEPH BULL, University of Michigan — Acoustic droplet vaporization (ADV) is a process by which stabilized superheated microdroplets are able to undergo phase transition with the aid of focused ultrasound. Gas bubbles resulting from ADV can provide local occlusion of the blood vessels supplying diseased tissue, such as tumors. The ADV process can also induce bioeffects that increase vessel permeability, which is beneficial for localized drug delivery. Previous in vitro studies have demonstrated that vaporization at the endothelial layer will affect cell attachment and viability. Several hypotheses have been proposed to elucidate the mechanism of damage including the generation of normal and shear stresses during bubble expansion. A single 3.5 MHz ultrasound pulse consisting of 8 cycles ($\sim$ 2 .3 μs) and a 6 MPa peak rarefactional pressure was used to induce ADV on endothelial cells in media of different viscosities. Carboxylmethyl cellulose was added to the cell media to increase the viscosity up to 300 cP to and aid in the reduction of stresses during bubble expansion. The likelihood of cell damage was decreased when compared to our control ($\sim$ 1 cP), but it was still present in some cases indicating that the mechanism of damage does not depend entirely on viscous stresses associated with bubble expansion. This work was supported by NIH grant R01EB006476.

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