Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Are endothelial cell bioeffects from acoustic droplet vaporization proximity dependent? ROBINSON SEDA, DAVID LI, J. BRIAN FOWLKES, JOSEPH BULL, University of Michigan — Acoustic droplet vaporization (ADV) produces gas microbubbles that provide a means of selective occlusion in gas embolotherapy. Vaporization and subsequent occlusion occur inside blood vessels supplying the targeted tissue, such as tumors. Theoretical and computational studies showed that ADV within a vessel can impart high fluid mechanical stresses on the vessel wall. Previous in vitro studies have demonstrated that vaporization at an endothelial layer may affect cell attachment and viability. The current study is aimed at investigating the role of vaporization distance away from the endothelial layer. HUVECs were cultured in OptiCell^{TM}chambers until reaching confluence. Dodecafluoropentane microdroplets were added, attaining a 10:1 droplet to cell ratio. A single ultrasound pulse (7.5 MHz) consisting of 16 cycles ($\sim$ 2 μs) and a 5 MPa peak rarefactional pressure was used to produce ADV while varying the vaporization distance from the endothelial layer (0 μm, 500 μm, 1000 μm). Results indicated that cell attachment and viability was significantly different if the distance was 0 μm (at the endothelial layer). Other distances were not significantly different from the control. ADV will significantly affect the endothelium if droplets are in direct contact with the cells. Droplet concentration and flow conditions inside blood vessels may play an important role. This work was supported by NIH grant R01EB006476.

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Date submitted: 02 Aug 2013 Electronic form version 1.4