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Bioeffects due to acoustic droplet vaporization JOSEPH BULL, University of Michigan — Encapsulated micro- and nano-droplets can be vaporized via ultrasound, a process termed acoustic droplet vaporization. Our interest is primarily motivated by a developmental gas embolotherapy technique for cancer treatment. In this methodology, infarction of tumors is induced by selectively formed vascular gas bubbles that arise from the acoustic vaporization of vascular microdroplets. Additionally, the microdroplets may be used as vehicles for localized drug delivery, with or without flow occlusion. In this talk, we examine the dynamics of acoustic droplet vaporization through experiments and theoretical/computational fluid mechanics models, and investigate the bioeffects of acoustic droplet vaporization on endothelial cells and in vivo. Early timescale vaporization events, including phase change, are directly visualized using ultra-high speed imaging, and the influence of acoustic parameters on droplet/bubble dynamics is discussed. Acoustic and fluid mechanics parameters affecting the severity of endothelial cell bioeffects are explored. These findings suggest parameter spaces for which bioeffects may be reduced or enhanced, depending on the objective of the therapy. This work was supported by NIH grant R01EB006476.

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