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Bubble dynamics in high-amplitude ultrasound therapies[1] ERIC JOHNSEN, LAUREN MANCIA, University of Michigan — Cavitation plays an important role in certain therapeutic ultrasound procedures, such as histotripsy in which megahertz pressure pulses are used to destroy tissue. The large tensions (¿ 25 MPa) nucleate bubbles in the tissue, which rapidly grow to radii on the order of hundreds of microns and subsequently collapse. To better understand potential cavitation-induced damage, we developed a numerical framework for spherical bubble dynamics in soft tissue that includes liquid compressibility and full thermal effects, as well as a comprehensive viscoelastic model with elasticity, relaxation, viscosity and various nonlinearities. This framework has enabled us to understand the effects of the viscoelastic and thermal properties of the tissue on the bubble dynamics, and compute stress and temperature fields in the surroundings. Results indicate that different viscoelastic properties affect the bubble dynamics differently, but that overall the viscoelastic nature of tissue produces larger stresses and increased heating on the surroundings, compared to bubble dynamics in purely viscous liquids.

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Eric Johnsen
University of Michigan

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