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Temperature measurements and determination of cavitation
thresholds during High Intensity Focused Ultrasound (HIFU)
Exposures in ex-vivo porcine muscle

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Cavitation in HIFU procedures can yield unpredictable results, particularly when the same location is targeted for more than several seconds. To study this effect, temperature rise was measured in fresh ex-vivo porcine tissue during HIFU exposures. Immediately following euthanasia, a section of back muscle (latissimus dorsi) was resected and a 50 μm diameter fine bare wire thermocouple was placed via needle through the tissue. 825 kHz HIFU was then applied to the tissue focused at the thermocouple junction. Thirty second HIFU exposures of increasing pressure from 1-7.5 MPa were applied and the temperature rise and decay during and after sonication were recorded. B-mode imaging was used to monitor any cavitation activity during sonication. If cavitation was noted during the sonication, the sonication was repeated at the same pressure level two more times at 20 minute intervals in order to characterize the repeatability given that cavitation has occurred. The cavitation threshold of porcine muscle was determined to be between 4 and 7 MPa. Temperature traces obtained at various pressure levels demonstrated a wide range of heating profiles in fresh ex-vivo tissue due to both the occurrence of cavitation and viscous heating artifacts. (This research was supported by DARPA IAG # 224-05-6016).