The Use of High Intensity Focused Ultrasound to Induce Tissue Ablation

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Although most physics departments in the US don’t have much research ongoing in acoustics, [BYU a notable exception] there are a lot of important problems in which a physics background is practically essential in order to develop a rigorous approach to the solution of these problems. This is especially true in the area of Medical Ultrasound, a research speciality that provides great benefit to the broad health community. I shall address a particular aspect of medical ultrasound research, namely non-invasive, (ultrasound) image-guided therapy. When high intensity focused ultrasound is directed toward a tissue, such as a tumor, mechanical and thermal effects can be generated that totally emulsify the tissue in the focal region. The mechanism for this ablation may either be cavitation, in which gas-filled cavities can be made to violently grow and collapse; or superheat boiling, in which the explosive growth of a superheated region occurs. This presentation will describe the relative effectiveness of these two methodologies to ablate a region of interest, such as benign and malignant tumors. The development of clinical applications of this technology has high promise for radically changing the current approach to tumor therapy.

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