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Focused ultrasound for targeted and noninvasive therapies

Abstract: The future of effective treatments lies in approaches that specifically target aberrant tissue while being applied remotely, in an incisionless manner. Focused ultrasound has emerged as a unique theranostic modality that combines depth penetration and sharp focus, within which it can exert mechanical or thermal effects. The modality begins to be used for noninvasive stimulation of excitable cells and for targeted drug delivery.

The ability of ultrasound to remotely stimulate excitable cells has far-reaching implications for treatments of disorders of the nervous system. I have pursued this direction under a K99/R00 grant from the NIH. I will present our recent findings regarding the biophysical mechanism using which ultrasound stimulates excitable cells, show how that knowledge informs the design of stimulation protocols, and demonstrate an application of the method in noninvasive stimulation of neurons in specific brain regions in behaving primates.