Mechanisms of Injury

Application of High-Intensity Focused Ultrasound to the Study of mTBI

Researchers sponsored by the USUHS Center for Neuroscience and Regenerative Medicine (CNRM) used high-intensity focused ultrasound (HIFU) pulse trains as a model for blast exposure in rats to examine the brain's immune response to pressure changes. Though intrinsically of much higher frequency than open-field blast overpressures, HIFU pulse trains can be frequency modulated to produce a radiation pressure that has a similar form to blast overpressure. In this study, 1.5 millihertz HIFU pulse trains of one millisecond duration were applied to intact skulls of mice in vivo. Subsequent histological analyses revealed blood-brain barrier disruption and immune responses including astrocyte reactivity and microglial activation up to 24 hours after HIFU pulsing, patterns that are consistent with findings from other types of blast exposures. HIFU shows promise for the continued identification of some of the biological effects of blast-related, non-impact mTBI in animals.