**International State-of-the-Science Meeting on Blast-Induced Tinnitus**

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**Abstract Submitted for Presentation: ETIOLOGY**

**Cochlear Damage, Hippocampal Injury and Tinnitus Assessment in Rat Model of Noise- and Blast Wave Exposure**

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Blast wave exposures along with continuous and impulse noise are major causes of hearing loss and tinnitus among military personnel. In addition to damaging the inner ear, blast wave exposure can induce traumatic brain injury (TBI). Previous studies have identified the hippocampus, one of two regions in the adult brain where new neurons are born (i.e., neurogenesis), as particularly vulnerable to TBI. In addition, human brain imaging and clinical studies indicate that the hippocampus is part of a neural network involved in tinnitus. Little is known about how blast exposure or intense noise exposure affects hippocampal neurogenesis—a process strongly associated with memory function, depression and anxiety. In the present study, we exposed adult rats to blast waves (3 blasts; ~187 dB pSPL) or high level continuous noise (126 dB, 2 h, unilateral). Several weeks later, we assessed cochlear damage, hippocampal neurogenesis, and tinnitus using the gap-startle paradigm. High-level continuous noise caused massive hair cell loss in the exposed ear and significantly suppressed hippocampal neurogenesis. Because the decrease in hippocampal neurogenesis was nearly the same in rats with or without tinnitus, we conclude that hearing loss was the major factor suppressing hippocampal neurogenesis. Blast wave exposure significantly reduced distortion product otoacoustic emissions (DPOAE), indicative of impaired outer hair cell (OHC) function. Although most of the hair cells were still present, FM-143 staining showed that the surviving OHCs had damaged stereocilia transduction channels which likely contributed to their impaired function. Similar to high-level continuous noise, the blast wave exposure also suppressed hippocampal neurogenesis. Given the critical role the hippocampus plays in memory, depression and anxiety, we speculate that the noise- and blast wave induced suppression of hippocampal neurogenesis may contribute to the cognitive and emotional deficits frequently seen in combat personnel.
Supported by NIH grants (R01DC0090910; R01DC009219-01; 1R03DC011374-01).