Injury Risk Assessment and Criteria Development

Lower Than Expected Levels of Cochlear Exposure Derived from Cadaveric Studies Lead to Refinement of Human Transfer Functions for Predicting Auditory Injury Risk

Auditory injury is a leading cause of medical referrals for Service members, and propagation of blast waves through the ear could exacerbate brain injury. Researchers have previously relied on models such as the Auditory Hazard Assessment Algorithm in Humans (AHAAH) model to predict the amount of auditory hazard after blast, however these models have limitations especially in large amplitude impulses.

Researchers at Applied Research Associates, Inc. (Littleton, CO) and the University of Colorado School of Medicine (Aurora, CO) previously developed a chinchilla-to-human transfer function to determine the human-equivalent of the blast exposure that leads to permanent hearing loss in chinchilla. The investigators are currently refining the AHAAH in multiple model systems to test which protective systems best mitigate auditory injury.

Recently, the team has published work on human cadaveric head experiments to better measure the response of auditory system components involved in the transmission of acoustic exposure (*Greene, et al., 2018*). Pressure sensors were placed in the ear canal, middle ear, and inner ear to determine pressure transmission (n = 16 ears). They found that the magnitudes of middle-ear transfer functions at high intensity impulses were lower than expected, meaning transfer functions determined from mild-to-moderate intensity pulses should not be used to extrapolate exposure from higher impulses. These data will be used to refine models predicting auditory risk.

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REFERENCES:

Greene, N. T., Alhussaini, M. A., Easter, J. R., Argo, T. F. t., Walilko, T., & Tollin, D. J. (2018). Intracochlear pressure measurements during acoustic shock wave exposure. Hear Res, 365, 149-164. doi:10.1016 j.heares.2018.05.014