



US DEPARTMENT OF DEFENSE

# BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

## Injury Models

### Improvement and Extension of Auditory Hazard Models

This work by a team from Applied Research Associates is leading to improved models of auditory injury after blast and other high-impulse noise. Auditory injury is a leading cause of medical referrals for Service Members, and additional work suggests that propagation of blast waves through the ear could exacerbate brain injury. Researchers have previously relied on models, such as the AHAAH model to predict the amount of auditory hazard after blast, however these models have limitations especially in large amplitude impulses. In the current proposal funded by CDMRP, the investigators are refining the AHAAH in multiple model systems to test which protective systems best mitigate auditory injury and protect. Performed at the University of Colorado-Anschutz Medical Campus in Denver, Colorado, and the Brooke Army Medical Center in Fort Sam Houston, Texas, the majority of the work commenced in early 2015, and the investigators have already developed a new design for a blast wave emulator that allows for the delivery of high-amplitude acoustic stimuli to specimens in a controlled manner and improves the exposure level and frequency bandwidth of currently available devices. Using this new testing equipment, the investigators have completed testing on multiple post-mortem samples and four different hearing protection devices. This preliminary data has led to refinements of the AHAAH model to take into account non-linear elements of hearing protection as some devices have amplitude-dependent responses. Refinement of this model will aid the development of improved hearing protection devices for Service Members and mitigate the effects of auditory hazards.