



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Repetitive Blast Exposure

The Development of Exposure Standards for Repeated Blast Exposures

A collaborative team from institutions including Walter Reed Army Institute of Research (WRAIR; Silver Spring, MD); Naval Medical Research Center (NMRC; Silver Spring, MD); National Institutes of Health (NIH; Bethesda, MD); and the University of Virginia (UVA; Charlottesville, VA) are conducting a multi-year, multi-institutional study to develop validated human standards for repeat low level blast exposure based on current training DoD exposure guidelines. The goals of this effort are to further characterize the physiological response to blast exposure, to develop an algorithm that can be used in the development of an occupational standard for repeated blast exposures, to utilize survey and clinical assessment tools to understand the relationship of blast exposure and adverse outcomes, and to improve standards for acute exposure to blast overpressure events.

As part of this work, the investigators explored the impact of blast on breachers, specialists who obtain access to structures using explosives. In one study, 20 experienced breachers and 14 military non-breachers underwent neuropsychological testing to assess cognitive and neurological function. Self-reported symptoms were also examined. The study revealed that experienced breachers reported ringing in the ears more than non-breachers. However, breachers performed better on several cognitive tests. The breachers also reported having more problems associated with memory, concentration, and irritability.

In a separate study, blood samples were collected daily from 97 Service members across three training sites for explosive breaching for two weeks. Self-reported TBI and blast exposure history was also documented. The blood was analyzed for levels of neurotrauma biomarkers (A β 40, A β 42, and tau). The study showed that those with a history of TBI had higher tau levels than other breachers before exposure to the blasts. Following a relatively larger blast at one of the training sites, the biomarker levels of those involved in the blast changed significantly, particularly for those with a history of TBI. These initial findings show that gene activity and the levels of their correlated proteins change after cumulative blast exposure. These results could impact current DoD blast exposure prevention and clinical practices since different mitigation strategies and/or treatments may be needed for blast exposure alone versus blunt force trauma if there are unique patterns resulting from blast exposure compared to blunt force trauma.

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