Studies on Repetitive Blast Exposure

Neurotrauma Biomarkers Associated with Exposure to Low-Level Blast in Military Training

Human subjects field studies of blast exposure conducted under a five-year research collaboration agreement between Walter Reed Army Institute of Research (Silver Spring, Maryland), Naval Medical Research Center (Silver Spring, Maryland), Applied Research Associates, Inc., (Albuquerque, New Mexico), National Institute of Neurological Disorders and Stroke (NINDS; Bethesda, Maryland), and University of Virginia (Charlottesville, Virginia) included measurement of overpressure with wearable sensors in conjunction with multiple outcome measures. These field studies involved measurements from more than 100 military Service members who provided their consent to these measurements during multi day standard training protocols on explosive breaching. The primary hypothesis evaluated in these studies was that there is a measurable acute negative neurological effect following repeated exposure to low level blasts. Importantly, the hypothesized effect, if present, was predicted to be small and inconsistent across individuals. A large or prevalent acute effect was not assumed to be present in healthy, undiagnosed populations like the Service members in these studies. The first results reported showed some blast-related effects in behavioral symptomatology, specifically, increased postural sway and symptomology consistent with concussion, but no clear association with the blood-based biomarkers for neurotrauma assayed in those analyses (i.e., ubiquitin carboxy-terminal hydrolase-L1 and glial fibrillary acidic protein) (*Carr, Taylor, et al. 2015, Carr, Yarnell, et al. 2015*). In subsequent biosample assay results from an added partnership with the National Institute of Nursing Research (NINR), examination of additional biomarkers did reveal associations with training blast exposure (*Gill, Cashion, et al. 2017, Gill, Motamedi, et al. 2017*). The relatively small associations observed were consistent with the a priori hypothesis of small effects among healthy populations exposed to blast. These novel findings warrant replication to support definitive conclusions and assessment of clinical meaningfulness. Replication studies are underway in a separate effort. Discovery of objective biomarkers associated with blast exposure will be an important advance for research capability on this topic.

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