



US DEPARTMENT OF DEFENSE
BLAST INJURY RESEARCH PROGRAM
COORDINATING OFFICE

Mechanisms of Injury

Complications of Blast-related TBI

Researchers in the Naval Medical Research Center (NMRC), sponsored by US Navy Bureau of Medicine and Surgery (BUMED), are engaged in multiple investigations of TBI with or without other concurrent injury (polytrauma), with a particular focus on blast-induced TBI. One set of investigations is exploring the mechanisms by which blast exposure produces TBI, the levels of blast exposure (i.e., magnitude, number, and frequency) that affect the severity of injury, and potential interventions to mitigate the acute, subacute, and/or chronic neurological adverse effects of TBI. A second set of investigations is examining the potentially adverse effects of exposure to environmental stressors associated with aeromedical evacuation (e.g., hypobarica, vibration, noise) on TBI/polytrauma casualties. The third set of investigations, funded by JPC-5/DHP, is evaluating neurocognitive and vestibular data gathered from US military personnel previously exposed to IEDs. Researchers in the Neurotrauma Department at NMRC, in collaboration with clinical and scientific partners (including the WRAIR, USUHS, NINDS, National Institute of Nursing Research, the James J. Peters Department of Veterans Affairs Medical Center, the University of Virginia School of Medicine, and the NiCoE) have also initiated a series of studies to develop occupational exposure standards for repeated exposure blast overpressure events. These studies will use both animal and human blast exposure and outcome data, and mathematical analysis of those data, to predict human safe blast exposure limits in terms of blast magnitude, number, frequency, and between-blast latency. Information relevant to the clinician and researcher will be collected using a variety of neurocognitive, biomarker, and imaging modalities combined with new technologies to objectively measure blast overpressure. These data sets can be merged with health information obtained before and after exposure to provide more accurate pictures of long-term, chronic psychiatric, and comorbid health conditions that may develop following exposure to blast. Another multi-partner study with the Neurotrauma Department at NMRC is building on previous findings that blast overpressure waves may be transmitted into the skull via blood vessels. A rat model is being used to explore the potential role of damage to the cerebral vasculature incurred by either single or multiple blast exposures. Together, this large body of data will assist in the development of objective, clinically relevant cognitive and physical return to duty measures and help establish gold standards that can be used across military branches, assuring that improved methodology will be used to assess Service Members in the acute phase of a blast mTBI.