Health Outcomes Following Extremity Trauma

Assessing the Health Effects of Blast Injuries and Embedded Metal Fragments

Many of the common wounds of the current and recent conflicts in both Iraq and Afghanistan have been the consequence of Service Members coming into contact with improvised explosive devices (IEDs) resulting in traumatic injuries and wounds contaminated with toxic metals. This contamination with toxic metal potentially poses additional health threats to the Service Member arising from acute and long-term exposure to embedded fragments. Due to potential complications from surgeries to remove these fragments and the historical belief that metal was not thought to be harmful, the conventional wisdom was that it was safe to allow the metal fragments to remain in place. However, in recent years as researchers have learned more about the potential health threats caused by leaving unidentified metal fragments within the body, this policy has come under question. In addition, since the composition of the fragment is often unidentified and the toxicological properties and carcinogenic potential of these fragments is unknown, clinicians are left with little information upon which to base treatment decisions.

With funding from the Peer Reviewed Medical Research Program (PRMRP) managed by the Congressionally Directed Medical Research Program (CDMRP), this project proposes to leverage long-standing collaborations between the Armed Forces Radiobiology Research Institute and the Department of Veteran Affairs (VA) Depleted Uranium and Toxic Embedded Fragment (TEF) Surveillance Centers in order to bring together a complementary set of both animal and human studies in order to address this challenge. The four studies included in this project are: (1) “Health Effects of Embedded Fragments of Military-Relevant Metals” that will examine the absorption and effects of embedded fragments in tissue of animals implanted with metals of toxic concern; (2) “Biomarkers for the Early Detection of Adverse Health Effects Resulting from Embedded Metal-Fragment Wounds” that will identify early biomarkers of tissue injury that may signal the need for fragment removal; (3) “Biomarker Assessment of Kidney Injury from Metal Exposure in VA-TEF Registry Veterans” that will assess biomarkers of early kidney damage in Veterans registered in the VA-TEF registry and injured with a fragment; and (4) “Respiratory Health in a Cohort of VA-TEF Registry Veterans Exposed to Blasts and Metals” that will examine lung function and insult from both metal inhalation and blast effects from the traumatic injury in this same VA-TEF Registry cohort. Together, these projects will address the specific knowledge gaps currently challenging the care of embedded fragments and blast injury patients. It will specifically focus upon enlarging our knowledge base regarding military-relevant metals and their behavior in the body. Ultimately, the results of this project will provide the evidence base to support medical decision-making in the care of the estimated 40,000 Veterans injured in recent conflicts.