



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Wound Infection Mitigation

Cranial Implant Surface Modification to Reduce Infection Rates

Combat-related blast injuries to the head may require prosthetic reconstruction of the skull. Electron beam melting is an additive manufacturing technique that is currently used to produce customized titanium-6 aluminum-4 vanadium (Ti6Al4V) cranial implants for wounded warfighters who require cranioplasty procedures. Titanium cranial implant devices often fail due to postoperative infections that require removal of the implant and additional cranioplasty procedures for treatment. Researchers at NAMRU-SA, with sponsorship from BUMED, are working to optimize the surface characteristics of EBM Ti6Al4V cranial implants to reduce the incidence of postoperative infection. Various surface modification procedures have been perfected for EBM Ti6Al4V and have led to the development of unique combinations of surface topography, roughness, surface chemistry, wettability, and surface energy. Studies to compare bacterial adherence and biofilm formation on the various electron beam melting Ti6Al4V surfaces are currently underway. It is hypothesized that, of the various modified surfaces, the mirror finish surface will exhibit a significant reduction in bacterial adhesion and biofilm growth. Modification of titanium cranial implant surfaces may reduce the need for replacing cranial implants and the negative sequelae that result from multiple surgeries.