



Naval Medical Research Center

Fact Sheet

The Naval Medical Research Center (NMRC) is the headquarters for Navy Medicine's research and development enterprise that includes the NMRC laboratory and affiliated laboratories in the U.S. and overseas. The NMRC laboratory's research focuses on infectious disease vaccine development; operational and undersea medicine; bone marrow research and registry, and biological defense.

Research Areas

Infectious Diseases Directorate

The geographical distribution of a disease; the rapid emergence of drug resistance and the lack of an effective vaccine, treatment, or other control measures; the mode of transmission; and the medical impact during past operations are factors determining the importance of an infectious disease to the U.S. military. Infectious Diseases Directorate (IDD) researchers focus on minimizing the impact of infectious diseases by preventing infection or clinical diseases. In most cases, the best approach is the development of vaccines.

IDD scientists can develop a vaccine from the conceptual stage through "test tube" evaluation, laboratory model testing, human volunteer safety and immunogenicity trials to final large-scale volunteer field trials to prove efficacy as required for FDA licensure. Field testing of vaccines is made easier by the close association with the Navy's overseas laboratories where the target infectious diseases are highly endemic. IDD focuses on malaria, enteric diseases, combat-related wound infections, and viral and rickettsial diseases.

More person-days were lost among U.S. military personnel due to malaria than bullets during every military campaign fought in malaria-endemic regions during the 20th century and military personnel are still at risk. The objective of the Navy Malaria Department is to develop a vaccine that kills the malaria parasite during its first few days of development.

Historically, infectious diarrhea has been a substantial cause of morbidity for deployed military personnel and continues today. Pathogenic bacteria, including *Campylobacter jejuni*, enterotoxigenic *Escherichia coli* (ETEC), and *Shigella sonnei*, are the principal causative agents. Research in the Enteric Diseases Department is centered on countermeasures to prevent or abate bacterial diarrhea, with priority on developing a vaccine.

The Viral and Rickettsial Diseases Department researchers are determining the prevalence of rickettsial diseases among troops in previous and ongoing military operations. Developing a scrub typhus vaccine is an important component. Dengue fever is the most common infectious disease transmitted by a mosquito and is endemic in tropical and subtropical countries where U.S. military members are routinely deployed. The department aims to develop rapid diagnostics and an effective vaccine for dengue, and provide clinical diagnostics for emerging and re-emerging viral diseases such as Middle Eastern Respiratory Syndrome (MERS) and influenza.

The primary focus of the Wound Infections Department (WID) is to conduct research to develop and evaluate technologies and treatments to prevent and treat infections in combat injuries. Skin and soft tissue infections caused by multidrug resistant organisms (MDRO) adversely affect training and combat missions. WID researchers conduct basic and applied research focused on the epidemiology, pathophysiology, and immunologic response to MDRO and on the development of antimicrobial countermeasures.

Operational and Undersea Medicine Directorate

Research is focused on the medical issues of Sailors and Marines in operational environments. Researchers are developing novel strategies to prevent and treat combat casualties with a focus on early, far forward interventions. The team studies traumatic brain injury (TBI) including blast injuries, alone or in combination with hemorrhage or other injuries. This includes the study of blast biophysics, the pathophysiological responses to blast, neurocognitive and behavioral consequences of blast exposure and treatments for blast injury. Other researchers are developing interventions to improve performance and reduce injury in Navy

submariners and military divers. They are developing new technologies to prevent and treat decompression sickness and pulmonary and central nervous system toxicity associated with exposure to hyperbaric oxygen. A third group is studying composite tissue transplantation, stem cell biology, and translational medicine. This team specializes in treatment strategies for traumatic combat injuries and assessing technologies to improve the engraftment of transplanted tissue. By identifying the protein and gene expression patterns involved in wound healing, they are developing advanced diagnostics and treatment protocols to enhance overall outcomes for combat wounds.

A hallmark of the program is the dedication of medical providers who are developing research to improve the welfare of those injured in combat and who are expert clinicians, surgeons, and neurologists. Daily contact with wounded warfighters provides a bridge to accelerate the transfer of emergent clinical issues to the laboratory to expedite responsive solutions and a conduit for approaches developed in the laboratory to the clinic.

The C.W. Bill Young Marrow Donor Recruitment and Research Program

For over 40 years, NMRC has played a key role in expanding the knowledge of the hematopoietic and immune systems and genetic matching for treatment and prevention of disease. The program's mission is to develop treatment methods for marrow damaged by radiation and chemical weapons. Casualties with marrow toxic injury can recover normal function because a small number of remaining cells can restore function with medical support or more severe damaged marrow can be replaced by transplantation of hematopoietic cells from a normal, genetically matched donor. In 1990, DoD initiated the C.W. Bill Young Marrow Donor Recruitment and Research program at NMRC to connect with the national bone marrow program. The ability to find matched donors requires huge numbers of volunteers. This national system has been built to develop in parallel the capability to respond to a national emergency from radiation, nuclear or chemic event. In 2011, 9.5 million volunteers are listed in the national program, that includes 690,000 DoD volunteers, and over 50,000 transplants have been coordinated with over 500 donations annually from DoD volunteers.

Biological Defense Research Directorate

The Biological Defense Research Directorate (BDRD) is charged with research and development of ways to protect U.S. military personnel and civilians from the threat of infectious diseases and biological attacks. BDRD is a world leader in detection and

confirmatory laboratory analysis of infectious disease agents of public health importance especially select agents. The directorate is comprised of six departments: genomics/bioinformatics, molecular diagnostics, immunodiagnostics, clinical research, operations and international field microbiology. As part of the 2005 BRAC Law, BDRD relocated the research and reagent production activities to Ft Detrick, Maryland in October 2011.

The molecular diagnostics and immunodiagnostic laboratories are under ISO Guide 34/17025 accreditation ensuring that molecular and immunological detection products are produced under a rigorous quality management system. Annually, BDRD produces over \$50M worth of reagents for the DoD Critical Reagents Program and other U.S. Federal Agencies. The molecular diagnostic laboratory provides certified reference materials ensuring confidence in fielded biowarfare detection assays, pre-Emergency Use Authorization (EUA) studies and Good Laboratory Practices (GLP) efforts throughout DoD and Federal Agencies.

The immunodiagnostic department is the only laboratory within DoD capable of producing hand-held assays to detect biological agents from environmental samples. The group of bioinformaticians has developed better and faster bioinformatic tools to facilitate genomic and cell biology research in a laboratory or field conditions. They continue to expand international research collaborations and programs as part of the U.S. Government Health Security Agenda. In 2012, BDRD established the clinical research program, the Austere Environments Consortium for Enhanced Sepsis Outcomes (ACESO), to study sepsis in austere environments and to identify novel biomarkers for better diagnostics and treatment management.

BDRD is certified as a National laboratory within the CDC's Laboratory Response Network for biological hazard testing and analysis. The program has developed the reputation as a "go to" group for fast analysis and superior assays anytime anywhere. Its portable laboratory was a major asset to our nation during the anthrax attack in the early 2000's and continues providing support to Federal agencies during National events. BDRD's extensive field capability paired with superb performance has established the directorate as a key player for testing environmental samples anyplace anywhere. BDRD support s Naval Sea Systems Command (NAVSEA) ensuring Fleet protection, outfitting the Navy/Marine Corps with bioweapons defense field testing capabilities and managing the proficiency testing (PT) program for the Joint Biological Agent and Identification and Detection System (JBAIDS) platform keeping our Sailors' lab skills in high alert.