



U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND

USAMRMC

Military Infectious Diseases Research Program

Mission

As part of the U.S. Army Medical Research and Materiel Command, the mission of the Military Infectious Diseases Research Program (MIDRP) is to protect U.S. military personnel against naturally occurring infectious diseases via the development of U.S. Food and Drug Administration (FDA)-approved vaccines, drugs, and diagnostic procedures. MIDRP also develops Environmental Protection Agency (EPA)-approved products such as repellents and insecticides to prevent transmission of diseases by insects, ticks, and other arthropods.

Background and Environment

Primary Focus

MIDRP stresses the importance of keeping forces healthy by preventing disease via the use of vaccines and drugs. Vaccines, antimalarial therapeutics, and diagnostics are the program's primary focus. The availability of these therapeutics and prophylactics coupled with diagnostic resources assists individual service members and provides commanders and leaders rapid medical awareness of the areas in which they are operating.

Disease Impacts

Infectious diseases, particularly those known as "orphan diseases," continue to have an adverse impact on military operations and the health of service members. These impacts can lead to significant loss of duty time and even death. Dengue fever, also known as breakbone fever, is prevalent in warm environments and causes severe pain in joints and muscles, and is just one example of an expanding threat to service members in which there is no FDA-licensed treatment or vaccine available.

Protective Controls

Vector control through improved personal protective technologies can reduce a wide range of insect-borne diseases. Nearly two-thirds of the infectious diseases that military personnel can come in contact with are transmitted by biting insects and other arthropods, such as mosquitoes, ticks, and mites. By preventing infected insects from biting or coming into contact with humans, the incidence of insect-borne diseases can be decreased. New insect repellents are being developed and improved as are other preventive measures, such as bed nets and novel insect control materials and approaches.

Technology and Support

MIDRP has been very successful in leveraging technology and support. MIDRP scientists interact with the larger national and international medical research and development communities through sharing technology and by leveraging support from outside organizations.

Examples of governmental sources include the National Institutes of Health and the U.S. Agency for International Development; nonprofit organizations such as Medicines for Malaria Venture, Malaria Vaccine Initiative; and corporate sponsors such as GlaxoSmithKline, Pfizer, and Sanofi Pasteur. MIDRP scientists also have extensive collaborations with university partners and currently have more than 100 Cooperative Research and Development Agreements (CRADAs) in place.

Sociopolitical Benefits

Global political stability, health of coalition forces, public health, and humanitarian concerns are often impacted by infectious diseases such as Human Immunodeficiency Virus (HIV) and malaria. Products under development by MIDRP not only protect Warfighters but also benefit people living in disease-endemic areas. In addition, U.S. military medical research activities have generated significant goodwill by way of the program's overseas laboratories as well as the many countries U.S. scientists have collaborated with over several decades. These interactions have provided an important educational opportunity between local and U.S. personnel that cannot be overestimated.

MIDRP Assets

The program supports eight Army and Navy continental U.S. and international infectious diseases research laboratories that employ a highly skilled workforce (more than 2,300 Army, Navy, Air Force, and Department of Defense [DoD] civilian and contractor scientists and technicians) in state-of-the-art laboratories that include unique facilities such as biosafety level 4 (BSL-4) containment, a pilot vaccine production facility, and human clinical trials units.

Key Themes and Messages

The discovery and development of vaccines to protect the Warfighter are priorities for MIDRP.

MIDRP has played a significant role in the development of licensed vaccines for rubella, hepatitis A and B, Japanese encephalitis, typhoid fever, adenovirus types 4 and 7, and tetravalent meningococcus.

MIDRP has contributed to the development of drugs for preventing and treating malaria, including mefloquine, doxycycline, malarone, chloroquine, primaquine, sulfadoxine-pyrimethamine, and halofantrine.

MIDRP is enhanced by numerous facilities, including eight infectious disease research laboratories around the world, accredited animal and BSL-4 containment laboratories, a pilot vaccine facility, and clinical trial units.

MIDRP maximizes research dollars by collaborating with industry and academia through more than 100 CRADAs.

Questions and Answers

Q1. Why are infectious diseases a concern to the military?

A1. Infectious diseases continue to impact operational forces. More service members are hospitalized more often for infectious diseases than those who are wounded in combat. Infectious diseases also place a significant burden on the medical logistical system for people

requiring treatment or hospital space. The loss of personnel to infectious diseases reduces operational readiness and effectiveness by requiring replacement troops.

Q2. What impacts have infectious diseases had in recent operations?

A2. Cutaneous leishmaniasis, a disease transmitted by sand flies, had a major impact early in Operation Iraqi Freedom. More than 1,700 personnel were diagnosed with this disease, and many had to be evacuated to the United States for treatment, which majorly impacted treatment facilities. The impact of malaria was seen in Vietnam, where 25% of all Army troops suffered with this disease. Malaria remains a militarily-relevant disease as evidenced in 2003 when 44% of 268 Marines conducting a 2-week mission in Liberia were rapidly rendered ineffective due to malaria. About 40 of them were evacuated to the United States for treatment, and 4 developed severe symptoms. Fortunately, no one died from the infections.

Q3. Why does the military need to conduct infectious disease research?

A3. The focus of MIDRP is to develop countermeasures against diseases our deployed military forces will likely encounter. Most of these diseases are not of concern in the United States. Preventing disease is a force multiplier by keeping people healthy and by enhancing readiness. Unfortunately, a major focus in much of the civilian research community is on treating and not preventing these diseases. For many diseases in this program, there are no other directed research efforts to develop preventive countermeasures required by our military. Focus on prevention helps maximize the military's ability to accomplish its mission around the world.

Q4. What are the technical issues with developing medical products?

A4. Developing vaccines and drugs are a challenge—scientists all over the world are still trying to learn the basic biological principles that make them work. Making safe and effective vaccines and drugs as countermeasures for different microorganisms is highly empirical. Vaccine and drug development is also a high-risk, high-cost venture, with most vaccines and drugs failing in human clinical trials. As such, there is a requirement for continued technology development to provide a robust pipeline of new technologies and materials to replace those that have failed.

Q5. Why can't these products be developed faster?

A5. Besides the technical issues, major constraints on making vaccines are the high costs of development and the need to conduct human clinical trials in a safe and acceptable way. The ability to move forward in clinical testing is dependent on demonstrating that the vaccine/drug is safe in both short- and long-term studies. Conducting trials also is impacted by the ability to recruit subjects into the trials and to complete the studies. Compiling, verifying, and analyzing clinical trial results require considerable time. The next required clinical trial is often dependent on completing a previous trial that may take 1 to 4 years to complete, and FDA licensure often takes many months of evaluation after trials are completed.

Q6. What roles do the FDA and EPA play in medical product development?

A6. Therapeutics, vaccines, diagnostic devices (FDA), and certain other products such as insect repellents (EPA) are, by law, regulated by the U.S. government to ensure the products are safe and effective. Safety concerns are the primary driver for the guidelines and processes in place to ensure individuals and the environment are not harmed by the products being developed and marketed. In recent years, the level and complexity of regulatory oversight have increased significantly, resulting in longer development times.

Q7. How helpful are the FDA and EPA?

A7. The FDA and EPA processes allow for open discussion between product developers and regulatory staffs. However, due diligence by the agencies is the primary concern, and any concerns for safety or effectiveness can result in programs being justifiably slowed or stopped until these concerns are eliminated.

Q8. Why does MIDRP have an HIV program?

A8. Congress started the DoD HIV program in 1985. At the time, the impact of HIV on the military was unclear, and with the DoD's history as a vaccine developer, Congress hoped to provide a mechanism to test HIV vaccines within the context of the DoD laboratories. This effort is now being conducted in a partnership with the National Institute of Allergy and Infectious Diseases.

Q9. With many others funding research in these areas, why does the DoD need to conduct this type of research?

A9. As indicated previously, the DoD must protect its forces from diseases that may impact the ability to complete missions. This does not necessarily align with the needs of the public health community where most efforts are directed at reducing mortality rates. For example, the international malaria effort is dedicated to preventing death in children in endemic areas so that they can acquire immunity and lead more productive lives, whereas the U.S. military's goal is to prevent troops from becoming ill. These are very different efforts requiring different technologies.

Q10. What are the contributions of MIDRP?

A10. MIDRP makes contributions in four main areas:

Vaccines: The U.S. military has collaborated in the development of eight U.S.-licensed vaccines since 1945 to include to include [Influenza](#) (1945), [Rubella](#) (1969), [Adenovirus 4 & 7](#) (1980), [Tetavalent meningococcus](#) (1981), [Hepatitis B](#) (1981), [Oral typhoid](#) (1989), [Japanese encephalitis](#) (1992), and [Hepatitis A](#) (1995). These vaccines are nearly one-half of all nonpediatric vaccines administered to deployed service members.

- **Drugs:** MIDRP has contributed to the development of most synthetic drugs licensed in the United States for the prevention and treatment of malaria. Next-generation antimalarial drugs include tafenoquine and an intravenous formulation of artesunate.
- **Diagnostics:** MIDRP diagnostic products include fieldworthy devices to diagnose human infections (e.g., scrub typhus) and to determine if insects are carrying infectious agents transmissible to humans (e.g., malaria parasites and West Nile virus).
- **Vector Control:** Vector control products include personal protective devices (e.g., insect repellents, insecticides, and bed nets) to prevent mosquitoes, ticks, and sand flies from biting service members. Additional products include computer-based systems that identify potential disease-carrying insects.

Q11. Why does MIDRP have an anti-diarrhea program?

A11. Diarrhea continues to be a major problem for deployed personnel. It can cause serious dehydration and crippling disease, which impacts mission accomplishment. Some affected troops are placed on restricted duty or hospitalized for treatment. Historically, some diarrhea outbreaks have resulted in entire units becoming nonoperational.

Q12. What are the program's interactions with outside research efforts/outside funding organizations?

A12. MIDRP has many successful governmental and commercial partnerships such as CRADAs, the Small Business Innovation Research Program, Congressional Special Interest-appropriated funding, and Interagency Agreements. Critical to the development of any vaccine or therapeutic is the involvement of a commercial partner that has the ability to manufacture and market medical products to those who need them. The high cost of product development usually can only be recovered and the product sustained by having a commercial market for the product. In addition, the basic research and concept development for new products involve both academic and governmental research organizations that are critical for intellectual input and for providing critical research capabilities not always available at military laboratories.

Q13. Where can I learn more about MIDRP?

A13. MIDRP maintains a web site, which can be accessed at www.midrp.org.