From the development of America’s first typhoid vaccine in 1909, the WRAIR has led the U.S. military’s research and development efforts in bacterial diseases. With a direct lineage from the beginnings of the institute, the Bacterial Diseases Branch develops vaccines, novel therapeutics and diagnostic products targeting militarily-relevant bacterial pathogens, particularly those that cause enteric and wound infections.

Enteric Infections
Diarrheal disease afflicts millions of people worldwide and is a major cause of morbidity among deployed U.S. military. In Iraq and Afghanistan, 76% of deployed troops reported diarrhea and 17% were confined to quarters for 2-3 days.

Major research focuses on developing vaccines against Shigella, a bacterial pathogen that causes severe diarrhea or dysentery. The Department of Enteric Infections has two vaccine development approaches:

1. Genetically modified attenuated Shigella vaccine,
2. Recombinant vaccine made of bacterial proteins and antigens.

Advances in Wound Infection Therapeutic Development
- Small and large preclinical infection models with clinically relevant MDR bacteria
- Preclinical proof-of-concept bacteriophage for treatment of infections
- Monoclonal antibody therapeutic development
- Home to the Army’s only center for x-ray crystallography for drug discovery and vaccine development

Major activities in enteric infection research include:
- Developing relevant preclinical models to test vaccine efficacy and safety
- Conducting clinical trials to evaluate enteric vaccine products

Combating Multidrug Resistant Organisms
Recent conflicts in Iraq and Afghanistan resulted in the highest survival rate of wounded in the history of warfare. Due to the unique nature of combat injuries, wound contamination frequently results in bacterial infection by multidrug resistant (MDR) organisms.

However, MDR bacterial infections are not just a military problem, but a worldwide problem with an estimated 1-2 million MDR infections and a $5 billion economic burden in 2015 in the U.S. alone.

As a worldwide leader in critical assays, antigens and antibodies for enteric vaccine development, WRAIR’s Enterics Department has filed more than 22 patents for ETEC and Shigella spp. vaccines.
Multidrug Resistant Organism Repository and Surveillance Network (MRSN)

WRAIR is at the forefront of U.S. efforts to mitigate the threat of drug-resistant bacterial pathogens. Established in 2009, the MRSN launched to stem outbreaks of infections in military medical facilities.

Advances by the MRSN

- Worldwide submission of isolates - Asia, Africa, North and South America, Europe
- First identification of mobile colistin resistance gene (mcr-1) in the U.S., May 2016
- The only large-scale repository of MDR bacterial isolates within the U.S. DoD (>41,000 isolates)
- Expanded role to 87 hospitals - all Army, Navy and Air Force medical treatment facilities as of 2016
- Characterizes ~6,000 specimens per year
- Provides whole genome sequence analysis for outbreak investigations

Bacteriophage Therapeutics

Our scientists are researching alternatives to antibiotics for the treatment of infections caused by drug resistant bacteria. One focus is bacteriophages (phages), viruses that infect and replicate within bacteria, ultimately leading to death of the bacteria.

Advances in Bacteriophage Therapeutic Development

- Partners (AmpliPhi Biosciences Corp.) in Phase 1a safety study with a bacteriophage therapeutic
- With AmpliPhi Biosciences Corp., collaborated on a phage therapeutic for Staphylococcus aureus
- Developed rapid high-throughput isolation technology against military-relevant bacteria
- Established up-scaled bioproduction (up to 25L) on a single-use WAVE bioreactor