

# Scientists fight antibiotic-resistant diseases with technology

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NRL's Dr. Chris Taitt (white lab coat) works with the staff at the Naval Medical Research Unit-2 in Phnom Penh, Cambodia. Credit: U.S. Naval Research Laboratory/LCDR Michael Prouty-NAMRU-2

Before sailors and soldiers deploy to locations around the world, they need to know the kinds of infectious diseases they might encounter, especially those diseases that are resistant to antibiotics. As part of ongoing research in this field, U.S. Naval Research Laboratory (NRL) scientists recently conducted on-site testing for the NRL-developed

Antimicrobial Resistance Determinant Microarray in Phnom Penh, Cambodia. NRL scientists Drs. Gary Vora, Tomasz Leski, and Chris Taitt joined with researchers from the Naval Medical Research Unit 2 (NAMRU-2) in this effort.

The joint NRL-NAMRU-2 team successfully carried out testing and technology transition of the NRL-developed Antimicrobial Resistance Determinant Microarray (ARDM) to the NAMRU-2 satellite laboratory at the National Institutes of Public Health in Phnom Penh, Cambodia. This was the first time the technology has been tested outside of the NRL laboratory setting. NAMRU-2 supports American interests in the Pacific Theater by studying infectious diseases of critical [public health](#) and military importance to the United States and other regional partners. Drs. Vora, Leski, and Taitt from NRL's Center for Bio/Molecular Science and Engineering developed the ARDM to provide simultaneous DNA-based analysis for hundreds of [resistance](#) genes. This array works quickly to determine resistant genetic assemblages and also to monitor the spread and evolution of antibiotic resistance.

During the tests in Cambodia, June 1 - 16, Dr. Chris Taitt and NAMRU-2's LCDR Michael Prouty used the ARDM to test more than 50 drug-[resistant pathogens](#) and wound isolates, including the methicillin-resistant Staphylococcus aureus (MRSA). Relatively small and speedy, the ARDM can simultaneously detect hundreds of pathogens, the agents that cause disease, with just one-day turnaround time. The data generated from the ARDM tests indicated a widespread distribution of genes causing resistance to both first- and last-line antibiotics within this region, explained Dr. Taitt. She notes that it was interesting to learn that the types and levels of multidrug resistance in Phnom Penh were found to be different from those of similar bacterial pathogens tested from the Middle East, South America, and North and West Africa.



The array is the size of a microscope slide and the reader (blue box) is the size of a brick. Other readers are typically the size of a standard microwave oven. So the NRL-developed ARDM offers a tremendous savings in size and speed. Credit: U.S. Naval Research Laboratory/Dr. Joel Golden

The data collected using the ARDM is critical in steering medical personnel towards strategies with the highest chances of success when treating sailors and soldiers deployed to these regions. This knowledge also will enable epidemiologists to track the spread of new and emerging sources of resistance, while also providing guidance for public health and antimicrobial administration policies for more timely response to infectious disease outbreaks. The testing that NRL and NAMRU-2 conducted in Cambodia in June resulted in the first molecular epidemiological characterization of antibiotic resistance genes and resistance trends from bacterial enteric pathogens in Cambodia and also

contributed to an expanding database of global antibiotic resistance gene signatures. Using the ARDM to study [antibiotic resistance](#) in different regions, such as Cambodia, NRL researchers have made the surprising discovery that there are geographic difference in the [resistance genes](#), and that some of these genes could be resistant to entire classes of antibiotics. Armed with the ARDM, researchers can now help to provide the military with knowledge that helps them defend against these diseases they might encounter around the world.

Provided by Naval Research Laboratory

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