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Featured Story: EDGE

Naval Medical Research Center 2016 Junior Officer of the Year (cover)

From Naval Medical Research Center Public Affairs

SILVER SPRING, Md.— The Junior Officer of the Year (JOOY) program is an opportunity for military officers to be recognized for their contributions to the command research mission and their commitment to leadership and professionalism as a Naval Officer. The Naval Medical Research Center (NMRC) recently named Lt. Joshua Swift as the Junior Officer of the Year for 2016.

He serves as Deputy Department Head of Operational and Undersea Medicine (OUMD) at NMRC, and assists in directing 20 military researchers, civilian scientists, guest researchers and contract personnel. He is also a very productive research scientist leading several cutting-edge projects on altitude stress.

“He embodies the Navy core values of Honor, Courage and Commitment, and he leads by example every day. In addition to working directly with the Command on several high visibility collateral duties, he is equally involved outside of the command in leadership positions,” said Cmdr. Carl Goforth, OUMD Deputy Director...

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NAMRU-2 Establishes Regional Reference Laboratory in Cambodia

From Naval Medical Research Unit-San Antonio Public Affairs

CAMBODIA — Located between the eastern banks of the Mekong River and adjacent to the Vietnamese border, Kampong Cham Province is the fourth largest province in Cambodia by population and a key supply corridor for Cambodia and neighboring countries. Since 2005, sporadic cases of H5N1 Avian Influenza have been detected in this region. The U.S. Naval Medical Research Unit No. 2 (NAMRU-2), in collaboration with the National Institute of Public Health (NIPH), and the Provincial Health Department (PHD) in Kampong Cham, established longitudinal research and epidemiological surveillance studies in this province starting in 2006, which provided important public health information for the Ministry of Health.

NAMRU-2, with funding support provided by the Defense Threat Reduction Agency (DTRA), implemented capacity building renovations projects at the Kampong Cham provincial hospital, including establishing diagnostic testing protocols adapted for disease surveillance in Cambodia...

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New Bio-Informatics Software Allows for Interactive, Real-Time Analysis of Sequence Data (Feature)

From Naval Medical Research Center Public Affairs

SILVER SPRING, Md. — Researchers from the Naval Medical Research Center (NMRC), in collaboration with the Los Alamos National Laboratory, developed, tested and deployed to the field a unique software package. EDGE, short for Empowering the Development of Genomics Expertise, is designed to lower the barrier to bioinformatics, both in terms of hardware and ease of use.

The field of DNA sequencing has seen a lot of technological and scientific advancement since its discovery in the 1970’s. Because of these advancements, what used to take days can now be done by a single technician in one day’s time. EDGE is designed to analyze sequencing data and compile a detailed taxonomic profile from complex clinical or environmental samples containing bacteria and viruses. Results gathered on EDGE are available real-time as both static and interactive graphics.

“Not only has output increased, but preparation time and cost per base have decreased, and the physical footprint of a gene sequencing instrument in the laboratory is also dramatically decreasing, from being as large as a person to something small enough to fit into the palm of one’s hand,” said Lt. Cmdr. Theron Hamilton, one of the NMRC researchers involved in the development of EDGE.

“This makes it a very useful tool for clinical and force heath protection applications,” said Hamilton. “One of the main goals behind developing EDGE was to find a way to enable the analysis of sequence data closer to where the samples are collected, so faster collection of actionable information could be used to support the warfighter.”

Laboratories across the world, including clinical and university laboratories, have started to adopt high-throughput sequencing with this advanced technology, but there is a caveat. Hamilton explained, “Many laboratories new to high-throughput sequencing are ill-equipped to analyze the enormous amounts of data the instrument is capable of producing, both from the standpoint of computational hardware and bioinformatics expertise.”

To combat this problem, EDGE is designed to run on small, portable and relatively inexpensive hardware that makes bioinformatic analyses user friendly by providing an intuitive web-based interface for scientists to analyst high-throughput sequence data.

According to Hamilton, EDGE is the only freely available, open-source bioinformatic software platform that can be run locally without internet, and enables the user to perform quality control of sequence data, host removal, genome assembly and annotation, comparisons to reference genomes, taxonomic profiling, phylogenetic analyses, as well as primer design...

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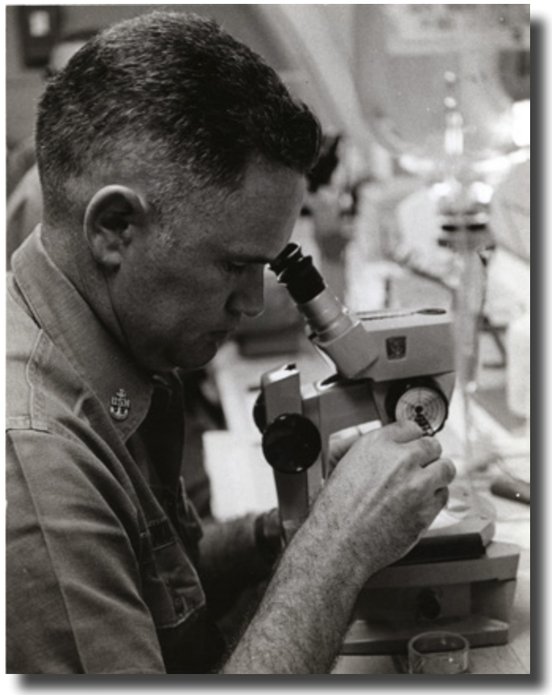
R&D Chronicles: The Mosquito Fighters, Part XI: Malaria in the Dragon's Den, 1964-1975

By André B. Sobocinski, Historian, BUMED



> "With the conduct of operations into the highlands and jungles where malaria control measures have been impossible due to Viet Cong control, the incidence of malaria has risen to the point where it is now a significant military as well as medical problem."
>
> ~Professional Knowledge Gained from Operational Experience in Vietnam, 1965-1966 (NAVMC 2614, 1967)

Malaria proved to be a very serious challenge for military personnel in the Vietnam Conflict. From 1964 to 1975, there were 24,606 cases of malaria in the Navy and Marine Corps, amounting to over 391, 965 sick days lost. Only wounds and non-battle injuries amounted for more personnel days lost among combatants.

The *Plasmodium falciparum* form of malaria was especially pernicious. In 1968, 75 percent of the malaria cases in theater were *P. Falciparum* infections—which unlike *P. vivax*—proved resistant to the standard Chloroquine-Primaquine (C-P) regimen. In February 1968, after dealing with increased levels of malaria, the Commander, U.S. Military Assistance Command, Vietnam (MACV)—who oversaw Armed Forces in theater—authorized the administration of Dapsone tablets (diaminodiphenyl sulfone) in addition to the C-P regimen. An anti-inflammatory that historically had been used for everything from acne to leprosy, Dapsone was seen by some as a dubious prophylaxis.

To investigate the malaria problem, the Bureau of Medicine and Surgery (BUMED) sent a preventive medical specialist Capt. Charles Miller, MC, USN, to Vietnam in July 1969. Much of his work would be conducted in concert the Navy Preventive Medicine Unit (PMU) G-18/19 based in Da Nang. Established July 7, 1965, the PMU would execute sanitation and vector control practices, conduct malaria surveys, oversee field surveillance, and collect larvae throughout the tactical zone. Of the 75 species of mosquito collected, PMU personnel identified two subspecies of Culex (Lophoceraomyia and Mochthogenes) never before identified in Vietnam.

Aerial insecticides would prove a key component of the Navy's vector control effort in theater. In 1967, the Navy Disease Vector Ecology and Control Center (DVECC) in Jacksonville, Florida, developed the Helicopter Improved Aerial Insecticide Dispersal Apparatus prototype as an alternative to liquid droplet (Fog) dispensers. Designed to spread granular insecticides that could penetrate through dense jungle areas, the device consisted of a receptacle placed at the nose of a helicopter from which the insecticide was propelled by a stream of forced air. It would be used extensively in theater and serve as the basis for apparatuses later used by the Army and civilian organizations....

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February 2017 | Vol. 9 Iss. 2

Navy Lab Opens a State of the Art Insectary in the Amazon Region of Peru

From U.S. Naval Medical Research Unit No. 6 Public Affairs

LIMA, Peru — The U.S. Naval Medical Research Unit No. 6 (NAMRU-6) celebrated the opening of a new insectary, December 9, 2016. The event started with a ribbon cutting ceremony. The Honorable Brian Nichols, U.S. Ambassador to Peru, and the Commanding Officer of the Naval Medical Research Center, Capt. Jacqueline Rychnovsky, attended the event along with other invited guests. The new insectary will be an important asset to continue the fight against vector borne diseases like malaria and dengue fever.

"The work that will take place in the new building is critical to the understanding and mitigation of infectious diseases in the country, and exemplifies the collaboration between the Peruvian Navy and U.S. Navy, as well as with the Ministry of Health, local and international universities, and research institutions," said Capt.

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Naval Medical Research Center Welcomes New Director for Field Laboratory Operations

From Naval Medical Research Center Public Affairs

SILVER SPRING, Md. — The Naval Medical Research Center (NMRC) selected James Andrews, Ph.D. as the new Director of Field Laboratory Operations (FLO).

Andrews has many day-to-day administrative and scientific responsibilities, including assuring researchers at NMRC and the laboratories across enterprise succeed.

"Part of giving researchers the chance to succeed includes identifying their needs and the needs of the various programs," said Andrews. It isn't uncommon to find the Director of FLO as the interface between the various commands, headquarters, and higher authority.

Communicating and identifying problems or areas of concern is a major role as Director of FLO. "It is important to be mindful of the importance of good communication between sponsors, researchers, leadership, and higher authority....

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Millennium Cohort Study Examines Self-Reported Back Pain and Combat Deployment

From Naval Health Research Center Public Affairs

SAN DIEGO — Recent research from the *Millennium Cohort Study* found that military personnel who deployed with combat experiences were more likely to report back pain after deployment than service members who deployed without combat experience. Study findings were recently published in the November issue of *Spine.*

Researchers conducted an analysis of 53,933 Millennium Cohort participants who did not report back pain at baseline but did self-report back pain at follow-up, which was 3.9 years on average. The Millennium Cohort Study began in 2000 to assess the long-term health outcomes of military service. The study currently has over 200,000 enrolled participants. According to the study, military personnel who had combat deployments had 38 percent higher odds of reporting back pain at follow-up and 27 percent higher odds of having repeated back pain than service members who deployed without combat....

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NHRC Researchers Studies Impact of Operational Postures on Low Back Pain

From Naval Health Research Center Public Affairs

SAN DIEGO — Recent research from Naval Health Research Center's Warfighter Performance Department found that the sitting position was associated with high rates of low back pain (LBP) and disc degeneration among U.S. service members who participated in the study. Research findings were recently published in the January issue of the *Journal of Orthopaedic Research.*

According to researchers, in 2013 there were over 975,000 military medical encounters due to back pain, more than any other major medical condition, and the Veterans Health Administration has also noted an increasing trend of LBP in recent years.

Previous studies have shown an association with increased rates of intervertebral disc (IVD) degeneration and increased military service, time, and age among U.S. service members....

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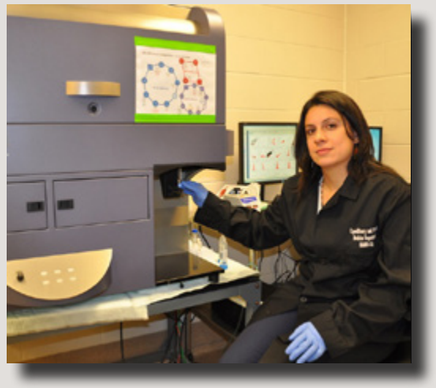
NMRU-SA Researchers Focus on Monitoring the Immune System to Diagnose and Treat Traumatic Injuries

From Naval Medical Research Unit - San Antonio Public Affairs



SAN ANTONIO — Researchers at the Naval Medical Research Unit San Antonio (NAMRU-SA) are working to understand both the physiologic and molecular changes that occur in response to traumatic injury. One of the primary focus areas of this research is the identification of the mechanisms within the immune system that respond to injury, specifically hemorrhage and poly-trauma.

"Traumatic injury is a leading cause of mortality in the military and civilian population. The loss of blood, combined with tissue damage, initiates a physiologic response that can promote both reparative wound healing and deleterious inflammation, depending on the predisposition of the affected individual's immune system," said Dr. Madelaine Paredes, researcher in NAMRU-SA's Immunodiagnostic and Bioassay Development Department NAMRU-SA. Humans have widely varying immune systems due to a variety of factors including genetic makeup, gender, age, lifestyle, and previous antigen exposure....

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NMRC STEM Intern Became Finalist in Marvel Studios Doctor Strange "The Magic of STEM" Challenge

From Naval Medical Research Center Public Affairs

SILVER SPRING, Md. — Former Naval Medical Research Center (NMRC) Science, Technology, Engineering and Mathematics (STEM) intern, Navya Annapareddy, 16, was a finalist in a Marvel Studios challenge. Marvel Studios' "Doctor Strange: The Magic of STEM challenge sought to inspire girls and show them the wonders of science and technology. The challenge encouraged young girls to answer some of sciences most complex problems and questions, with the intent to motivate all young-thinkers to explore all options and think outside of the box.

As an NMRC intern, Annapareddy said, "I gained a lot of experience at my time with NMRC, the whole experience really taught me the technical translation skills that I think helped me become a finalist in this competition." At NMRC she was assigned to the Viral and Rickettsial Disease Department in the Infectious Diseases Directorate at NMRC and had the opportunity to work with Dr. Peifang Sun, her mentor. Her primary project focused on the enhancement of a Zika virus infection of human monocytes by dengue immune sera....

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Closing the Gap: Malaria Vaccine Candidate Proves to Be Effective in Navy Medicine Clinical Trial

From Naval Medical Research Center Public Affairs

SILVER SPRING, Md.— In recent years, researchers at the Naval Medical Research Center (NMRC) and the Walter Reed Army Institute of Research (WRAIR) have put much effort into developing an effective and safe vaccine against malaria – a disease that is ranked by the Department of Defense (DoD) as the number one infectious disease threat to military personnel deployed to areas where it is endemic.

The paper, *Protection Against Plasmodium falciparum Malaria by PfSPZ Vaccine*, published in *JCI Insight*, January 12, 2017, highlights the research conducted by a team of clinical investigators at NMRC and WRAIR, led by Navy Capt. Judith Epstein and Army Maj. Kris Paolino, now retired. The study reports that a radiation-attenuated *P. falciparum* (Pf) sporozoite (SPZ) malaria vaccine, PfSPZ Vaccine, developed by NMRC collaborative business partner, Sanaria, protected volunteers against two strains of *P. falciparum* malaria. The sporozoite is the stage of the malaria parasite which an infected mosquito injects into a person. The PfSPZ Vaccine includes parasites that are attenuated, or weakened; they generate strong immune responses against malaria, but cannot cause disease.

"As a Navy scientist it has been rewarding to work hand-in-hand with Army investigators as we move closer to the goal of a vaccine that can provide protection against malaria for our military personnel," said Epstein. "Many experts believe that this vaccine may be used to protect the most vulnerable populations abroad and in mass vaccination administration campaigns to eliminate the disease."

A recent clinical trial assessed tolerability, safety, immunogenicity and protective efficacy of the vaccine in non-immune subjects. The clinical trial included 67 subjects, 19 to 45 years old. Of the 67 subjects, 45 received at least one dose of the vaccine, and 22 were control subjects.

Initial studies demonstrated that five doses of PfSPZ vaccine provided protection against infection by malaria parasites similar to those used in the vaccine in six of six subjects (100 percent) who were tested three weeks after the final vaccine by exposure to malaria-infected mosquitoes in a Controlled Human Malaria Infection, (CHMI).

Three weeks after last immunization, 25 of the 28 subjects (89 percent) were protected against infection by malaria parasites similar to those in the vaccine that were transmitted by exposure to malaria-infected mosquitoes in the CHMI. Four out of five vaccinated subjects were protected against infection by parasites different from those in the vaccine....

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