

## Inside this Issue:

DoD Funding for Zika	1
CO columns	2
NREIP Student Interns at NMRC	3
NAMRU-SA Announces Publication of SERS Biosensor Research	6
NHRC Hosts Respiratory Diseases Working Group	7
Understanding the Military Family	8
NHRC Developing Mobile App to Help Prevent Prescription Medication Misuse	10
R&D Chronicles: Part III: The Mosquito Fighters	11
NAMRU-SA Showcases Navy Research at SURF 2016	13
NSMRL Research Psychologist Successfully Completes SCUBA Diver Course	14

More stories inside

NMR&D News is a publication of the Naval Medical Research Center, 503 Robert Grant Avenue, Silver Spring, Maryland, 20910. NMR&D News is published monthly by the NMRC Public Affairs Office 301-319-9378.

*Commanding Officer*  
CAPT Jacqueline D. Rychnovsky

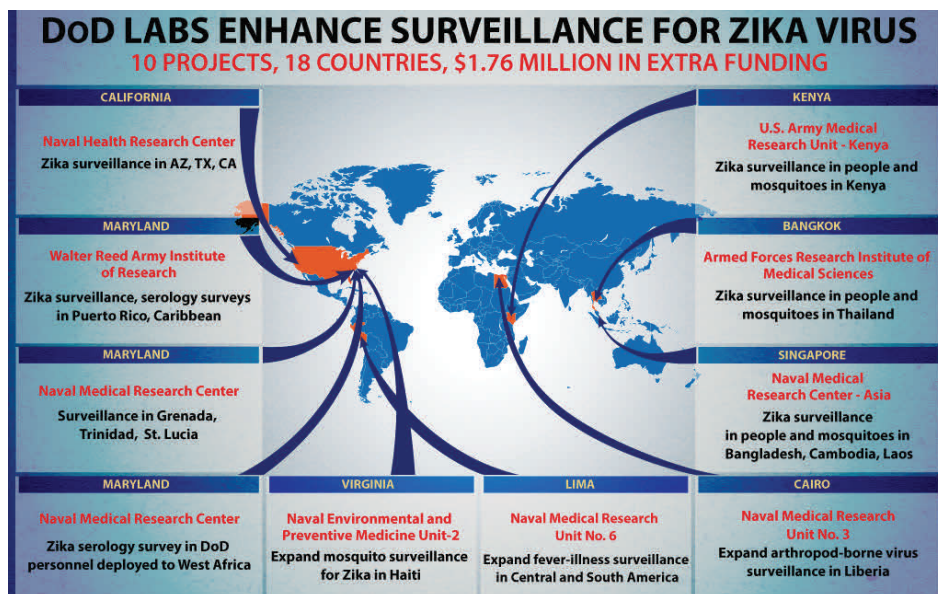
*Executive Officer*  
CAPT Eric R. Hall

*Director for Administration*  
Steven S. Legette

*Public Affairs Officer*  
Doris Ryan

## DoD Adds Funding to Enhance Zika Surveillance by Military Labs

By Cheryl Pellerin, DoD News, Defense Media Activity



The Defense Department is providing \$1.76 million in extra funding to military laboratories to expand Zika virus surveillance worldwide and assess the virus's impact on deployed service members' health and readiness. DoD graphic by Regina Ali.

WASHINGTON, May 16, 2016 — The Defense Department is providing \$1.76 million in extra funding to military laboratories to expand Zika virus surveillance worldwide and assess the virus's impact on deployed service members' health and readiness, Navy Cmdr. Franca Jones said in a recent interview.

Jones, who holds a doctorate, is chief of the Global Emerging Infections Surveillance and Response, or GEIS, section of the Armed Forces Health Surveillance Branch in the Defense Health Agency's Public Health Division.

The enhanced Zika virus surveillance will involve 10 projects in 18 countries and

territories by four lab partners based in the United States and five located overseas.

Jones said the labs receiving more Zika virus funds are part of the GEIS integrated worldwide emerging infectious disease surveillance network that includes core Army or Navy medical research labs in Egypt, Georgia, Kenya, Peru, Thailand, Cambodia and Singapore, and Army, Navy and Air Force labs in the United States, working in more than 60 countries around the world.

In the current fiscal year, she added, GEIS already has provided its network partners with more than \$51 million to support a range of emerging infectious disease surveillance programs.

(Continued on page 4)

## NMRC Commanding Officer's Message

Mentors ... not a single one of us would be here today, doing the diverse tasks, jobs, and program execution that we are charged with, without a strong mentor in our past. This summer, many of you are going to have an opportunity to mentor young scientists participating in the Naval Research Enterprise Internship Program (NREIP) and the Science and Engineering Apprenticeship Program (SEAP), sponsored by the Office of Naval Research. These vital STEM programs focused on developing young scientists are 8-10 week paid internship programs administered by the American Society for Engineering Education (ASEE). On a personal note I am very pleased they are here at the Naval Medical Research Center in Silver Spring, Maryland, and I'd like to offer you a brief, virtual introduction of our NREIP interns.

NREIP interns are selected based on academic achievement, personal statements, and recommendations, and career and research interests. This internship program is designed to provide opportunities for undergraduate and graduate students to participate in research under the guidance of a research mentor.



Mr. Greg Pearson, a graduate student at Shippensburg University, is onboard to use quantitative real-time polymerase chain reaction assays and multilocus sequence typing to identify rickettsial agents infecting ticks. Mr. Matthew Bond, an undergraduate student at the University of Miami, will explore the synergistic activity of four *Lactobacillus* species and various antibiotics against ESKAPE pathogens; Mr. Sragvi Tirumala, an undergraduate student at George Washington University, will be processing physiological data, working with large data sets in the Undersea Medicine Department.

Ms. Sydney Zarriello, an undergraduate student at the University of Miami, and Mr. Sudhamsh Tippireddy, an undergraduate student at George Washington University, will be assisting on a study to determine if blast overpressure causes damage or alteration in the medial prefrontal cortex in a rat model of traumatic brain injury; Ms. Michelle Bundy, an undergraduate student at

(Continued on page 3)

## NAMRU-SA Commanding Officer's Message

James Taylor, (American singer-songwriter) said, "The secret of life is enjoying the passage of time." This month marks a year since I moved to San Antonio to assume the command at NAMRU-SA and I have certainly enjoyed the passage of time here in this dynamic research environment. In this past year the pace of scientific research picked up and NAMRU-SA continued to grow and produce products to help the warfighter, even while we bring in new research talent, as others transition out. I am proud to say, NAMRU-SA investigations are advancing significantly in all project areas including, promoting craniomaxillofacial regenerative bone healing, rapid detection of multidrug-resistant microorganisms, laser-therapy for the treatment of bacterial biofilm infections, novel wound healing dressing for craniofacial injuries, stabilization of hemorrhagic shock, evaluation of field tourniquets, and even the development of a universal antivenom. Our scientists are known for their passion and commitment, so it is no surprise our Principal Investigators are boldly committed to an aggressive publications plan this year and we successfully achieved the 100<sup>th</sup> publication project within the first half of this fiscal year, including six published manuscripts to-date. When I started in medical research, it took months if not years, to get a paper published and have someone cite the manuscript. This lag time is rapidly decreasing thanks to the Internet and the idea of open access articles. In-turn, open access and the dissemination of research findings opens the door to collaborations and partnerships within and across the services and beyond. To ensure military relevant research continues to advance and is transitioned on time and on budget, the services are going to have to work together. So what is on the horizon for the next year? I see the need to cultivate more collaborations/partnerships and leverage resources to offset research funding constrictions. NAMRU-SA is already aggressively engaging in these pursuits and will continue to tell our original research stories in published work to fuel new research collaborations that will result in the best technology and treatment solutions to help warfighter survival.

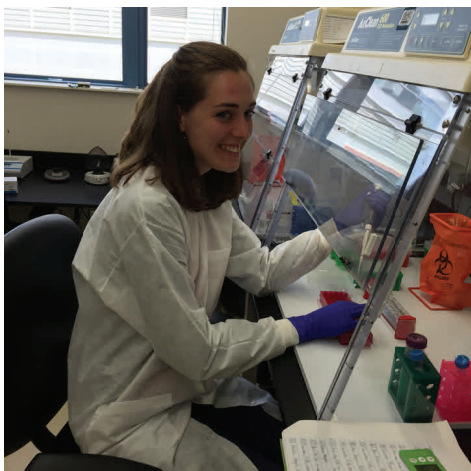


NAMRU-SA Commanding Officer sends,  
Elizabeth Montcalm-Smith, CAPT. MSC, USN

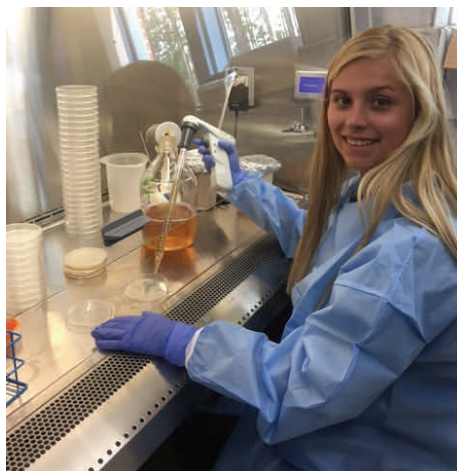


---

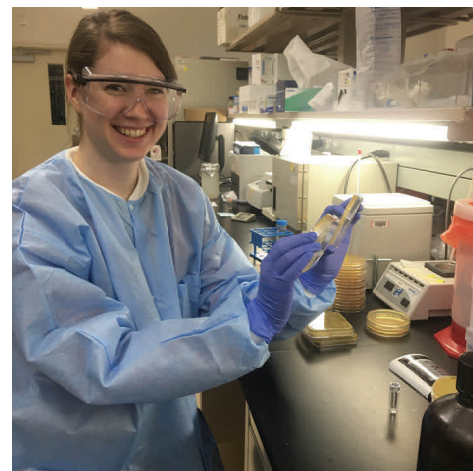
# NREIP Student Interns at NMRC



Adrian Paskey, working with the sequencing team in Genomics.



Lisa Curbo, working in the Genomics Dept.



Sara Wilson, working in the Genomics Dept.

(Continued from page 2)

St. Augustine's University, will be assisting with a study to understand combat-related concussions and to determine associated health outcomes post-deployment.

Ms. Sarah Wilson, a graduate student at University of Wisconsin-Madison, will assist with a project to explore isolation, identification and characterization of *Pseudomonas aeruginosa* bacteriophages to study the efficacy of phage growth on their respective host.

Ms. Jessica Goodrich, an undergraduate student at St. Mary's College of Maryland, will assist on a project to assess the impact of physical blast injury and acute enteric infection on changes in the intestinal microbiome and on long-term behavior of rats.

Ms. Jasmine Moore, a recent graduate of Alcorn State University with an MS in Biology, will test the hypothesis that one can select for *Lactobacilli* that are better equipped at outcompeting and inhibiting pathogens through continual exposure and isolation to such pathogens.

Ms. Lisa Curbow, an undergraduate student at Valencia College, will be involved with isolation, identification and characterization of various broad spectrum *Acinetobacter baumannii* bacteriophages from environmental sources to study the efficacy of phage growth on their respective host.

None of this could be accomplished without the seasoned mentors who agreed to support these students during a very compressed summer schedule.

I wish to offer my personal gratitude to Dr. Richards, Dr. Fedrow, LT Watters, Mr. Stanbro, Dr. Hall, Dr. Tschiffely, LCDR Walker, Dr. Kawoos, Dr. Abutarboush, Dr. Scultetus, Dr. Glueck, and Dr. Biswas.

And finally, nothing of this magnitude could be successful without a stellar program manager, so "hats off" to the ultimate mentor, LT Kimberly Edgel, who has managed this program flawlessly for the past two years.

These interns are away from their homes, their families and their friends, so please offer them a warm smile and a big welcome to the NMRC family for the short time they are here. Never forget that a home cooked meal, a batch of cookies, or a bit of sightseeing advice is always a welcome treat from you at their "home away from home."

**NMRC Commanding Officer sends,  
Jacqueline D. Rychnovsky  
CAPT, NC, USN**



NREIP students at the Naval Medical Research Center. From left to right—Sudhamsh Tippireddy, Jasmine Moore, Michelle Bundy, Jessica Goodrich, Matthew Bond. Not present: Gregory Pearson, Sragvi Tirumala, and Sydney Zarriello. All photos provided by NMRC.



# DoD Adds Funding to Enhance Zika Surveillance by Military Labs

(Continued from page 1)

## Mosquito-Borne Zika

Zika virus disease spread to people through the bites of *Aedes aegypti* mosquitoes, usually shows mild symptoms -- fever, rash, joint pain and red eyes -- that last several days or a week, according to the CDC. But Zika virus infection during pregnancy can cause a serious birth defect called microcephaly and other severe fetal brain defects, the CDC says.

In May 2015, the Pan American Health Organization issued an alert about the first confirmed Zika virus infection in Brazil. The WHO declared Zika virus a public health emergency of international concern. Local transmission has been reported in many other countries and territories.

Zika virus likely will continue to spread to new areas, CDC says. Some 4,905

confirmed and 194,633 suspected cases had been reported in 33 countries and territories in the Western Hemisphere, according to an April 6, 2016, Armed Forces Health Surveillance Branch summary.

Jones said the DoD labs will use the Zika money provided by the branch's GEIS section for three kinds of surveillance studies. One will look retrospectively for Zika virus exposure among DoD personnel through serum repository samples. A retrospective study looks backward in time, in this case using serum samples of patients who had been deployed in areas with high rates of Zika virus infection.

The other surveillance studies will leverage existing work in the GEIS lab network in different parts of the world to expand clinic-based surveillance for Zika virus disease among DoD and civilians,

and expand testing for Zika virus in mosquitoes.

## DoD Serum Repository

The Defense Department collects a range of blood serum samples from all service members before, during and after their military service, and maintains the samples in the Armed Forces Health Surveillance Branch's Department of Defense Serum Repository. Serum is a clear fluid that's part of a person's blood. It's used in many medical diagnostic tests and in blood typing. The repository is the world's largest of its kind, with more than 60 million serial serum samples from more than 10 million service members.

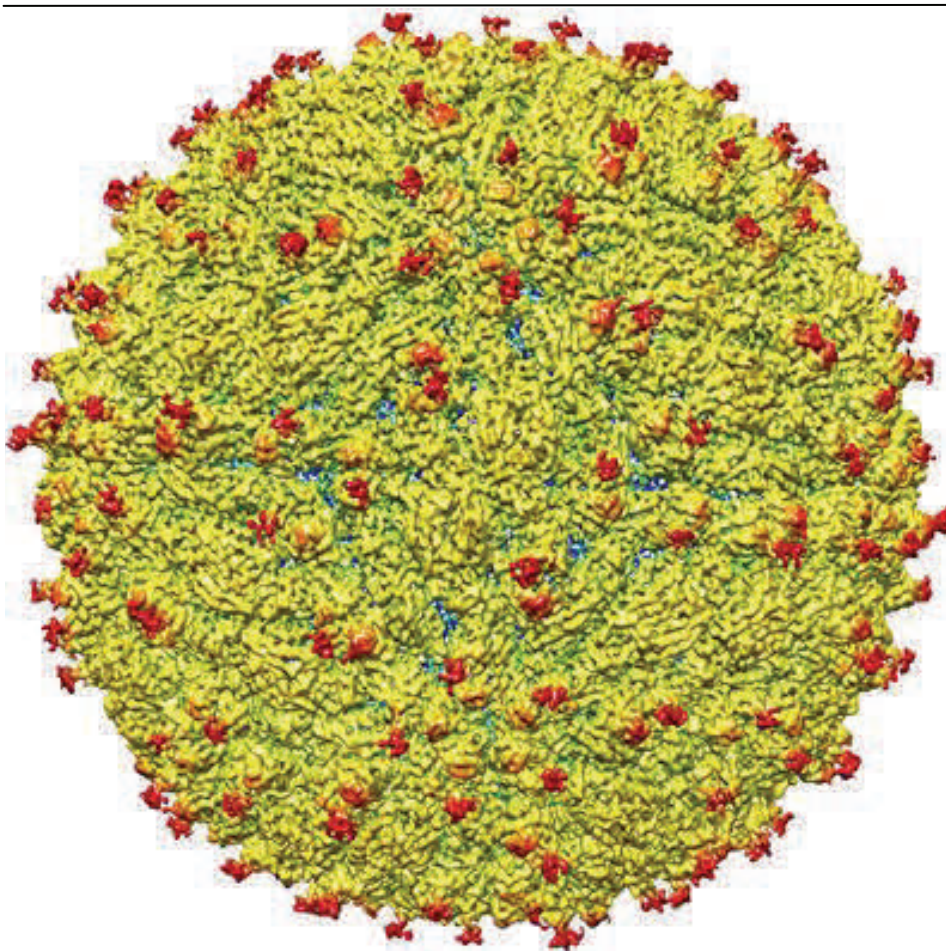
For the retrospective Zika virus surveillance study, military virologists -- scientists who study viruses -- and public health officials will check the serum samples of service members stationed in the United States and in high-risk regions in the Caribbean and other places overseas. The scientists will be looking for prior exposure to Zika, dengue and chikungunya viruses, all of which are transmitted by *Aedes aegypti* mosquitoes.

In recent years, according to CDC, dengue and chikungunya cases have begun to appear in the United States, most of them brought in from tropical urban areas of the world.

## Understanding Risk

"For the service members, I can talk from personal experience," Jones said. "Our blood is drawn when we enter active duty, prior to and following all deployments, and occasionally during acute illness for the purpose of storing in the serum repository, allowing for [later] analyses of a service member's serum over his or her time in service. So the serum repository keeps a history of a service member's serum on tap."

She added, "When looking to understand exposure to our service members, the repository provides a unique resource for helping to determine if, when and where there was any exposure to a variety of pathogens."



A representation of the surface of the Zika virus with protruding envelope glycoproteins (red) shown. Photo courtesy of Kuhn and Rossmann research groups, Purdue University, research funded by the National Institute of Allergy and Infectious Disease

(Continued on page 5)

# DoD Adds Funding to Enhance Zika Surveillance by Military Labs

(Continued from page 4)

This serum surveillance effort will examine 500 samples from service members stationed in Puerto Rico during a time when some of the viruses were transmitted, and 500 from service members deployed to West Africa, Jones said.

“We’re trying to understand the baseline risk for service members,” she added.

## Lines of Effort

Other lines of effort for surveillance include looking for Zika virus in mosquitoes in the Caribbean, East Africa, and Southeast Asia, Jones said, and also looking for Zika virus in service members and in military beneficiary and civilian populations who go to medical facilities with a fever, medically known as a febrile illness.

The febrile surveillance will be done in the southwestern United States -- California, Arizona and Texas -- and in the Caribbean, Central and South America, East and West Africa and Southeast Asia, she said.

In mosquito surveillance, scientists capture mosquitoes in traps and take them to the DoD labs to be processed to get the genetic material for testing.

“By testing the genetic material, we can understand where mosquitoes are carrying the virus,” Jones explained. “We won’t necessarily be able to tell quantitatively the percentage of mosquitoes carrying the virus, but in relative terms we’ll learn about the population that’s carrying the virus, in what parts of the world, and the risk to DoD populations.”



*A female Aedes aegypti mosquito. National Institute of Allergy and Infectious Diseases photo*

## Febrile Illnesses

Human surveillance focuses on service members and military beneficiary and civilians who go to the hospital with febrile illnesses. “Most of these are efforts where we are already conducting surveillance for other febrile pathogens,” Jones said.

“For example we have a study in Peru, where they’re already doing clinic-based febrile surveillance activities in South America. These are people in the population who come to the clinic with a febrile illness. Their blood will be drawn and sent [to the U.S. Naval Medical Research Unit No. 6 in Lima, Peru,] for testing for Zika virus, along with other

pathogens the scientists there have been looking for,” she added.

## Protecting the Global Force

Jones said officials don’t know what they’re going to find in the GEIS-funded effort.

“It’s very possible that the actual [number] of mosquitoes that are carrying the virus or the number of patients that we get is so small that the chance of finding something could be small,” she acknowledged. But she said GEIS still wants to do the work, because the lack of Zika virus in the samples is also valuable information and helps to determine the risk to service members.

The Defense Department is providing \$1.76 million in extra funding to military laboratories to expand Zika virus

“For us in GEIS, because it’s very important to us to understand what diseases are currently in what geographic locations in the world, and understand what disease may emerge and spread rapidly,” Jones explained. “Our forces are present globally, and we need to make sure they are able to complete their mission. Infectious diseases are one of the things that can impede their ability to do their mission.”



# NAMRU-SA Announces the Publication of SERS Biosensor Research to Aid in Prevention of Infectious Complications in Wounded Warfighters

Story courtesy of NAMRU-SA Public Affairs

SAN ANTONIO—Naval Medical Research Unit San Antonio (NAMRU-SA) recently published data in the Volume 8 issue of the *Sensing and Bio-Sensing Research* journal that demonstrates the surface-enhanced Raman spectroscopy (SERS) biosensor was capable of detection, identification, and classification of a majority of the bacteria of military interest sampled from human serum.

Bacterial diagnostic techniques take between 24 to 48 hours and require plating, growth and examination of colony morphology or color for identification. Biosensors based on SERS technology hold great promise as a platform for rapid and sensitive detection of bacterial pathogens by decreasing time of diagnosis and preventing infection related mortality and morbidity.

Navy researchers utilized hand-held SERS biosensor technology to detect microorganisms and to generate a bacterial “molecular fingerprint” of infection-causing pathogens in under 30 seconds at the species level. Hydrophilic bacteria were readily detected and identified from serum samples without significant changes occurring to their spectra due to sample processing. Shifts in relative peak intensities of SERS spectra were observed primarily for hydrophobic bacteria after recovery from serum. The study observed that the lysis filtration process to separate and isolate bacteria can cause changes to the SERS spectra of some bacterial species and the bacterial cell wall may be affected by lysis filtration procedures.

NAMRU-SA researchers believe the SERS biosensor will be able to aid in administering appropriate antibiotic treatments. After successful identification of an infecting microbe, drug resistance can be assessed by observing shifts in SERS peak intensity after incubation on antibiotic coated nanoparticles.

“Ultimately, we would like to see a fully functioning biosensor system deployed, even in field conditions, and to curate libraries of bacterial SERS spectra that can be prepared in advance to generate reference criteria for identification of several bacterial species and strains from blood and tissue samples,” says Luis Martinez, Ph.D., article co-author and researcher in NAMRU-SA’s Cellular and

Immune Based Adjuncts for Casualty Care Department.

**Citation:** Kotanen CN, Martinez L, Alvarez R, Simecek JW, (2016) Surface enhanced Raman scattering spectroscopy for detection and identification of microbial pathogens isolated from human serum. *Sensing and Bio-Sensing Research* 8:20-26. <http://dx.doi.org/10.1016/j.sbsr.2016.03.002>.



NAMRU-SA's original research describes the characterization and evaluation of a handheld surface-enhanced Raman spectroscopy (SERS)-based diagnostic system for the detection and identification of bacteria in pooled human sera. (Graphics courtesy of NAMRU-SA Public Affairs)

---

# NHRC Hosts Respiratory Diseases Working Group to Keep Warfighters Healthy

---

*Story from NHRC Public Affairs*

SAN DIEGO – The Naval Health Research Center (NHRC) hosted a working group for military researchers from around the globe to discuss future directions for respiratory diseases surveillance, testing, and research in support of force health protection, May 24-25.

The group, Respiratory Illness Surveillance Working Group (RISWG), is part of the Global Emerging Infections Surveillance (GEIS) section at the Armed Forces Health Surveillance Branch (AFHSB). The mission of the AFHSB is to contribute to the protection of all Department of Defense (DoD) beneficiaries and the global community by integrating a worldwide disease surveillance system.

“Our mission is force health protection,” said Capt. Michael Cooper, lead for respiratory infection surveillance for GEIS. “That’s what we are really concerned with—keeping the warfighter

well. The purpose of this meeting was to get together with our partner laboratories and discuss the future of respiratory illness surveillance for the DoD.”

Researchers and public health professionals came for the meeting from Navy, Army, and Air Force laboratories located around the world, including Thailand, Germany, and Peru, and throughout the U.S. The locations represent places where there is a U.S. military presence as well as places important for respiratory diseases surveillance such as Middle East Respiratory Syndrome Coronavirus (MERS CoV) and influenza, particularly the H5N1 strain.

“These are very important public health problems,” said Cooper. “Keeping vigilant of their spread, transmission rates, and the severity associated with the diseases and then reporting our findings to the Centers for Disease Control and Prevention and the World Health Organization really puts us

in the thick of the fight to catch emerging infectious diseases.”

According to Dr. Christopher Myers, head of biosurveillance at NHRC, topics for the two-day meeting included discussing which pathogens have the largest impact on operational readiness, best practices for testing samples to maximize detection of infectious diseases, evaluating new technologies for shipboard and forward-deployed use, sharing data regarding influenza vaccine effectiveness in terms of global public health, and data and sample sharing among RISWG partners.

One outcome of the meeting is that the RISWG will place more emphasis on providing influenza surveillance data for southern hemisphere vaccine selection to the CDC. This will support health readiness for troops who deploy globally.

“Influenza is very contagious and easily spread,” said Cooper. “Flu viruses can

*(Continued on page 9)*



*Members of the Respiratory Illness Surveillance Working Group (RISWG) pose for a group photo at Naval Health Research Center. RISWG, is part of the Global Emerging Infections Surveillance (GEIS) section at the Armed Forces Health Surveillance Branch (AFHSB). The mission of the AFHSB is to contribute to the protection of all Department of Defense (DoD) beneficiaries and the global community by integrating a worldwide disease surveillance system. (U.S. Navy photo by Mayra A. Conde).*



# Understanding the Military Family: Researching the Impact of Military Life

Story from NHRC Public Affairs

SAN DIEGO. Today, the Navy, along with the Marines, Army, and Air Force, understand families play an essential role in the readiness of their service members. Deployed service members worried about their families back on the home front are not 100 percent focused on the mission. That's why the Department of Defense (DoD) is making quality of life for military families a priority.

In June 2011, the DoD's largest population-based study in military history, the Millennium Cohort Study, began enrolling spouses from all services, including the Reserves and National Guard, as part of a new Family Study. Since then,

approximately 10,000 spouses have been enrolled.

"We have known for a long time that military spouses play a critical role in supporting our military personnel," said Valerie Stander, Ph.D., and principal investigator for the Millennium Cohort Family Study at the Naval Health Research Center (NHRC). "In many ways the military counts on spouses to be the other half of our military readiness equation. Yet, for too long we haven't understood enough about how military life affects the lives of service members' partners."

The overarching goal of the Family Study is to understand how military service impacts family members. This study, the first of its kind, seeks to get a better understanding of the long-term association between military experiences and deployments and the health and well-being of families.

Information is collected from participating spouses using a web-based survey with a focus on a variety of topics, including physical and mental health, the quality of marital and family relationships, work/family balance, deployment and reunion

(Continued on page 9)



160601-N-XG464-036 NORFOLK, Va. (June 1, 2016) Family of Lt. Cmdr. Patrick Batiste show their support by holding up homemade signs as the aircraft carrier USS Dwight D. Eisenhower (CVN 69) departs Naval Station Norfolk. The ship is deploying as part of the Optimized Fleet Response Plan (OFRP) and will conduct air strikes against ISIL in support of maritime security operations and theater security cooperation efforts in the U.S. 5th and 6th Fleet areas of operation as well as the Great Green Fleet initiative. While deployed, CSG ships and aircraft will employ operational procedures and energy conservation measures in order to enhance operational capabilities, enabling strike group units to go farther, stay longer and deliver more firepower without having to refuel. The ships in the carrier strike group are USS Dwight Eisenhower (CVN-69) with Carrier Air Wing 3 (CVW-3), the guided missile cruisers USS San Jacinto (CG-56) and USS Monterey (CG-61) and the guided missile destroyers USS Mason (DDG-87) and USS Nitze (DDG-94). (U.S. Navy photo by Mass Communication Specialist 2nd Class Jonathan B. Trejo/Released)



---

# Understanding the Military Family

(Continued from page 8)

experiences, and protective factors and coping mechanisms.

The study is longitudinal and seeks to follow spouses for 21 or more years, with follow-up surveys requested approximately every three years. Even if enrolled spouses become separated or divorced from their service member or the service member separates from the military, follow-up will continue to capture the changes in military families' experiences over time.

"Through the Millennium Cohort Family Study we hope to get a bird's-eye view of how military life plays out for our families over the long haul," said Stander. "We know most families are resilient in the short term, but how does military life impact spouses and kids of service members who stay in the military for 20 years compared to those who serve a single term and then move on to civilian life? And, we know deployment and other military-related family separations are stressful, but most families bounce back once they have the chance to reunite and reintegrate. But, what factors predict the difference for those who do continue to struggle for some time?"

Researchers want to answer these questions and more. They are also interested in studying the cumulative impact of deployments, frequent training assignments away from home, and extended unaccompanied assignments.

"The only way to get our arms around those outcomes is to take a really long, hard look at how people are doing over the years," said Stander.

"The military family policy, support, and research communities have all expressed considerable interest in the Family Study as it has evolved and progressed" said Stander. "All of these groups potentially look to the results of the study to understand how they can do their jobs better."

The team at NHRC also partners with military family researchers at multiple locations, including Walter Reed Army Institute of Research and civilian universities, who are all helping to analyze and interpret the data.

"Our internal team here, in turn, is connecting with military policy makers

and service providers to ensure we communicate the results of this work to those who can make a difference," added Stander.

"The Millennium Cohort Family Study research team is profoundly grateful for the dedication of all of our research participants," said Stander. "Without family members who take time out of their busy schedules to tell us about how things are going for them and how they feel military life has impacted them and their families, this study would not be possible. I think most of our participants are motivated to help the military community improve programs and services for future generations of service members and their spouses and children. I think they see it as a chance to help build that future military community."

## To date, key findings from the Family Study include:

- 89% of participants are younger than 35
- 12% of participants are male
- 71% of participants have been married five years or less
- 63% of participants have children
- 10% of participants are dual military families
- 74% of participants' spouses have deployed
- 3% of participants represent Reserve and National Guard families



---

## NHRC Hosts Respiratory Diseases Working Group

(Continued from page 7)

mutate and change, turning into something novel that the average individual won't have any real immunological defense against, which is why so much time and effort is spent on surveillance."

NHRC's role in respiratory disease surveillance and analysis enabled the early detection and identification of a novel influenza virus, H1N1, in 2009. During

routine testing, NHRC scientists discovered two influenza A cases that were different—they didn't subtype as either of the seasonal strains that year. Using advanced molecular diagnostic techniques, NHRC was able to identify the first cases of the 2009 pandemic. This early identification allowed U.S. public health authorities to respond to the outbreak in a timely manner.

"NHRC and GEIS share the common goals of promoting force health protection and protecting our warfighters from respiratory diseases, especially influenza," said Capt. Rita Simmons, commanding officer at NHRC. "Our partnership is a natural outcome of these mutual interests, and our collaborative efforts to mitigate infectious respiratory diseases through research and development is vital to readiness. *A sick warfighter is not mission ready.*"

# NHRC Developing Mobile App to Help Prevent Prescription Medication Misuse

Story from Naval Health Research Center

SAN DIEGO - In support of force health readiness, staff at the Naval Health Research Center (NHRC) have begun the second phase of development in a smartphone application aimed at preventing prescription medication misuse by military personnel.

Service members who have been injured or suffer from chronic pain are often prescribed pain medication during recovery and rehabilitation. Pain management is an important part of the healing process, but it may also create the potential for prescription medication misuse.

In an effort aimed at prevention, researchers at NHRC are part of a collaborative effort funded by the National Institute on Drug Abuse (NIDA) to develop a mobile tool to educate and inform service members about prescription medications and assess the potential for misuse.

“The idea for the app is to provide Sailors, Marines, soldiers, and airmen with information on prescription drugs and prevent inadvertent misuse,” said Capt. Kim Lefebvre, executive officer at NHRC and a Navy pharmacist.

According to Lefebvre, the app is intended to support patients in situations where they

In support of force health readiness, staff at the Naval Health Research Center (NHRC) have begun the second phase of development in a smartphone application aimed at preventing prescription medication misuse by military personnel. Phase one of the app development tested usability which included feedback from Sailors and Marines who were asked to perform specific tasks in each of the app’s modules.

Assessment	Evaluates individual factors related to prescription drug misuse
My Meds	Allows users to enter their current medications
Feedback	Shows user risk level based on the assessments along with specific recommendations to reduce risk
Practice	Provides different scenarios designed to help users build skills to effectively manage situations related to prescription medication use
Learn	Contains educational information related to prescription drug misuse
Resources	Provides links to military and civilian resources with information and support for pain management, prescription drug disposal, medication interactions, and substance abuse.

do not have immediate access to their health care providers but have questions about appropriate use of their prescription medication.

“A patient may find that their prescribed dose of medication is not controlling their pain or they may be uncertain about whether or not they can take another medication in addition to their prescribed one,” said Lefebvre. “In these situations,

the app can help support the patient’s decision-making process by providing education and resources about medication interactions, risk behaviors that can lead to addiction and more, but it is not intended to replace the expertise of a health care provider.

The app supports the Military Health System’s initiatives to provide patient-centered care and engage patients in their own health care.”

“As we enter the second phase of the app development we will be working on enhancing the app based on the user feedback we received during phase one,” said Suzanne Hurtado, the NHRC principal investigator whose team partnered in the development of and led testing for the beta app.

“Overall, the app was positively received and we gathered valuable feedback during initial testing that will help us improve functionality, make it more user-friendly, and, most importantly, contribute to reducing prescription medication misuse and abuse,” said Hurtado.

## Happy 118<sup>th</sup> Birthday Navy Hospital Corps!



The Hospital Corps is the only enlisted corps in the military. The hospital corpsman rating (HM) is the largest and most diverse in the Navy.





## Part III: The Mosquito Fighters, Early Treatments and Prevention of Febrile Illnesses in the Navy

By André B. Sobocinski, Historian, BUMED

*“Dryness, coolness, fresh air, sunshine, cleanliness of body, clothes and bedding, good food, pure water, temperance, refreshing sleep, occupation exercise, cheerfulness, and contentment of mind...”*

~A Recipe for Good Health by Medical Inspector Albert Gihon, USN, 1871

For much of the nineteenth century the United States was losing a war to an overlooked threat. Even as casualties by gunfire, cannon and sword mounted over the course of the century’s conflicts, the proboscis of a disease carrying insect would prove the deadliest weapon of them all.

In the Mexican War (1846-1848), an estimated 13 percent of U.S. forces (11,000) died of disease, chief among them Yellow Fever. At the U.S. Naval Hospital on Salmandina Island, naval surgeons were overwhelmed with Army, Navy and Marine Corps victims of the yellow scourge; many including the Navy’s senior physician in theater—Fleet Surgeon John A. Kearney—would die from the disease.

Disease would account for two-thirds of Union and Confederate deaths in the Civil War (1861-1865); 30,000 of these were the result of malaria alone.

Generations before the microbe hunters and long before mosquito control was a preventative measure, military surgeons treated mosquito-borne illnesses with the tried and well-meaning methods of their day. Typically, these were Mercury-based purgatives/emetics, venesection, and blistering/cupping—all based on ancient theories of bodily humors and

temperaments; and all were designed to rid the underlying cause of disease.

In his 1854 textbook, *Diseases and Injuries of Seamen*, Navy Surgeon G.R.B. Horner advised treating Yellow Fever by first evacuating the stomach and bowels with Ipecac, castor oil, blue mass (mercury, licorice, rose honey, althaea, and glycerol), rhubarb, or grains of calomel (mercuric chloride) and jalap (a poisonous root). More than sixty years earlier, Dr. Benjamin Rush had advocated the very same treatment of calomel and jalap (known as the “10-10 treatment”) to purge victims of the 1793 Yellow Fever Epidemic in Philadelphia.

Quite understandably, dehydration would prove a significant problem for patients being treated for the disease. Navy doctors typically counteracted the ensuing dehydration with everything from tamarind water and weakened Chamomile tea to lemonade and orange juice.

For fever, Dr. Horner recommended the application of cold water to the brow, but also the ingestion of ammonium acetate, potash (potassium carbonate) as well as tartar emetic (antimony potassium tartrate)—all of which had “fever reducing properties.”

A popular treatment for a host of other ailments, tartar emetic would be used for everything from parasitic diseases like

shistosomiasis to alcoholism well into the twentieth century.

Venesection or blood-letting was a common practice used by many ship surgeons during the early stages of febrile diseases. This practice would fall into increasing disfavor throughout the century.

Even by the early nineteenth century, very few Navy doctors ascribed to Dr. Rush’s practice of bleeding fever victims 10 to 12 ounces during a sitting.

In his book *Physician for Ships* (1820), Surgeon Usher Parsons asserted that it was only “advisable to draw a small quantity of blood in the first twelve hours,” and the practice should be abstained from after this. In case of severe headache associated with the fever, Parsons advised application of leeches to the temples.

Narcotics like laudanum (alcoholic solution containing opium), black drop (opium, vinegar, and sugar) and Dover’s Powder (Ipecac and opium) were typically used as analgesics as well as for bouts of “irritable stomachs” and insomnia. To “quiet” the unsettled stomach, Parsons stood by his recipe for an “effervescing mixture” that contained lemon juice, water, potash, and laudanum.

(Continued on page 12)



# The Mosquito Fighters, Early Treatments and Prevention of Febrile Illnesses in the Navy

(Continued from page 11)

The bark of the Cinchona Tree (commonly referred to as “Peruvian bark”) had been used against malaria by Dr. James Lind of British Royal Navy as far back as 1765. Containing the alkaloid quinine, this was arguably the most effective prophylactic against malaria, but also used in treating other febrile illnesses.

In the 1830s, U.S. Navy Assistant Surgeon Alexander J. Wedderburn used quinine as part of an “eclectic treatment” that also included a warm water and mustard enema and a hot mustard foot-bath. He administered the quinine powder in syrup or diluted in water (*tonic water*); the latter would often be laced with a tincture of opium. Parsons recommended administering quinine in pill form or

dissolved in an “elixir of vitriol” (*alcohol, ginger, cinnamon and sulfuric acid!*)

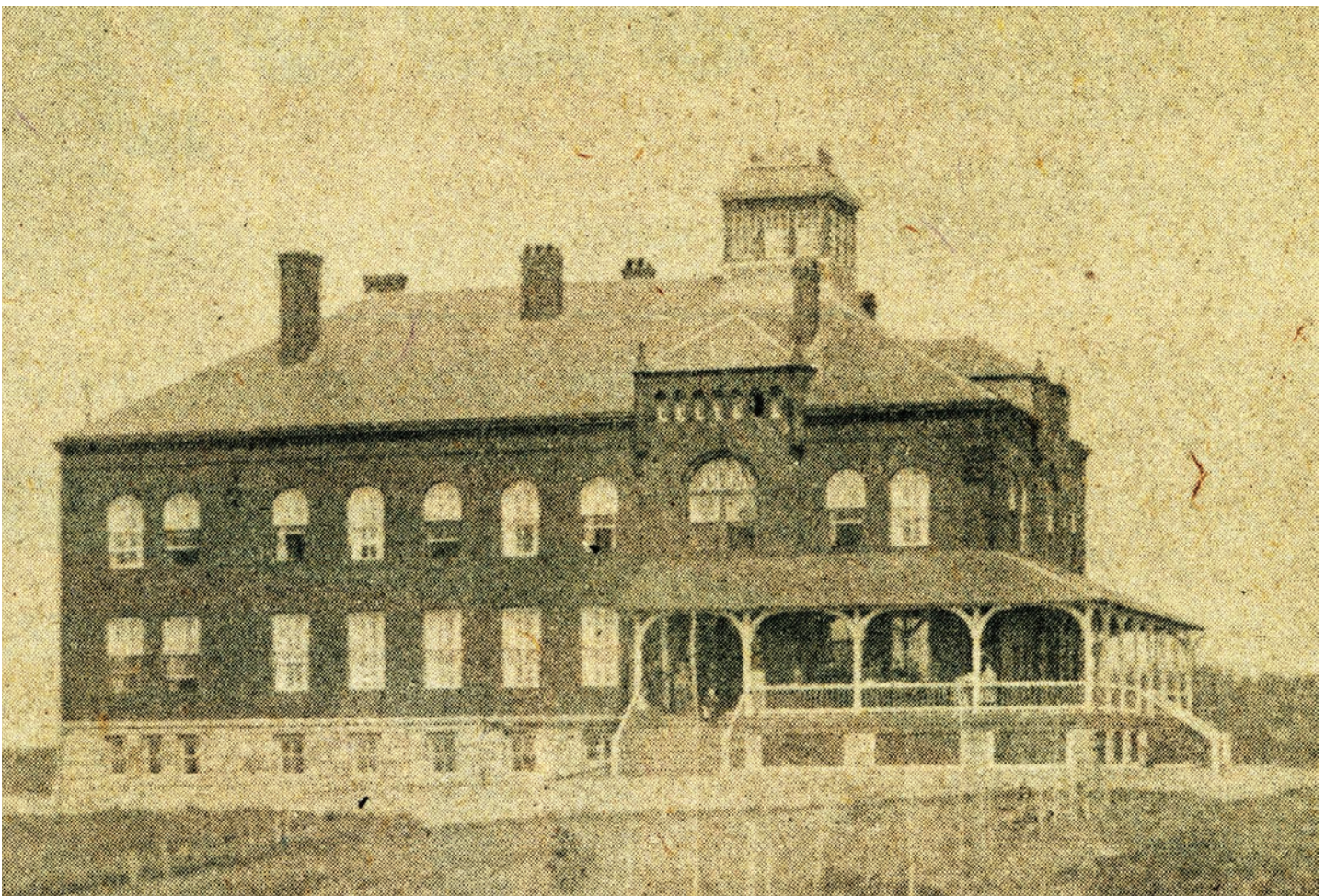
For much of the nineteenth century patients suffering mosquito-borne disease would be sent to a special quarantine facility for treatment. In 1887, the U.S. Navy opened a quarantine hospital on Widow’s Island for Yellow Fever patients. Soon seen as obsolete, the hospital closed in 1901 without ever having treated a patient. The hospital was ceded to the state of Maine in 1903 where it was used as a psychiatric asylum.

With the advent of the naval hygienic movement in the 1860s, Navy physicians began looking at new preventive measures against febrile diseases. Naval hygienists like Albert Gihon and Joseph Wilson advocated for better ventilation aboard ships, and disinfecting the shipboard

environment with bleaching agents like chloride of lime (*calcium hypochlorite*). Swamps, foul-smelling bilge water, and pollutants were long-associated with what was later known as mosquito-borne illnesses.

In his seminal work *Naval Hygiene* (1871), Gihon cautioned ship captains from docking in “notoriously unhealthy ports,” and advised maintaining a sufficient distance from the shore to avoid “malarial influences.” This notion of avoiding areas in which Sailors were likely to contract illnesses would be a common method of disease prevention throughout the century.

Quarantine measures would be taken frequently in epidemics and ships or ports of call holding fever patients would often fly yellow flags signifying contagion or presence of infection.



*Naval Hospital Widow’s Island, Maine, ca. 1900. For much of the nineteenth century patients suffering mosquito-borne disease would be sent to a special quarantine facility for treatment. In 1887, the U.S. Navy opened a quarantine hospital on Widow’s Island for Yellow Fever patients. Soon seen as obsolete, the hospital closed in 1901 without ever having treated a patient. The hospital was ceded to the state of Maine in 1903 where it was used as a psychiatric asylum.*



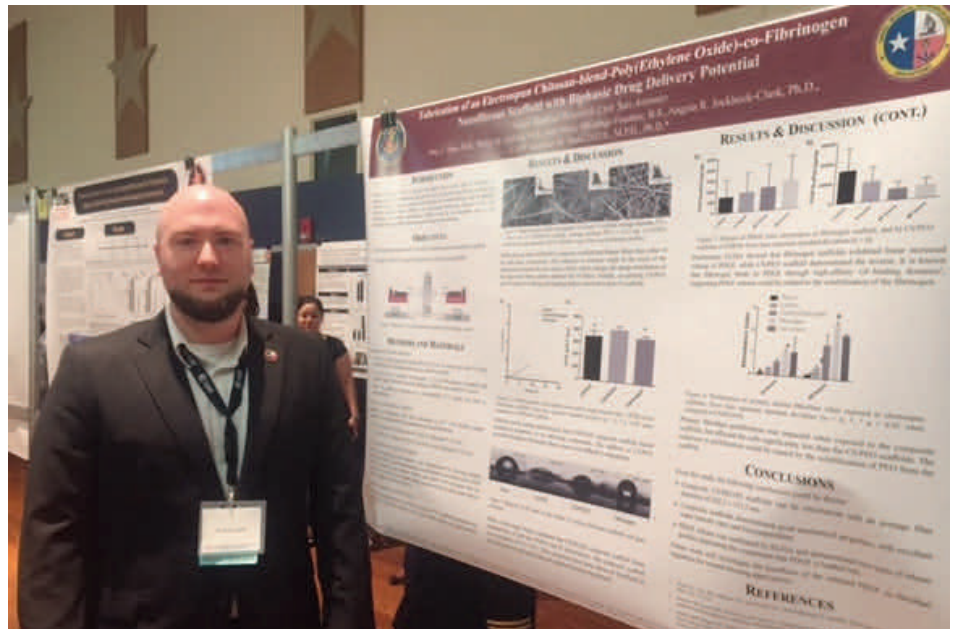
# NAMRU-San Antonio Showcases Navy Research at SURF 2016

Story courtesy of NAMRU-SA Public Affairs

SAN ANTONIO—Research scientists from Naval Medical Research Unit San Antonio (NAMRU-SA) showcased select Navy Medicine research at the second annual San Antonio Military Health System and Universities Research Forum (SURF), May 20, 2016. The University of Texas at San Antonio hosts this local research learning meeting, highlighting the latest research and discoveries of trainees, faculty, staff and students from health-related disciplines.

With attendees from the military, government, education and industry, it is one of the city's largest professional development forums focused on health care research. This year's theme "Evidence-Based Practice & Research in Healthcare: Encouraging Collaborative Partnerships" gave forum participants the opportunity to present and share research, practice, policy, collaborations, and connect members of the military with local peers.

NAMRU-SA was well represented at the forum with Capt. Jonathan Stahl, Head of Maxillofacial Injury and Disease Department, counted among the 40 speakers. Stahl gave a briefing on dental



One of three posters presented at the San Antonio Military Health System and Universities Research Forum. NAMRU-SA researcher and postdoctoral fellow, Phillip Jenkins, M.A., Maxillofacial Injury and Disease Department, "Fabrication of an Electrospun Chitosan-blend-Poly (Ethylene Oxide) –co-Fibrinogen Nanofibrous Scaffold with Biphasic Drug Delivery Potential." (Photo courtesy of NAMRU-SA Public Affairs)

and craniofacial research at one of the morning symposia sessions.

"The forum provides a unique opportunity to expand and strengthen NAMRU-SA's local partnerships with government and civilian healthcare research organizations

to maximize readiness and health through research," said Stahl.

Navy researchers were also invited to present three posters and they were counted among the 94 poster presentations highlighted at SURF 2016.



## Force Master Chief Call, NMRC Corpsmen Attend

Force Master Chief (FMF/SW/AW) Terry J. Prince (left) offers the mic to HM1 (IDW) Ezechiel Fenelon (right) from the Naval Medical Research Center, Biological Defense Research Directorate, during the Force Master Chief Call at the Medical Logistics Command, located at Fort Detrick Maryland. FORCM Prince is the enlisted leader of Navy Medicine and Director of the Hospital Corps.

Photo by PO3 Christelle Francios, Naval Medical Research Center

---

# NSMRL Research Psychologist successfully completes SCUBA Diver Course at the NDSTC

---

Story from NSMRL Public Affairs

GROTON, Conn.—Lt. Christopher Rodeheffer, a research psychologist at the Naval Submarine Medical Research Laboratory, (NSMRL) successfully completed the SCUBA Diver Course at the Naval Diving and Salvage Training Center (NDSTC) in Panama City, Florida.

This five week course is designed to provide qualified non-diving personnel with the basic instruction and training in SCUBA diving techniques, inspection, search, and underwater procedures to safely and effectively perform as a dive team member and SCUBA diver, ( IAW approved technical manuals and the U.S. Navy Diving Manual).

The community of Navy divers includes all officer and enlisted personnel in the United States Navy who are qualified in underwater open or close-circuit breathing

apparatus, surface-supplied, and saturation diving.

“There are probably only 4-5 MSC’s in the Navy who are dive qualified, so it is a rare occurrence and a truly unique skill set for a psychologist,” noted Capt. Fred Yeo, commanding officer of the Naval Submarine Medical Research Laboratory.

“Attending the SCUBA course will go down as one of the most unique, exciting, and challenging experiences of my life,” stated Rodeheffer. “I’ve never pushed my body and mind so far outside of my comfort zone and it is such a rewarding experience to achieve something that in your mind seems way outside of the realm of what you are capable of accomplishing. I learned so much about myself, the Navy, and the community of divers that I am currently supporting through my research

efforts at NSMRL. I now have a much better understanding of the problems, challenges, and obstacles of diving, and I’m very excited to apply this knowledge and experience to my future research endeavors.”

“I’m so grateful to the command for giving me this opportunity,” said Rodeheffer. “I couldn’t have made it through without the help of NDC Byrum and NSMRL’s dive locker. They spent many early mornings training me, preparing me both mentally and physically for the arduous training environment.”

Located on Submarine Base New London, Groton, Conn. NSMRL conducts research into submariner wellness, psychological fitness, shipboard health and performance, underwater bioeffects, submarine survival and escape, and hearing protection.



*Divers at the Naval Submarine Medical Research Center (left to right) ND2 David Longfellow, ND3 Matthew Stephan, Lt. Christopher Rodeheffer, ND2 Mark Dvorak pictured in front of the Genesis Chamber*



---

# NAMRU-6 Conducts Important Exercise in Fire Preparedness and Response

Story from the NAMRU-6 Public Affairs

---

LIMA, Peru—In every endeavor the Navy emphasizes readiness and preparedness. In the military medical research and development world, this involves handling emergency situations inside a laboratory where personnel who work with or are around pathogens need to maintain the highest levels of preparedness and response to ensure safety.

The U.S. Naval Medical Research Unit 6 (NAMRU-6), located in Lima, Peru, conducts military relevant research and development to protect U.S. military personnel. NAMRU-6 has over 200 scientists and technicians conducting projects on life saving drugs, personal protection from mosquito-borne pathogens, and understanding the distribution of infectious diseases in Central and South America.

In maintaining the highest standards of Navy emergency management, NAMRU-6

conducted an emergency exercise May 6, 2016, simulating a fire at the laboratory.

Lt. R. Gerbasi, NAMRU-6 Emergency Manager said, “This drill was exceptional in that it considered an emergency situation where firefighters would have to take additional precautions due to the nature of our mission.”

With support of the Peruvian Navy Hospital, Callao (CEMENA) and local Peruvian firefighters from Antonio Alarco Espinoza Company No. 60, the exercise involved a full-scale response by firefighters to a fire alarm inside one of the labs, evacuation of personnel, and medical evacuation and treatment of a simulated injury.

Upon initiation of the fire drill, eight firefighters from Company No. 6 responded in three emergency vehicles capable of fire and medical response. Once

evaluation of personnel from the building was complete, firefighters responded to the alarm and simulated extinguishing the fire.

Following the fire response, a simulated injury with one of the firefighters was performed.

Coordination with CEMENA, the emergency exercise allowed quick access of firefighters to the base and continued communication between NAMRU-6 and CEMENA necessary for appropriate emergency response preparedness.

Lt Nate Reynolds, who served as the organizer, said, “This exercise highlights the strong ties NAMRU-6 has with its host, CEMENA, not only for research purposes, but for the health and well-being of everyone working on the CEMENA campus.” He continued, “Working and responding to an emergency provides an extra layer to our response.”



*Peruvian Firemen from Antonio Alarco Espinoza Company No. 60 conduct an emergency response drill at NAMRU-6, Lima Peru.*