



NMR&D News

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and Development

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Navy Medicine Leadership Hosts the First R&D Symposium

Navy Medicine leadership brought together over 150 members of the Navy Medicine and DoD scientific community for the first Biomedical and Dental Research and Development Symposium at the National Convention Center in Lansdowne, Va., to address the unique medical needs of warfighters and their families.

“...Three days were spent focusing on the ever changing operational environment, the current advances in medical technology and the collective biomedical and dental research that addresses emerging military medical requirements...”

Researchers, clinicians and policy makers spent three days learning about current biomedical and dental research related to a variety of issues from resolving submarine atmosphere CO2 levels, and quicker surgical wound healing intervention techniques to disaster medicine, medical modeling and simulation, aviation medicine and environmental health issues.

The Navy Surgeon General, Vice Adm. Adam M. Robinson, Jr. set the tone for the symposium with his keynote address as he acknowledged the

attendees' accomplishments and encouraged them to look ahead and explore new avenues of research.

“Your contributions are many and varied,” said Robinson, “ranging from confirmatory work in the early stages of the H1N1 pandemic to the exciting progress in the development of a malaria vaccine. Your research efforts targeting wound management, limb salvage and regenerative medicine are having an impact on the lives of our wounded warriors. Your efforts are being translated into saved lives, not only in terms of surviving but also in terms of patients being able to lead fuller, productive lives. The significance of what you do is felt every day by the men and women in our armed forces deployed around the world.”

Robinson went on to point out that past and current research efforts have allowed Navy Medicine to lower warfighter mortality rates and make exceptional force health protection a reality for patients and for all the men and women Navy Medicine is privileged to care for.

The symposium showcased through presentations, panel discussion and poster displays the successes of Navy Medicine's research facilities along with the medical treatment facilities'

clinical investigation programs (CIPs) to include expanding cooperative efforts to bring the advances at the bench to the bedside and the battlefield.

“In terms of growing the next generation of men and women who have to come along and



Lt. Cmdr. Walter Carr shows his poster to NMRC CO Capt. Richard L. Haberberger, Jr. and XO Capt. Eileen Villasante

make sure we have the readiness and the clinical capabilities, means enhancing the quality of graduate medical education to include quality clinical and bench research,” said Rear Adm. Thomas R. Cullison, Deputy Surgeon General. “We have to make sure the RDT&E community and the CIP community are tied together in a synergistic way so we can build upon shared opportunities because our medical centers are our force generator platforms from which come all the people who will deploy in the future; who will be taking care of all of us.”

“Three days were spent focusing on the ever changing operational environment, the current advances in medical technology and the collective biomedical and dental research that addresses emerging military medical requirements,” said Rear Adm. Eleanor V. Valentin, Commander, Navy Medicine Support Command. “This is our first year of hosting such an event, and next year and each following year I know this will continue to grow in scope, in size and in the Services and research effort represented. Our focus this year was building synergy between all those involved in identifying military requirements and those in Navy Medicine who are working to find the solutions. I am looking forward to next year.”



Navy Surgeon General Vice Adm. Adam M. Robinson, Jr. addresses the symposium

Awards Presented at the Biomedical and Dental R&D Symposium

Echoes Video – NHRC – Innovative video regarding combat trauma and the need to seek help for related symptoms. Addresses the effects of trauma and the need to overcome the long-standing stigma around mental health treatment. Dr. Gerald Larson accepted the award.

Wound Repair Biomarkers – NMRC – Significant advances in the characterization of local and systemic influences on wound management. Dr. Trevor Brown accepted the award.

Heterotopic Ossification – NMRC – Research identified increased risk of abnormal bone growth in patients exposed to improvised explosive devices. New avenues were identified for clinical intervention in orthopedic wounds. Cmdr. Eric Elster accepted the award.

Intranasal Scopolamine Gel – NAMRL – Intranasal scopolamine is an efficacious treatment of motion sickness with no significant cognitive or sedative effects and appears to be an excellent treatment for use in dynamic operational environments. Cmdr. Rita Simmons accepted the award.

Travelers' Diarrhea Management – Enteric Diseases Department, Infectious Diseases Directorate, NMRC – Consideration of adjunctive loperamide in combination with antibiotics or treatment outcomes in travelers' diarrhea. Capt. Richard L. Haberberger, Jr. accepted the award on behalf of the investigators.

Otoacoustic Emissions – NSMRL – Otoacoustic emissions can be used clinically to detect preclinical noise-induced hearing loss. Capt. Paul Kelleher accepted the award on behalf of the investigators.

Armodafinil – NAMRL – Armodafinil was found to significantly improve vigilance among Naval air traffic control students eleven hours post-dose. Dr. Jeffrey Phillips accepted the award.

Photoacoustic Joulemeter Utilizing Beam Deflection Technique – NAMRU-SA – A new method for accurate measurement of absorbed electromagnetic energy utilizing beam deflection technology. Mr. Norm Barsalou accepted the award.

NAVSCREEN – NSMRL – Assessment technology transitioned to active screening program in the nuclear training pipeline for both surface and submarine sailors.

Navy R&D Labs work with MTF CIP programs

By Lt. Cmdr Janine Danko
NMRC Clinical Investigator

Navy Medicine Research and Development's dedicated facilities focus on research to meet the needs of today's military personnel on the battlefield. Collaborations between laboratory researchers and physicians, nurses and other allied professionals at the medical treatment facilities (MTFs) and Department of Defense clinics support these efforts through clinical investigation programs. Examples include:

- One collaboration brings together infectious diseases specialists from the Navy Medical Center Portsmouth, Navy Medical Center San Diego (NMCS), Tripler Army Medical Center and the Naval Medical Research Center (NMRC) Virology/Rickettsial Diseases Department (VRDD). The National Naval Medical Center (NNMC) will soon join this collaboration. Blood specimens from persons traveling abroad are being collected at the clinical sites and sent to VRDD, where diagnostic studies are done to detect dengue, rickettsial pathogens and chikungunya.

- An infectious disease research

collaboration at NMRC and the Infectious Diseases Department at NMCS is seeking to understand some of the immune responses to the H1N1 vaccine. The group at NMCS enrolled immunocompetent and immunocompromised vaccinated volunteers. Researchers in VRDD receive blood specimens from these volunteers and perform various virological assays.

- Researchers from the Naval Health Research Center (NHRC) are developing new Clinical Investigation Program (CIP) projects with NMCS clinicians. Topics focus on the heat tolerance level of warfighters in extreme conditions, brain dynamics associated with post-traumatic stress disorder symptom reduction and the effects of wet clothing on thermoregulation. NHRC recently initiated a formal Resident Research Program at the laboratory. Three residents are working with NHRC investigators during the course of their NMCS training. This program is expected to grow significantly over the next 12 to 18 months.

- NMRC researchers partnered with clinicians and scientists from Walter Reed Army Medical Center, U.S. Marines Weapons Training Battalion and

four civilian institutions to study dynamic entry personnel, known as "breachers." Breachers are repeatedly exposed to controlled low-level blast during training. The project's focus included conducting a high-fidelity examination of blast forces received during breacher training and determining the potential for primary blast injury. Follow-up currently underway includes NNMC and other agencies.

- For several years, NMRC researchers in the Operational and Undersea Medicine Directorate have collaborated with residents in the Integrated Department of Orthopedic Surgery at NNMC and WRAMC. Surgical residents trained in this program have won several national awards and published critical findings in high-impact journals leading to changes in the care of injured warfighters.

Capt. J. Christopher Daniel, the specialty leader for Navy R&D, appointed Lt. Cmdr. Janine Danko as his assistant in order to facilitate more collaborations. She is a researcher at NMRC and active clinician at NNMC. For more information, contact her at Janine.danko@med.navy.mil or 301-319-7320.

San Antonio Navy Week Opens Door to Opportunities for Students

By Chief Mass Communication Specialist L.A. Shively, Navy Office of Community Outreach

Scientists from the Naval Medical Research Unit – San Antonio (NAMRU-SA) discussed cutting-edge biotechnologies, such as cell and organ printing, and opportunities in the Navy with students at the Northside Health Careers High School (HCHS) as part of San Antonio Navy Week.

Cell and organ printing is computer-aided, jet printer-based, 3D tissue-engineering of living human organs, offering a possible solution to the organ transplantation crisis.

HCHS’s curriculum focuses primarily on health care. Although a public school, students must apply for admission to a limited number of spots.

The presentations offered students interested in pursuing careers in the health professions a door to opportunities in the Navy.

“My buzz word is options – you

always want to have options in life,” said Capt. Vincent Delnnoentiis, NAMRU-SA commanding officer.

“I want to be a cardiologist,” said 11th grader Michael Collier, a student in the Diagnostics Services class, adding that he decided on his career in the third grade.

He said listening to Navy scientists discuss their work was intriguing.

“There are more branches to Navy medicine than I thought,” said Collier. “I was always interested in the Navy, so now I am seriously considering it.”

“It’s nice to know there are opportunities out there for us,” said Rebecca Moreno, also an 11th-grade student in the Diagnostics Services class.

Moreno said she is interested in pursuing a career in plastic surgery, perhaps in the Navy.

“Whether it’s for combat or regular medical purposes,” Moreno said, “it can change people’s lives and that’s what I want to do.”

Navy medical research also helps change lives through partnerships with

high-volume trauma centers such as those in Los Angeles County, Calif., Baltimore, Md., and the University of California - Davis, Calif., where experience with military medicine is used in the civilian world to treat patients injured in street-level violence such as in gang wars, Delnnoentiis said.

“Things they found out we can use on the battlefield, and things we see on the battlefield we bring back and they use right away. It’s a great avenue and collaboration with the civilian community.”

Delnnoentiis also said that he and his researchers’ presence on the HCHS campus is the start of a partnership between his unit and the school that could lead toward future internships.

“Getting them excited about careers in Navy medicine, in math and science – we’re going to get them thinking and hopefully going to college, becoming the next researcher – the next person coming into the Navy.”

NHRC Change of Command

By Dr. Karl Van Orden
NHRC Senior Scientist

The Naval Health Research Center (NHRC) held a change of command March 30 when Capt. Gregory C. Utz relieved Capt. Kerry R. Thompson as commanding officer. More than 100 staff, family, friends and guests attended the traditional ceremony held at NHRC, including the guest speaker, Rear Adm. Karen Flaherty, Deputy Chief, Wounded, Ill and Injured, Bureau of Medicine and Surgery (BUMED).

“I had a chance to spend some time learning about the work you all do here yesterday, and I can tell you that I was thoroughly impressed with what I saw,” said Flaherty. She described some of the command’s recent highlights, including NHRC’s discovery of the H1N1 influenza virus, the Expeditionary Medical Encounter Database and related modeling and simulation capabilities and NHRC’s focused

epidemiology work and resulting targeted behavioral change interventions.

NHRC serves as a leading research and development laboratory for the Department of Defense (DoD). Their biomedical research focuses on the areas of medical modeling and simulation, warfighter performance, behavioral sciences and epidemiology, deployment health, respiratory diseases and HIV/AIDS prevention. Most of the work conducted at this facility is in the advanced development stage and requires close and continuous interaction with operational units of the Navy, Marine Corps, and DoD.



(Left) Capt. Richard L. Haberberger, Jr., NMRC CO, and (right) Capt. Gregory C. Utz, the new NHRC CO. Photos courtesy of NHRC Public Affairs

During his remarks, Capt. Utz said, “I am honored at being selected to lead this very impressive group of scientists!”

Before reading his orders, Capt. Thompson highlighted his time at NHRC. “I can’t tell you how well known and highly regarded you all are”, he *Continued on page 5*

Commanding Officer's Message

Greetings,

The Naval Medical Research Center's research, development, testing and evaluation enterprise is the Navy's and Marine Corps' premier biomedical, dental and biosurveillance organization with a cadre of scientific leadership and technical expertise focused on force health protection and enhancing deployment readiness of DoD personnel worldwide. The course of biomedical and dental research and product development is an evolutionary process that is both long and challenging. The article on the milestones in the malaria vaccine work is an excellent example, and just one success story that was highlighted, along with many others, at the first R&D symposium hosted in April by the Navy Medicine Support Command.

The symposium showcased our successes through presentations, panel discussions and poster displays. We were there alongside representatives from the MTFs' clinical investigation programs highlighting more opportunities to bring the advances at the bench to the bedside, the battlefield and beyond. The translational research conducted by NMRC in collaboration with NNMC on wound closure markers and NHRC's numerous partnerships with NMCSO on psychological health and rehabilitative medicine are further examples of the enterprise's commitment to working collaboratively with our MTF counterparts.

In addition to the conduct of research and surveillance supporting expeditionary medicine, our personnel maintain a high level of individual military readiness to support BUMED's operational and disaster relief/humanitarian assistance deployment requirements.

This year we will experience major changes in leadership in eight of our ten laboratories. Along with associated BRAC and non-BRAC relocations and construction, non-BRAC facilities projects, and the increasing tempo and visibility of the enterprise's operations, we have some interesting changes and challenges ahead of us, but we are well suited to addressing these challenges and see them as opportunities.

Commanding Officer sends,
Richard L. Haberberger, Jr.
CAPT, MSC, USN



Toxicology Experts Host Special Session at Public Health Conference

Toxicology researchers hosted a special session at the 49th Navy and Marine Corps Public Health Conference, Hampton, Va., in March, focused on current studies of exposure risks in military settings. A team from the Naval Health Research Center Detachment, Environmental Health Effects Laboratory (EHEL), provided updates to attendees, who included professionals in industrial hygiene, occupational health, toxicology and policy development.

The session began with Lt. Cmdr. Michael Stockelman providing an overview on EHEL's capabilities and research portfolio. He pointed out that through in-house capabilities and an extensive network of peers and collaborators, EHEL takes an experimental
Continued on page 5



(Left to right) Lt. Vishwesh Mokashi, Ms. Amanda Lear and Mr. Jim Reboulet monitor the composition and flow of a test atmosphere in the EHEL inhalation toxicology facility, Wright Patterson Air Force Base, Ohio.

Change of Command

Continued from page 3
said to the staff. "Everywhere I go, people speak of the quality and relevance of what you do for the fleet."

During his tenure, Thompson pushed for greater involvement and integration with research activities at the Naval Medical Center and established the "NHRC Resident Research Program," where residents could become involved with NHRC protocols as part of their training. He also directed more effort towards developing protocols to identify ways of accelerating rehabilitation and reset of injured warriors. Finally, he expanded the Science Support Office at NHRC beyond Congressional special interest programs to include the execution of contracting requirements of NHRC's technical codes, Navy Medical R&D enterprise laboratories and specific BUMED special interests. For his accomplishments, Thompson was awarded the Legion of Merit by Naval Medical Research Center Commanding

Officer Capt. Richard L. Haberberger, Jr.

Thompson thanked the men and women of the NHRC team for all they accomplished during his three years in command. He will report to USS Ronald Reagan.

Much of NHRC's research focuses on deployment and career-span health and performance of DoD personnel, which requires close coordination with senior medical department representatives afloat and force medical officers ashore. NHRC's location within a major fleet concentration area affords access to Navy and Marine Corps operational platforms and special warfare units and training commands. The center is also collocated with several leading research universities.



Rear Adm. Flaherty arrives at the ceremony.



Capt. Thompson, the outgoing NHRC CO.

Toxicology Experts Host Special Session at Public Health Conference

Continued from page 4
biology approach to characterize the toxicology of military relevant exposure risks. EHEL's core capabilities include laboratory modeling of exposures, with special emphasis on inhalation toxicology, neurobehavioral assessment and *in vitro* assays for biological effects, and also includes an analytical lab for chemical and biological assays.

In addition, the session highlighted efforts on several major environmental health and risk assessment challenges confronting the Department of Defense. Dr. David Mattie of the Air Force Research Laboratory and Mr. John Hinz of the Air Force School of Aerospace Medicine provided information on the toxicology and risk assessment of synthetic jet fuel, describing a comprehensive exposure assessment of a synthetic fuel under development by the Air Force. This work has the potential to be a benchmark as future alternative fuels are developed and tested.

Dr. John Schell, an industry representative, discussed private industry's perspective of research initiatives concerning tungsten and tungsten-containing materials. He pointed out that in the face of new concerns about tungsten's health effects and new regulatory requirements, the tungsten industry has a broad portfolio of tungsten toxicological studies.

Dr. Andrew Osterburg, another EHEL researcher, described his work on the health effects of tungsten exposure. A laboratory model that included exposure to soluble tungstate in drinking water showed inhibition of immune response following immune challenge, possibly due to alterations in cell signaling. Outcomes of this mechanistic toxicology may have an impact on future military guidelines.

Stockelman later presented information on approaches to evaluating burn pit health effects. Burn pits for disposal of solid waste in Iraq and Afghanistan have raised smoke exposure concerns.

Other military units, including the U.S. Army Public Health Command, are performing screening health risk assessments of burn pits. Dr. Coleen Baird of the U.S. Army Public Health Command presented information on current issues related to burn pits in deployed settings. She recapped the timeline of burn pit use, monitoring and public awareness. Emissions and air quality monitoring continue.

EHEL provides subject matter expertise, including literature review, for emerging military exposure risks as well as advisory reports for management and further investigation of environmental concerns. EHEL has ongoing collaborative efforts with intra/intergovernmental agencies, academia and private industry. The primary focus of EHEL's research is on environmental and occupational exposures, particularly in deployed environments, in order to identify toxic effects before health and operational performance is compromised.

NMRC's Commanding Officer Visits Navy Medicine Labs in Peru

By Lt. Jeremy Westcott
NMRCD Administrative Officer

Capt. Richard L. Haberberger, Jr., Commanding Officer (CO) of the Naval Medical Research Center (NMRC), concluded a week-long visit to the Naval Medical Research Center Detachment (NMRCD) – Peru, March 26. During the week, Haberberger met with the Officer in Charge (OIC), Cmdr. John Sanders, and all of the Detachment Department Heads. He also toured the main laboratory and held a meeting with the lab's staff.

NMRCD has study sites throughout South America, and Capt. Haberberger visited two important field study sites in Iquitos and Puerto Maldonado, Peru. Throughout his visit, the CO highlighted the importance of the work performed at NMRCD – Peru and the wonderful opportunities for collaboration with South American military and public health institutions. Capt. Haberberger discussed future plans for NMRCD's facilities with Adm. Fernandez, Medical Director of the Central Naval Hospital,



Capt. Haberberger, NMRC CO, and Cmdr. Sanders, NMRCD - Peru OIC, meeting with the "Proyecto Influenza" field team in Puerto Maldonado, Peru.

Vice Adm. Mera, Operations Commander for the Amazon Region, and Cmdr. Meza, Commander of Naval Base Puerto Maldonado. All of the meetings were well-received and enriched an already close and coopera-

tive relationship between NMRC and the Peruvian Navy.

NMRCD – Peru's mission of identifying potential infectious disease threats of military or public health

Continued on page 7

Smoking To Be Extinguished On Submarines

From the Norfolk Naval Shipyard
Public Affairs Office

Commander, Submarine Forces (COMSUBFOR) has effected a policy April 8 banning smoking below decks aboard all U.S. Navy submarines. The smoking ban, announced via naval message, will become effective no later than December 31, 2010. The impetus behind the change of policy is the health risks to non-smokers, specifically exposure to secondhand smoke.

"Our Sailors are our most important asset to accomplishing our missions. Recent testing has proven that, despite our atmosphere purification technology, there are unacceptable levels of secondhand smoke in the atmosphere of a submerged submarine. The only way to eliminate risk to our non-smoking Sailors is to stop smoking aboard our submarines," said Vice Adm. John J. Donnelly, COMSUBFOR.

According to a 2006 Surgeon General's report on involuntary exposure to tobacco smoke, there is no risk-free level of exposure to secondhand smoke. Non-smokers who are exposed to secondhand smoke increase their risk of developing heart and lung disease.

Subsequent to the 2006 Surgeon General report, the Submarine Force chartered the Naval Submarine Medical Research Laboratory to conduct a study on U.S. submarines. The study indicated that non-smoking Sailors were exposed to measurable levels of Environment Tobacco Smoke (ETS), also called secondhand smoke. The year-long study was conducted in 2009 on nine different submarines, including at least one from each class of submarines in the force.

In conjunction with the policy change, cessation assistance to Sailors is being offered. The program

will incorporate education techniques and nicotine replacement therapy, such as nicotine patches and nicotine gum, to assist in kicking the smoking habit. In keeping with current submarine policy, drugs such as Zyban and Chantix are not authorized.

"To help smokers minimize the effects of quitting, nicotine replacement therapy, such as patches and gum, will be readily available along with an extensive cessation training and support program on every boat. What we want to discourage is smokers turning to alternative methods of tobacco use such a chewing tobacco," said Capt. Mark Michaud, Submarine Force Atlantic surgeon.

"While submarine duty is a dynamic and demanding job, the Submarine Force is dedicated to mitigating unnecessary risks to our Sailors. Exposure to a harmful substance that is avoidable, such as secondhand smoke, is unfair to those who choose not to smoke," said Donnelly.

Navy SG Talks about R&D at the Battlefield Health Care Summit

By Cmdr. Eric Elster
Operational & Undersea Medicine, NMRC

Navy Surgeon General Vice Adm. Adam M. Robinson, Jr. discussed the importance of military medical research in supporting the warfighter March 29-30 at the Battlefield Health Care Summit held in Northern Virginia. Hosted by the Institute for Defense & Government Advancement, the conference focused on medical advancements in treatment, training and technology that are helping to improve the level of care military personnel can receive from the battlefield (Level 1) to the United States. Members of the military health-care community came together for advanced and focused discussions on up-to-date clinical treatment techniques, lessons learned from the battlefield and in-depth panel discussions.

"Taking care of patients is the military's primary goal and we have never failed to answer our nation's call to help save lives," Robinson said.

During his speech, Robinson outlined the Navy's Research, Development, Test and Evaluation biomedical and dental efforts by highlighting several accomplishments from Navy Medicine's ten research laboratories. These successes included tracking respirato-

ry diseases along with developing rapid diagnostics, studying resuscitative technologies and developing large epidemiology databases such as the Naval Health Research Center's "Millennium Cohort Study" funded by the Department of Defense and the Veteran's Administration to track and study the long-term health effects of military service.

Robinson discussed his research priorities and said his scientists are focused on many areas, including traumatic brain injury and psychological health treatments, medical systems to support maritime and expeditionary operations; wound management throughout the continuum of care and hearing restoration protection for maritime, surface and air support personnel.

"We have the ultimate responsibility in ensuring the medical readiness of our warfighters," said Robinson. "We need to make sure our medical forces are prepared, trained and deployed with the right capabilities to support our warriors."

Robinson discussed several products under development and now in the pipeline that will help service members. One example was the military's need to replace existing field anesthesia

machines.

"Suppliers of the machines are stopping production or conducting limited production runs at prohibitive costs," said Robinson. "Our researchers are working to augment capabilities to provide anesthesia through an integrated design solution. By 2014, the military expects to have an integrated patient support device and anesthesia machine operating in a stand alone mode."

Another product discussed was the Cybertech Cricothyrotomy Kit, a one handed operation device with a retractable scalpel that provides automatic full retraction when the integrated tissue spreader is advanced into the incision. This device appears to be a prime dual use candidate for far-forward military care providers and civilian emergency medical services personnel.

The Navy's Surgeon General also shared his views on how the Navy medical research community directly supports the Maritime Strategy.

"Navy Medicine Research and Development plays an important role in the U.S. military in creating and sustaining the partnerships around the world which are essential in making our world safer and better for all," said Robinson.

NMRC's Commanding Officer Visits Navy Medicine Labs in Peru

Continued from page 6

importance, developing mitigation strategies and evaluating those strategies is essential to the health of our operational forces. Due to the support of the Peruvian Navy and a region that is fertile ground for research, NMRC has grown rapidly and can meet that mission better than ever. Once the smallest of NMRC's overseas labs, NMRC is now on par with the other overseas labs in size. As Haberberger put it, "It has been six years since I last visited NMRC and I can see much growth in both science and support infrastructure. I attribute this to Cmdr. Sanders, Capt. Martin (the former OIC) and the great staff at NMRC. The field work they are doing is impressive and on the cutting edge of good field epidemiology. Of course, they have the world's best garden for new diseases and new species, the Amazon. Additionally, they have the full support of the U.S. Ambassador and the Peruvian Navy. More than one Almaronte (Admiral) spoke highly of Cmdr. Sanders and the NMRC."



Capt. Haberberger and SKCM (Ret) Joe Diaz on the Madre de Dios River in the Amazon basin in Puerto Maldonado, Peru.

Vaccine for Tomorrow – NMRC Scientists Develop Malaria Vaccine

Navy Medicine researchers announced a new milestone in the decades-long effort to develop a highly effective malaria vaccine to protect military personnel. The research findings were described at two major scientific meetings, one held in Copper Mountain, Colo. and the second held in Bethesda, Md.

The importance of malaria to the U.S. military was illustrated by the mission-altering evacuation of 43 Marines from the West African country of Liberia in 2003. Five of these Marines required intensive care before they recovered. This past December, tragically, a Navy Seabee also deployed to Liberia died of malaria.

The research team announced they had induced complete protection against malaria in four volunteers immunized with a novel gene-based candidate vaccine designed to prevent infection with the deadly malaria parasite *Plasmodium falciparum*. These findings from a small clinical trial were detailed by principal investigator Cmdr. Ilin Chuang in a poster presentation in Colorado and an oral presentation in Bethesda. While more research needs to be done to further improve this novel vaccine, these initial results are very promising.

“This is the first time our gene-based vaccine approach has paid off,” said Chuang, an investigator in the

joint service U.S. Military Malaria Vaccine Program (USMMVP), at the Naval Medical Research Center (NMRC) and Walter Reed Army Institute of Research (WRAIR).

“We must develop new weapons in our fight,” said Chuang. “An effective vaccine would be the best weapon of all. Vaccines offer a ‘fire and forget’ preventative strategy that provides much less burden to deployed military personnel than the current prevention methods, which consist of drug prophylaxis and the use of insecticides and repellants to deter the mosquito vector.”

If one single malaria parasite enters an individual’s blood stream after the bite of an infected mosquito and invades a liver cell, the parasite multiplies in five days to produce 30,000-40,000 progeny parasites (merozoites), which are released into the blood when the liver cell ruptures. In the blood, each parasite invades a red blood cell and grows over 48 hours to produce 8-24 copies of itself, which are released back into the blood when the red blood cell ruptures. Over the course of one or two weeks, these replicating parasites lead to as many as one trillion parasites circulating in the blood stream. This can rapidly cause coma and death. Vaccines are designed to interrupt this destructive life cycle – and to do so during the early liver stages of

infection before the damaging blood stages even start.

“In our trial, four of fifteen volunteers were completely protected – by far the best result to date for a gene-based vaccine,” said Chuang. In the current trial, USMMVP investigators combined two adenovirus vectors, each containing the genes for a different malaria protein. The adenovirus vectors are designed to carry the malaria genes (DNA) into the muscle cells of the body, where the malaria genes are used as templates to express the malaria proteins, which in turn induce a strong immune response.

“One of the interesting things about our vaccine is that antibodies do not seem to be involved in protection, unlike most other vaccines,” said Capt. Tom Richie, the director of the Navy Component of the USMMVP, who leads the adenovirus vaccine development effort. “The adenovirus-vectored, gene-based approach rather induces killer T cells,” he said. “These killer T cells detect the infected liver cells and destroy these cells as well as the parasite harbored within. The next step will be to increase the number of malaria genes in the vaccine. We hope that adding genes will increase the level of protection to 80 percent or more of immunized volunteers, from the current level of 27 percent. Our goal is to develop a vaccine against malaria that protects 80 percent of vaccinated Sailors and Marines against infection for a minimum of six months.”

A warfighter with malaria can be incapacitated for one to three weeks, and some malaria infections can rapidly become life threatening if not promptly diagnosed and treated. In addition, warfighters can be exposed to more than one malaria species in today’s complex military operations.

“People who get malaria are typically very sick with high fevers, shaking chills, and flu-like illness,” said Richie, “Although malaria can be a deadly disease, severe illness and death from malaria can be prevented if protective measures are taken, such as drugs and insect repellants.”



Collecting mosquito specimens. Photo by Journalist 1st Class James Pinsky.

NMRC Scientist Gives Presentation at Infectious Diseases Forum

Dr. Angela Prouty, a senior scientist with the Naval Medical Research Center's Biological Defense Research Directorate, spoke at the Vaccines for Emerging Infectious Diseases and Biothreat Agents conference held April



Dr. Angela Prouty in the lab at NMRC

22 at the National Cancer Institute – Frederick Conference Center at Fort Detrick. Her talk was entitled “Development of a novel multi-agent vaccine against *Bacillus anthracis*, *Yersinia pestis*, and Ricin toxin using a *Bacillus thuringiensis* Spore Display Platform.” Invited speakers at the conference are a part of the National Interagency Confederation for Biological Research (NICBR), which brings together research entities from the Navy, Army, FDA, NIH, and the National Cancer Institute. The goal of this confederation is to bring researchers together from all disciplines and agencies in the hopes of creating fruitful collaborations.

Dr. Prouty works in the Vaccines and Medical Countermeasures Group headed by Dr. Andrea Keane-Myers. The group is dedicated to designing and developing vaccines necessary to protect warfighters against potential bioterrorist threats. The project Dr. Prouty presented at the conference is to design a novel vaccine platform on which to attach proteins that are known

to protect humans against bacteria such as *Bacillus anthracis* or *Yersinia pestis*. This unique vaccine platform utilizes the spore of a bacterium known as *Bacillus thuringiensis*, which is similar to *Bacillus anthracis* but only causes disease in insects. The goal of this project is to genetically manipulate the *Bacillus* spore to express the biothreat antigens to protect individuals against disease, thereby creating a stable vaccine. By using a spore as a means of transporting protective proteins into the host, it is believed that the body is more likely to generate a stronger response to the proteins. Spore display technology is promising for two reasons: the spore acts as a natural adjuvant, which stimulates the immune system, and spores interact naturally with immune cells in the host, allowing an opportunity to produce a protective response. Utilizing a spore display platform also provides the potential to express multiple proteins to protect against more than one pathogen in a single vaccine.

Greetings from the NMRC Ombudsman!

Military Spouse Appreciation Day: The Navy celebrates Military Spouse Appreciation Day, May 7. Showing appreciation for the ultimate unsung heroes, the Navy honors spouses for their support and stability in maintaining resiliency and mission readiness. Spouses “hold it down at home,” allowing Sailors to focus on the mission while deployed. We salute spouses, the patriots who serve out-of-uniform, for managing frequent relocations, family separations and holidays alone; for changing jobs; overcoming language and cultural barriers; and assuming the role of both mother and father. Every time you thank a service member serving our country, extend that same “thank you” to the SPOUSE that STANDS next to him or her.

Taking Care of Individual Augmentees (IAs) and Their Families: The Individual Augmentee Family Handbook has been redesigned and updated with new resources. This publication provides deployment support guidance and serves as an extension to existing FFSC individual deployment support programs. The handbook is available for download at www.ia.navy.mil (the official website for all IA information).

Operation Warfighter is an internship program for wounded, ill, and injured service members who are convalescing at military treatment facilities across the United States. This program is designed to provide recuperating service members with meaningful activity outside of the hospital environment to assist in their wellness and offers a formal means of transition back to the civilian workforce. For participation information, contact Patrick Brick – Program Manager, Office of the Under Secretary of Defense - Personnel and Readiness, 703-602-7071 or patrick.brick.ctr@osd.mil.

Helping Kids Cope with Deployment: The Department of Defense, USO, and Trevor Romain Company have launched *With you all the Way!*, a DVD aimed at helping school-age children deal with deployment. This video is a cartoon about a group of kids dealing with different stages of deployment, from pre-deployment to separation to reintegration, from a child's point of view. For more information, please check out www.militaryonesource.com or www.uso.org.

One Mile At A Time - Preparing for your PCS: Whether you are moving next month or next year, the FFSC Relocation Assistance Program (RAP) provides Navy personnel and their families the knowledge and skills necessary to manage the financial, emotional and logistical demands of relocation. Check out the available resources at http://www.cnic.navy.mil/CNIC_HQ_Site/WhatWeDo/FleetAndFamilySupportServices/RelocationAssistance/index.htm.

If you need information on these or other resources, please contact me at 217-722-4981 or angela.prouty@med.navy.mil.

Angela Prouty, Ombudsman, NMRC

Who We Are: NMRC Infectious Diseases Research Directorate

The NMRC Infectious Diseases Directorate (IDD) includes three research departments: Malaria, Enteric Diseases, and Viral and Rickettsial Diseases. IDD conducts research on infectious diseases with the potential to pose significant health threats to our warfighters and to incapacitate a large number of deployed forces over a short time period. The geographical distribution of a disease; the lack of an effective vaccine, treatment or other control measures; the mode of transmission; and the historical impact during past wars are all factors that determine the importance of an infectious disease to the U.S. Military.

The goal in IDD is to minimize the impact of these infectious diseases by preventing infection or clinical disease. In most cases, the best approach to achieve this goal is through the development of efficacious vaccines.

IDD departments have the capability of developing a new vaccine from the conceptual stage through construction, "test tube" evaluation, laboratory model testing, human volunteer safety and immunogenicity trials to final large-scale human volunteer field trials to prove efficacy as required for FDA licensure. The field testing of vaccines is made easier by IDD's close association with the Navy's overseas

medical research laboratories located in areas of the world where the target infectious diseases are highly endemic.

Scientists in IDD also work closely with their Army colleagues from the Walter Reed Army Institute of Research, which is collocated with NMRC at the modern research facility in Silver Spring, Maryland. With the direct use of recombinant DNA techniques for vaccine delivery combined with genomic and proteomic approaches to discover new vaccine components, the Navy can expect to make rapid progress in the new millennium towards controlling many of the infectious diseases that currently remain as major threats to U.S. military forces deployed around the world.



Scientists in NMRC's Infectious Diseases Research Directorate

The Cognitive Psychology of REM Sleep

Cdr. John Hughes, M.D. of the Naval Medical Research Center's Operational and Undersea Medicine Directorate and Dr. Thomas Mellman, M.D., Professor of Psychiatry in Howard University's College of Medicine, presented a lecture on the neuropsychobiology of rapid eye movement (REM) sleep and implications for post-traumatic stress disorder (PTSD) at Howard University, Washington, D.C.

The lecture included a description of the neuroanatomy, neuropharmacology and physiology of REM sleep and how the neuroscience of the REM state is conducive to certain aspects of learning and memory. Specifically, the combined state of a high concentration of acetylcholine and low concentration of norepinephrine in the cerebral cortex may be particularly conducive to making novel associations among concepts stored in semantic memory, a state that may foster problem solving. The lecture was presented April 12.

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