



NEEDIA



USARIEM
Warfighter Health & Performance



Our Mission

Provide solutions to optimize Warfighter health and performance through medical research.

Our Vision

Recognized by the Department of Defense as the trusted leader in medical research for Warfighter health and performance optimization.

USARIEM is co-located at the Soldier Systems Center in Natick, Massachusetts. A short distance from Boston, the institute offers researchers its own unique facilities and is in close proximity to many of the finest universities.

- Hypobaric Chambers (9,000m, -15°C to 40°C)
- Environmental Chambers (-10°C to 50°C)
- Water Immersion Laboratory (5°C to 45°C)
- Biomechanical Laboratory
- Human Exercise Physiology Laboratories
- Pikes Peak Research Facility (4,300m)
- Metabolic Kitchen
- Bone Health Lab

History

Recognizing the importance of environmental and operational contingencies for the health, performance and effectiveness of troops in training or combat, USARIEM was activated on July 1, 1961 in Natick, Massachusetts as a research laboratory under the U.S. Army Medical Research & Development Command (now called the U.S. Army Medical Research & Materiel Command).

The Institute was created from a composite of elements associated with a number of outstanding federal and academic laboratories, including the Harvard Fatigue Laboratory in Cambridge, Massachusetts, the Armored Medical

Research Laboratory at Fort Knox, Kentucky, the Climatic Research Laboratory in Lawrence, Massachusetts and the Quartermaster's Environmental Protection Research Division and Earth Sciences Division at Natick.

Key Products

Performance Optimization Doctrine: USARIEM produces training policy and guidelines that provide recommendations to enhance Warfighter capabilities and reduce health risks.

Preventive Medicine & Planning Doctrine: USARIEM produces preventive medicine guidelines to minimize Warfighter injuries and lost duty time and medical costs.

Materiel Development Support: USARIEM recommends product improvements for clothing, equipment, nutrition and pharmaceuticals by providing design specifications to improve individual Warfighter equipment and rations.

Monitoring Strategies & Predictive Algorithms: USARIEM has developed strategies for personal status monitoring and a variety of algorithms to prevent and detect Warfighter performance decrements.

Health Hazard Assessment: USARIEM coordinates with the Center for Health Promotion and Preventive Medicine (CHPPM) for thermal and hypoxic conditions.

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What's in That MRE?

New online Combat Rations Database can tell you

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (March 13, 2015)

When Soldiers rip open meals, ready-to-eat, also known as MRE, in a combat zone, most people probably are thinking more about flavor and filling their stomachs than about the nutrition.

However, that does not mean nutrition is not important. The new online combat rations database, or ComRaD, formally launched earlier this month by the Department of Defense's Human Performance Resource Center, or HPRC, provides warfighters, military dietitians, food service officers and leaders the opportunity to learn more about the nutritional value of what is inside those packages.

ComRaD is the result of a collaborative effort between HPRC, the Natick Soldier Research, Development and Engineering Center, also known as NSRDEC, and the U.S. Army Research Institute of Environmental Medicine, or USARIEM, at Natick Soldier Systems Center. The database contains nutrition information about the MRE, First Strike Ration, Meal, Cold Weather, and Food Packet, Long Range Patrol.

Before ComRaD, military customers needed to contact experts at NSRDEC's Combat Feeding Directorate, or CFD, to obtain accurate nutritional information. The lack of public access to this information has left customers to obtain nutritional information from alternate sources that are sometimes unreliable and inaccurate.

Today's increased emphasis on performance nutrition in the military provided the boost needed to get the website up and running.

"Military dietitians expressed a need for publicly available nutrition information that could be used to help educate warfighters on how to properly fuel themselves before a mission, during a mission and post mission," said Julie Smith, senior food technologist with the CFD.

In the past, one had to rely on the nutrition fact labels provided on the food component packages to have any idea what was in

them. Holly McClung, a research dietitian at USARIEM, said those labels are not always accurate.

"That's why the website's so important," McClung said. "That's where we want the warfighter and the dietitians to go to, because we know that the nutrition info is accurate and up to date."

How does McClung know this?

"The nutrition information that feeds into the database comes from actual chemical analysis of the food component," McClung said. "That's ... where USARIEM came in."

"That's why we hope the warfighter will use the website, as it will help them to figure out how many calories they need and guide them to make good decisions on what they should be choosing to eat."

**Holly McClung
research dietitian, USARIEM**

We funded the chemical analysis of food components in the 24-menu MRE and other ration lines, which is difficult, expensive and time consuming.

"This is why it's taken us so long to complete the process. At this website, the user will be able to get nutrition on every individual component, the composition of complete ration lines, and individual MRE menus that are 100-percent chemically analyzed, so we feel confident in the nutritional data."

A quick look at the website would seem to reveal that warfighters are consuming too many calories and that their intake of ingredients such as sodium is too high. The numbers are deceiving, however.

"A civilian might look at what the energy needs are for a warfighter, or look at how much is provided in a ration, and think the rations are providing too many calories and/or fat, et cetera," McClung said. "What they have to realize is that the rations are constructed to meet the energy and nutritional needs of physically active warfighters. So, while there may be excessive energy available in the ration for a Soldier sitting at a desk, the ration may just meet the requirements of a physically active Soldier (who is) on (his or her) feet for a 12-hour patrol.

"That's why we hope the warfighter will use the website, as it will help them to figure out how many calories they need and guide them to make good decisions on what they should be choosing to eat," McClung said.

Combat Feeding developed the ComRaD website in collaboration with HPRC, but it is hosted by HPRC.

"Part of their mission is to educate the warfighter," said Smith of HPRC. "Their website provides warfighters and their families with a one-stop clearinghouse for evidence-based information and key resources in all aspects of performance to achieve total fitness and, ultimately, human performance optimization."

The ComRaD website will change over time, Smith said.

"We're already working on ... additional features to the website that will provide ComRaD users with Unitized Group Ration nutrition information, as well as a cart feature that will allow users to track what they have eaten by adding and removing ration components in order to view their overall daily nutritional intake.

"I think that it will be an evolving website [with] future improvements based upon the feedback that we get from users," said Smith, adding "which is really going to be invaluable."

A Soldier digs into a First Strike Ration in the mountains of Afghanistan. Nutritional information about the First Strike Ration and other individual rations is now available at the online combat rations database.

Photo: Michael Stephen, Combat Feeding Directorate





John McNulty, the Executive Director of R&DA, presents Andrea Lindsey of DoD HPRC, Holly McClung of USARIEM, and Julie Smith of NSRDEC the Col. Rohland Isker Award, which recognizes civilian employees for outstanding contributions made to national preparedness.

Tension was high at Research & Development Associates, an organization whose mission is to provide the safest and highest quality food and food service to the U.S. Armed Forces, when judges of the 2015 Colonel Rohland A. Isker Award debated over the winner.

The Rohland Isker Award is presented annually to civilian employees of the federal gov-

This year, the ComRaD, a website application based on a nutritional database created in collaboration with the U.S. Army Research Institute of Environmental Medicine's Military Nutrition Division, won for making nutritional information easily available to warfighters.

Application creators Holly McClung of USARIEM, Julie Smith of the U.S. Army Natick Soldier Research, Development and Engineering Center, and Andrea Lindsey of Department of Defense Human Performance

ComRaD Wins Award

ComRaD creators win Col. Rohland Isker Award

By Mallory Roussel, USARIEM Public Affairs / NATICK, Mass. (Nov. 6, 2015)

ernment or military personnel for outstanding contributions made to national preparedness in food, equipment, packaging, food service or related areas. Judges grant the award for significant accomplishments made in the past 12 months or to a series of project accomplishments made over a period of time.

"What project really had the greatest impact in the long term to benefit Soldiers, Sailors, Marines, Airmen and Coast Guardsmen away from their families?" said John McNulty, the executive director of Research & Development Associates, or R&DA, of the tiebreaker.

Resource Center were unable to attend the R&DA Awards Banquet on Oct. 21. However, McNulty took a trip from San Antonio, Texas, to present them with the award on Nov. 3 in Natick Soldier Systems Center's Grant Conference Center during the annual Combat Feeding Research and Engineering Board Meeting.

"ComRaD is a nutrition tool for warfighters and military dietitians working with warfighter populations in garrison to smartly plan their fueling and refueling for mission deployments," McClung said.

With a few clicks of a mouse, warfighters

and dietitians can view menus for three types of rations: Meal, Ready to Eat; First Strike Ration; and Meal, Cold Weather/Long Range Patrol. They can even read the nutritional information in a nutrition label format for specific menu components, such as drinks and side dishes.

According to McClung, all nutritional information is accurate, and all menu components have been chemically analyzed, making the ComRaD the go-to application for precise, easily accessible nutrition information on individual items, menus, and daily food intake. The judges of the 2015 Rohland Isker Award were impressed by the capabilities of this software to provide warfighters with robust information about the rations and the potential for affecting their diets and mission readiness.

Smith, from NSRDEC's Combat Feeding Directorate, or CFD, took the vision of a publically available source of ration nutrition information to a website concept through her collaborations with McClung, from MND, when constructing a testing plan for chemically analyzing the ration components. McClung executed the testing plan and built the Ration Analysis System Database. Lindsey, from Uniformed Services University, or USU, was the liaison to contract programmers and is the website host.

"My contribution to ComRaD is the nutrition data," McClung said. "Basically, all the nutrient data that feeds into ComRaD is from my research team. Working collaboratively with the U.S. Department of Agriculture and (veterinary) inspectors stationed at every ration manufacturing and assembly plant, ration component samples were captured during food production and shipped to USARIEM."

McClung's research team then inventoried and processed the ration samples before sending them to an outside lab for nutrition analysis. The chemical data from these analyses were then reviewed and systematically entered into the RAS Database, the fuel of ComRaD. McClung said it took the team close to nine years to fund analysis and build a complete dataset containing all food items—more than 300 components—in multiple years of MRE and First Strike Ration menus.



Photo: Mallory Roussel, US-ARIEM Public Affairs / aboutmodafinil.com



Good USARIEM and Harvard team up against PTSD, mTBI

Chemistry

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (March 12, 2015)

Call it good chemistry.

Researchers from the Army and Harvard Medical School are collaborating on a Department of Defense-funded study to identify chemical biomarkers that could differentiate between post-traumatic stress disorder, or PTSD, and mild traumatic brain injury, also known as mTBI.

The study, which began five years ago with a Harvard Catalyst pilot grant, involves personnel from the U.S. Army Research Institute of Environmental Medicine and Brigham and Women's Hospital, the teaching hospital of Harvard Medical School. They are working to find better ways to treat warfighters returning home with one or both of the conditions.

"We're hoping that by looking at subtle differences in brain chemistry, we might be able to more easily, more efficiently, differentiate the conditions, which ultimately will help us direct treatment approaches more efficiently and effectively," said Dr. Kristin Heaton, a research psychologist at USARIEM.

Dr. Alexander Lin, director of the Center for Clinical Spectroscopy in the Department of Radiology at Brigham and Women's, is using magnetic resonance spectroscopy to non-invasively measure chemical concentrations in the brains of 330 study subjects, including active-duty Service members, National Guardsmen, Reservists, veterans and civilian controls.

The subjects were broken into four groups - those diagnosed with either mTBI or PTSD, those with both, and those who were never diagnosed with either.

"One of the key things for us coming in and talking with Kristin was to better understand what is the main problem here, what are the things that we could do to solve the problem that the military has?" Lin said. "We look at different brain regions and what kind of changes we see in chemistry there. We call it chemical topography."

USARIEM is overseeing neurocognitive assessments of participants, Heaton said.

"We're using some tests that are commonly used for screening for mild traumatic brain injury and for post-traumatic stress," Heaton said. "I'm using those tests to help validate the brain chemistry data that we're getting."

"Using the cognitive tests as indicators of function, and then linking this data up with the brain chemistry results, we can create a more complete picture of brain health to

work from."

The study's data will be used by Draper Laboratories for modeling.

"They're the number crunchers," Lin said. "Their role is to take all this data that we're giving them from the chemistry standpoint, as well as ... all neuropsychological information that Kristin is bringing into this, and fuse it together."

Lin pointed out that it will take input from all the study partners to make this a successful effort.

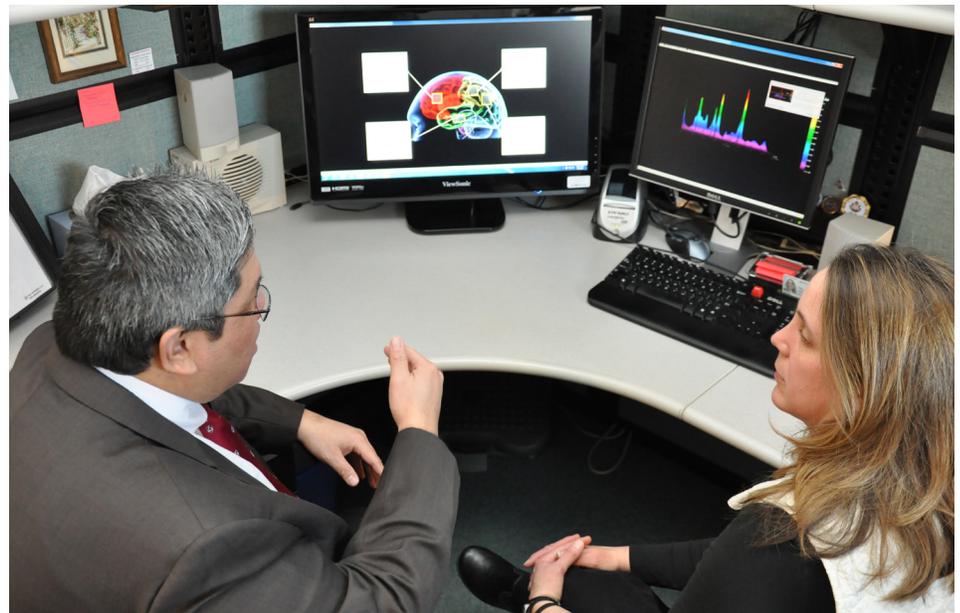
"This is not going to be the silver bullet," Lin

changes ... that would then provide us with information as to how we might be able to intervene with training programs or pharmacotherapies," Heaton said. "It's like body armor. It's brain armor."

USARIEM's proximity to Brigham and Women's has made for a smooth collaboration between Heaton and Lin.

"Kristin and I talk back and forth constantly," Lin said. "We see each other all the time."

"It's absolutely critical," Heaton said. "We are close to so many high-level academic institutions, hospitals. The biomedical activity in the



said. "It's got to be everything kind of coming together that forms the picture of what is going on in the brain."

Heaton said that she and Lin are about halfway through their data collection.

"It is difficult finding [participants] who meet our inclusion criteria, and we knew that going into the study," Heaton said. "We knew that was going to be a challenge."

Separating out mTBI and PTSD has important implications for future treatments.

"We can look at this chemistry and target certain medications for treatment," said Lin, adding that such applications could be as close as five years away.

Heaton added that this research might help identify potential preventive measures for warfighters before they deploy.

"If we can predict in advance who might be more vulnerable to injury or to functional

Boston area is world renowned.

"We're just so well situated, and taking advantage of that is a priority, because we can leverage so much more through these partnerships than if we were, I think, anywhere else."

Dr. Alexander Lin of Brigham and Women's Hospital in Boston and Dr. Kristin Heaton of the U.S. Army Research Institute of Environmental Medicine are working to identify chemical biomarkers that could differentiate between post-traumatic stress disorder and mild traumatic brain injury.

Photo: Tazanyia Mouton, USAG-Natick Public Affairs

Cold Truth

USARIEM returns to
Norway to study arctic
conditions

By Kelly Field, USARIEM Public Affairs /
NATICK, Mass. (March 3, 2015)

For the second time in three years, researchers from the U.S. Army Research Institute of Environmental Medicine partnered with the Norwegian Defence Research Establishment to study nutrition and physiological responses to cold-weather training.

The U.S. Army Research Institute of Environmental Medicine, or USARIEM, once again partnered with the Norwegian Defence Research Establishment to study nutrition and physiological responses to cold-weather training.

For the second time in three years, researchers from USARIEM traveled to Norway to study Norwegian soldiers participating in cold-weather training. About 75 Norwegian soldiers, from the 2nd Battalion, Brigade North, Norwegian Army, stationed on Skjold Garrison enrolled in this randomized controlled trial.

“The results of our last study showed that short-term winter training alters nutritional requirements,” said Dr. Stefan Pasiakos, a nutritional physiologist with USARIEM’s Military Nutrition Division. “We observed decrements in several markers of nutritional status, including protein retention, suggesting muscle mass is compromised during short-term military training in the cold.”

Pasiakos said this gave researchers the information they needed to design a targeted nutrition intervention to attenuate those effects in Soldiers participating in a similar winter training program. The research team expected to produce physiological decrements that mirrored those observed in their last study.

“Our primary objective was to determine the efficacy of an optimized recovery food product designed for combat rations,” Pasiakos said. “We were trying to identify ways to effectively use nutrition to promote recovery and resistance to muscle loss during military operational stress.”

Pasiakos said that often times Soldiers can experience severe calorie decrements during training because they either quickly strip down rations and remove food with nutritional value because they do not want to carry the extra weight, or they simply

do not have the time to eat all the food they are given. For example, Soldiers threw away about a third of their food rations, causing a severe calorie deficit throughout training during Pasiakos’ previous study in Norway.

Researchers divided the Soldiers into three intervention groups, aimed at testing whether supplementing existing rations with a protein or carbohydrate-based snack product would improve these various markers of nutritional status. USARIEM partnered with Natick Soldier Research, Development and Engineering Center’s Combat Feeding Directorate to develop and create nearly 5,000 snack products for use in this study.

“The groups were each given their standard combat ration allotment for their training exercise.

One group served as the control and received no additional food,” Pasiakos said. “The other groups received their three rations plus, either four carbohydrate or protein-based snacks, like a First Strike Ration bar or a crispy rice bar.

“By providing easily accessible snacks, we were trying to see to what extent we could actually offset the physiological decrements that occur during severe calorie deficit. If we are able to develop a food product that Soldiers like to eat and also promotes recovery, this would allow us to make some positive changes to our combat rations,” Pasiakos said.

USARIEM researchers also examined the risk of frostbite on peripheral areas such as the fingers, wrists, calves and toes. Dr. John Castellani, a research physiologist with USARIEM’s Thermal and Mountain Medicine

Division, said that these areas are the most susceptible to frostbite, but they are the least understood.

“Currently, we have limited information on finger and toe skin temperatures in the field or in an operational setting,” Castellani said. “The information that we collected is important because it will allow us to build biophysical models that will enable Soldiers to choose the correct cold-weather clothing ensembles as well as evaluate if the Army’s cold-weather doctrine for injury prevention is accurate.

“This study will enable USARIEM to provide Soldiers with practical solutions in extreme environmental temperatures so that they continue to perform

“This study will enable USARIEM to provide Soldiers with practical solutions in extreme environmental temperatures so that they continue to perform their mission with a low risk of cold injury.”

Dr. John Castellani, research physiologist, USARIEM

their mission with a low risk of cold injury,” Castellani said.

Both Pasiakos and Castellani said that these types of field studies are extremely important for them as scientists because they provide a level of reality that can not be re-created in the laboratory. While the information collected during this trip is just beginning to be analyzed, USARIEM researchers are excited for the results.

“Typically, field studies give us the most realistic model to test our hypotheses. When military units provide us the opportunity to conduct a study, our mission is to execute strong science without being disruptive to their operations,” Pasiakos said. “USARIEM has a long history of doing just that and, most importantly, it gives us the operationally relevant evidence we need to improve science and, ultimately, warfighter health and performance.”

Recipe for Success

USARIEM publishes MRE cookbook

By Mallory Roussel, USARIEM Public Affairs / NATICK, Mass. (Dec. 11, 2015)

Imagine unwrapping a meal, ready-to-eat, or MRE, and digging into nostalgic comfort cuisines, like Parachute Pork, Battalion Brownie Pops and Ranger Red Hot Party Mix. Who in the U.S. Army Research Institute of Environmental Medicine, or USARIEM, is cooking up these creative concoctions, and where can we get some?

The recipes are pages from the cookbook “MRE Recipes: A collection of recipes bringing a creative twist to your MRE experience!” This book is one of the perks volunteers receive for joining USARIEM’s ongoing, cutting-edge study, “Effects of Meal, Ready-to-Eat consumption on gut health,” headed by Dr. J. Philip Karl, a scientist in USARIEM’s Military Nutrition Division, or MND.

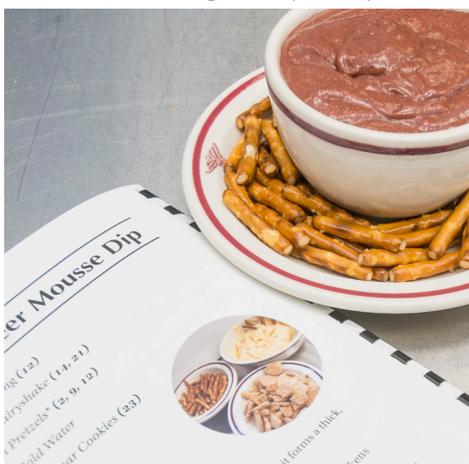
“We are looking at gut health and consumption of the MRE,” said Holly McClung, a research dietitian from MND working on the project. “What we are doing is asking volunteers to consume a MRE-only diet for 21 straight days. Twenty-one days is consistent with current field feeding policy, and research has shown that consuming MREs for this length of time does not hurt a warfighter’s nutritional status.

“But older and new research shows us that, in addition to nutritional status, a healthy gut is also important for physical and mental health,” she said. “Interactions between the millions of bacteria living in our gut and what we eat is a very important factor in gut health, but we don’t know how MRE foods interact with those bacteria to impact gut health. Ultimately, discovering how eating MREs influences gut bacteria and gut health will help our efforts to continually improve the MRE.”

McClung said this study will help USARIEM discover new nutrition-based strategies for changing gut bacteria in a way that benefits warfighter health. Yet the researchers are facing a significant problem that could affect how soon they are able to develop these strategies: getting study volunteers to eat nothing but MREs for 21 straight days.

“Anytime you limit what somebody can eat, there is a possibility of that person becoming tired of the diet. In a research study like this, that means there is going to be a possibility of dedicated volunteers wanting to drop out of the study,” McClung said. “They may get tired of the food. Even though there are 24 different meals, after three weeks, volunteers will have tried everything at least once. Many people can hit a wall.

“My idea was to put together a book of recipes that might invigorate volunteer interest in the study and the MREs. We needed to somehow increase variety within the foods available, so I thought, ‘Why not try out



some new recipes?”

Enter the cookbook. What started out as McClung’s brainchild became a reality after she handed the task off to newcomer research dietitian Adrienne Hatch to cook up some concoctions.

“It was really a great opportunity for me when Holly approached me to do this because it’s already something I enjoy doing on my own,” Hatch said. “To be able to take MREs and create a new recipe, because you’re only given so many ingredients and components, and make something new and enticing out of that, was both a challenge and fun!”

What Hatch and McClung described as a fun way to entice volunteers to continue eating

the MRE for their study could also serve as a steppingstone toward solving some of the constraints eating an MRE presents on the battlefield.

“What is nutrition if you don’t consume the food,” McClung asked. “One of the big hurdles we have seen in our field studies is getting the Soldier to eat. So, why, at the end of a 20-mile march, do you want to get all the food out and prepare it unless you’ve been thinking about it for those 20 miles? We need ways to keep warfighters interested in and excited about eating in the field after they have been training and eating MREs for several days.”

During the brainstorming stages of the book, Hatch was inspired by enticing, palatable dishes online - barbecue, cake pops, potato salad and other goodies. Hatch said her current love of food trends had its roots in her childhood.

“My mom actually had her own little cake business at home, where she made mainly birthday cakes and baked for special occasions,” Hatch said. “I always grew up around my mom making some sort of pastry, something in the kitchen. I think it carried over into adulthood and professional life. On snow days last year, I decided to make cake pops because I wanted to perfect my recipe. With this, I was thinking, ‘How could I bring a cake pop into the recipe book?’ So, I came up with the Battalion Brownie Pops.”

The new and improved recipes bring both a burst of life and nostalgia to the MRE. Getting the food into Soldiers’ stomachs, however, can still be a challenge due to monotonous food choices and limited food options.

“The limitation in the number of ingredients in the MRE was my biggest challenge because you only have so much to work with,” Hatch said. “It could get repetitive if you used the same type of ingredients in every recipe.”

Hatch combated this problem by making the

Left: Mountaineer Mousse Dip is one of the many innovative recipes research volunteers can create during the study.

Right: A Soldier digs into an MRE in Afghanistan.



Photo: Michael Stephen, DoD Combat Feeding Directorate

recipes adaptable. Combining different types of nuts, peanut butter or dried fruit can offer Soldiers a variety of flavors. This encourages Soldiers in the study and potentially on the field to show creativity and interest in what they are eating.

“That’s what happened with our most recent volunteer,” McClung said. “We gave these cookbooks out during the last iteration of our study, and the volunteer was really inspired by the book. He came up with his own Doc’s BBQ Delight recipe using the pork patty and some of the barbecue sauce, and he actually put raisins in it to make it sweet.”

The research dietitians spent a day in their test kitchen cooking and tasting MREs. McClung said they were surprised by how delicious the new concoctions tasted. After the

recipes were tested and finalized, McClung and Hatch sought the expertise of colleague Phil Niro to put the creativity into a cookbook format that would entice volunteers to read, make and try the recipes. Both Hatch and McClung were eager to name a few of their favorite recipes - from sweet to spicy.

“Mountaineer Mousse Dip,” Hatch said. “It’s composed of the pudding pouch, dairy shake and water. You mix it up and get a whipped mousse type of consistency. I really liked dipping pretzels in it - because you get the salty and sweet - or the little sugar cookies are good with the mousse, as well.”

“I’m not a real beef connoisseur, but I feel like Battlefield Beef Dip could be a hit as a Super Bowl dip,” McClung said.

The book is only being released to volunteers

for USARIEM’s gut health study, as it is awaiting approval for copyright registration. McClung and Hatch think that the book will fulfill its original mission of keeping study volunteers engaged in the research. More than that, they also hope that the book, once it receives approval, contributes to USARIEM’s progress toward benefiting warfighter performance by encouraging consumption of the rations that their partners at the Combat Feeding Directorate spend so much time, thought and science developing.

“We want to benefit the warfighter in as many ways nutritionally and physiologically as possible,” Hatch said. “We hope that the ideas offered in this book help entice Soldiers to eat the foods needed to sustain health and energy in the field and ultimately benefit them as they carry out their missions.”



Healthy Families, Healthy Forces

Army launches weight loss trial program for adult dependents

By Kelly Field, USARIEM Public Affairs / NATICK, Mass. (Feb. 9, 2015)

The U.S. Army Research Institute of Environmental Medicine launched a collaborative research study with Tufts University to assess the effectiveness of two weight-loss strategies.

Called “Healthy Families, Healthy Forces,” this randomized trial will measure the effectiveness of two weight-loss programs for meaningful and sustainable weight loss in military families.

“This study targets dependents of active-duty military personnel and addresses the eating environment at the Soldier’s home,” Lt. Col. Asma Bukhari said. “Collaborating with Dr. (Susan) Roberts and Dr. (Sai Krupa) Das at Tufts University is a great opportunity for us to further investigate evidenced-based weight-loss strategies for our military beneficiaries.”

The Tufts researchers bring over 30 years of research expertise in the weight loss arena. Bukhari, a research dietitian with USARIEM’s Military Nutrition Division, said this study is in line with the Army surgeon general’s vision on addressing Soldiers’ “life space” and moving from health care to health.

“Spouses of active-duty Soldiers may be the primary influence for eating behaviors, food selection and preparation at home. While we are aiming to see improved weight in the dependents directly participating in this study, our thought is that this program may also have a ripple effect on the active-duty family members -- the Soldier(s),” Bukhari said.

This two-year study, which is based on Tufts University’s innovative “Healthy Weight for Living Program,” began in January 2015 and features group classes that provide free education and support to help family members lose weight and prevent weight regain. These classes will be a fun way to learn menu planning, grocery shopping, self-monitoring of weight, diet and activity.

Bukhari said many times military families just do not know where to start when it comes to healthy eating. She said that quick weight-loss programs can often be expensive and frustrating, with no real long-term benefits. This program focuses on changing behaviors in an environment that connects military families to one another.

“We are trying to change a lifetime of habits for a healthier life,” Bukhari said. “We approach weight loss as an opportunity for problem solving. So, for example, we have group sessions to help with recipes, explaining how to cook with healthy ingredients using recipes

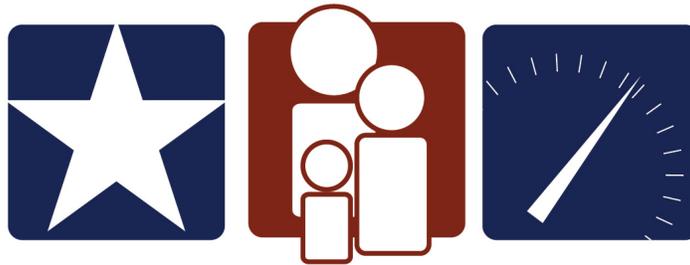
that are easy to make and that taste good. Participants will get to test some of the foods, and then they can go home and make them.”

Bukhari said that if this study is successful in the Boston area, where it is currently taking place, she would like to scale it up to the rest of the military community nationwide so weight-loss programs are consistent on all installations. She would also like this program to help her and other Army registered dietitians understand the barriers to seeking a weight-loss program as families move from one duty station to the next, even though there is a desire to participate in them.

She said the interesting aspect of this study is an online capability if dependents have difficulties with in-person group sessions and follow-up.

“In surveys, dependents expressed a high need for a program like this,” Bukhari said. “Even though the Army has programs, they vary from place to place, so progress is disrupted by deployments, PCSs, etc. We are taking all those factors into consideration. Through this

study, we are exploring an intervention in the service members’ home space to expand effective strategies that promote weight loss and weight maintenance for the military families no matter where they are.”



Healthy Families | Healthy Forces

“Healthy Families, Healthy Forces,” is a randomized trial that will measure the effectiveness of two weight-loss programs for meaningful and sustainable weight loss in military families.

Graphic: Philip Fuyana, NSRDEC

Photos (Left): Pixabay



Marching On

Army researchers continue physical demands study

By Kelly Field, USARIEM Public Affairs / NATICK, Mass. (May 22, 2015)

Researchers, from the U.S. Army Research Institute of Environmental Medicine, or USARIEM, traveled to Fort Carson, Colorado, three times this year as they continue to collect data for the Physical Demands Study.

USARIEM is working with the U.S. Army Training and Doctrine Command as part of the comprehensive Soldier 2020 initiative. The purpose of the Physical Demands Study, or PDS, is to provide valid, reliable and accurate predictive tests to select Soldiers for accession into physically-demanding occupations.

USARIEM's role in this initiative is to examine the physical performance requirement of the specified combat arms occupations and to develop predictive physical tests that will apply uniformly to every Soldier being recruited for these military occupational specialties, or MOSs, regardless of gender, age or ethnicity.

"The Army's scientific approach for evaluating and validating MOS-specific standards aids leadership in selecting the best-qualified Soldiers for each job within the Army profession," said Jack Myers, a planner in the Training and Doctrine Command's, or TRA-

DOC's, G-3/5/7 section. "This will ensure force capability and readiness."

Over the past two years, USARIEM researchers have traveled thousands of miles, conducted several stages of testing, and spoken with hundreds of Soldiers at all levels.

"First, the physically demanding tasks for each combat arms MOS were defined by branch commandants and command sergeants major," Myers said. "We then vetted this through commanders and CSMs [command sergeant majors] from the operational force. The tasks were approved by [TRA-

DOC] and then reviewed by SMA-hosted [sergeant major of the Army-hosted] board of directors.”

Subject matter experts, within each branch, identified 31 physically demanding occupational requirements necessary to be successful in combat MOSs. Once the tasks were identified and verified, TRADOC conducted the first phase of testing to verify tasks, conditions and standards across the operational force.

The 31 tasks were validated by having more than 500 Soldiers from eight brigades - heavy and light units - throughout five installations perform the tasks. While the task validation events were conducted by TRADOC, USARIEM researchers were able to observe the Soldiers in action.

“During each verification, we learned a lot about the tasks while making measurements related to task standards, such as weight lifted, number of repetitions, and distances walked,” said Marilyn Sharp, the study’s principal investigator from USARIEM.

The first action taken by USARIEM, for the PDS, was to conduct focus group interviews with junior and senior enlisted Soldiers to obtain feedback on the accuracy and completeness of the tasks identified for their respective MOSs. By and large, Soldiers in the focus groups confirmed that the tasks, conditions and standards were appropriate.

USARIEM then observed and measured small groups of male and female Soldiers performing each of the 31 critical tasks in a controlled laboratory environment. This enabled researchers to take measurements to examine the physiological demands of each task. Measurements included heart rate, respiration, oxygen consumption, perceived exertion and time to completion for each individual Soldier.

“We then observed these same tasks in a more controlled lab experiment, with Soldiers performing tasks to standard in combat gear,” Sharp said. “This allowed us to compare measurements like heart rate, oxygen consumption, and the Soldier’s perception of

how hard they were working.”

Sharp said that these measurements were very controlled and that all participants had to complete the task the same way.

Researchers then compared physiological requirements of tasks, skill, equipment, perception of difficulty and importance to MOS.

“We categorized each task by the type of movement needed - lift, carry, pull, et cetera, - and the physical demands, the muscle strength, power, muscular endurance and aerobic endurance, and then ranked the tasks by difficulty level,” Sharp said. “The tasks with the highest physical demands were selected as representative of that MOS.

“We reported the critical tasks selected to each schoolhouse and got their concurrence that these would serve as the basis from which we would build the predictive models.”

The tasks with the highest physical demands were then simplified into task simulation tests. These simulations captured the physically-demanding aspects, but they removed the highly-skilled portions of the tasks.

The first trip to Fort Carson was used to determine the reliability of the task simulations. Soldiers performed the tasks four times over a two-week period to identify learning effects and to ensure that a Soldier scored similarly over the course of each test. If the test was not reliable or a similar score was not obtained from test to test, the simulation was unsuitable.

Once the reliability of the task simulations was established, a suite of predictive tests was selected by subject matter experts.

The predictive tests are physical-fitness-type tests. The same Soldiers performed the task simulations and the predictor tests to develop a test battery to predict performance on the task simulations. This aspect of testing is called the test validation phase and involved field artillery, armor and infantry task simulations.

Two more field studies will be conducted during the summer on Fort Stewart and Fort Riley. This will complete the data collection

for the predictive test validation phase. The data will be analyzed, and recommended courses of action will be presented to TRADOC.

“It’s very deliberate and it’s very scientifically based,” said Gen. David G. Perkins, TRADOC commanding general, of the study. “One (advantage) of it is it’s giving us really concrete data that’s quantifiable and measurable. It’s really giving us insight even beyond what it originally was chartered for.”

Perkins lauded USARIEM’s work on the study.

“It’s invaluable, really, because for one thing, they’re extremely responsive,” Perkins said. “The fact that you can do it all in house ... we’re much more innovative. We can adapt more quickly to rising insights. You really can innovate and adapt much quicker.”

Sharp said that developing valid, reliable and accurate predictive tests to be used to select Soldiers to serve in the physically demanding occupations is essentially what these past couple years have been all about for her and her team. While the study still has a few more months to go before being wrapped up and all the data are analyzed, Sharp is excited about the results.

“We want a battery of four to seven predictive tests that will give us a good idea if a Soldier has the potential to be successful in that MOS when they are called upon to perform the physically demanding tasks expected of them,” Sharp said. “We are looking for tests that could be used early in a recruit’s career and be safe and cost-effective.

“They must also use little equipment, require little training and experience, and most importantly, be representative of the most physically-demanding aspect of a military occupation. The goal is to help find the right Soldier for the right job.”

A researcher from the U.S. Army Research Institute of Environmental Medicine tracks a Soldier during one of the validation tests of the Physical Demands Study.

Helping Aircrews Keep Their Cool

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (May 29, 2014)

For years, helicopter pilots have kept cool by plugging into aircraft-mounted microclimate cooling systems, but their crews have used them less frequently to avoid becoming entangled in the tethers that connected them to the systems.

That's why researchers at the Natick Soldier Systems Center have been testing the "Light-Weight Environmental Control System," or LWECS, a body-worn microclimate cooling system that allows crew members to move around inside the aircraft without tripping on tethers, and to exit the aircraft while still being cooled.

"Basically, it's a small refrigeration device," said Brad Laprise, a mechanical engineer with the Warfighter Directorate, Natick Soldier Research, Development and Engineering Center, or NSRDEC. "It's the same technology that's in your air conditioner or in your refrigerator, except instead of conditioning air, it chills a fluid. And then it pumps that fluid through a tube-lined cooling vest."

The cooling unit is a cylinder 3 ½ inches around that connects to a cooling vest and provides 120 watts of cooling. The vest has approximately 110 feet of tubing through which fluid can pass, and it is worn against a Soldier's skin. The system is powered by a plate-like conformal battery that can fit inside body armor.

"So we're hoping that this small, lightweight system would give them a lot more autonomy in the rear of the aircraft," said Laprise, "and to allow them to get the cooling when they need it."

Researchers from NSRDEC and the U.S. Army Research Institute of Environmental Medicine, or USARIEM, working with Product Manager Air Warrior, have been

testing LWECS at Natick's Doriot Climatic Chambers. With the assistance of volunteers wearing MOPP 4 chemical-protective gear, they have been simulating 11-hour missions in desert and jungle conditions.

"We've been living in the desert for the last 20 years, but we also know that the Pacific Rim is the next area that we're looking at," said Bruce Cadarette, a research physiologist with USARIEM's Thermal and Mountain Medicine Division. "We've been providing microclimate cooling for the pilots ... for 16 years now. It made them be able to prolong their mission, their endurance time, and able to perform at a higher level."

The hope is that their crews will be able to realize similar benefits with LWECS, without being tethered to an aircraft-mounted system.

"Right now we're looking at crew chiefs that have to load and unload cargo and maintain the cargo," Cadarette said. "They also have to sit as rear gunners in some of the helicopter frames."

"The other people that we're concentrating on ... are the medics, who have to fly out in the back of the helicopters and who have to go out and treat wounded in the field, load them onto stretchers, (and) get them onto the back of the helicopter."

Over two weeks, the five test subjects each took two turns in the simulated desert conditions and a pair in the jungle conditions – one using the cooling system and one without it – in the chamber.

"It's really a critical step, ... proving out the efficacy of this microclimate cooling technology and the capability that it provides," Laprise said. "If we don't have Doriot, we need to find somewhere else to do it, and I'm not so sure there's a place in the world where we

can do this testing. So it is absolutely critical that we have this capability here at Natick."

The cooling systems and the volunteers performed well, according to the researchers.

"We really haven't had any issues with (the LWECS)," said Laprise, who looked at the fluid temperature before and after it passed through the system, and monitored flow rate. "By and large, they've been very reliable."

Cadarette said the same for the volunteers, who sat for 50 minutes and walked for 10 minutes each hour to simulate missions during which they would get off and back on the aircraft.

"A lot of the day is not heavy work, but for brief periods of time, they work very, very hard," Cadarette said. "Now you've got a battle between your muscles calling for blood in order to exercise and your skin calling for blood in order to cool off."

During the 11-hour sessions, Cadarette and his team monitored core and skin temperature, heart rate, and everything that went into or came out of the subjects' bodies.

"From our point of view, we monitor everything we can, physiologically," Cadarette said. "So now we know, are you doing better with the cooling?"

Cadarette has a great deal of data to sift through, but the early indications are that the LWECS is making a difference.

"Physiologically, we're seeing that their body core temperatures are lower, their heart rates are lower," Cadaratte said. "So far, what I'm seeing looks really good. I think we can show that the cooling portion of this does what we're asking of it."

Volunteers wear MOPP 4 gear during testing of a body-worn microclimate cooling system for the helicopter aircrew members in Doriot Climatic Chambers.



Working Up a 'SWET'

USARIEM app helps determine body's water needs

By Kelly Field, USARIEM Public Affairs / NATICK, Mass. (Oct. 24, 2014)

Clean, potable water is one thing the world universally cannot live without. It hydrates. It cleans. It keeps us alive and well. No doubt, water is very valuable to Soldiers.

However, as many mission planners know, water planning can be a nightmare. Too much water can strain already heavy combat loads, perhaps forcing some Soldiers to pack too little in favor of a lighter pack. When Soldiers don't have enough water, dehydration could set in, decreasing performance and increasing the risk of serious heat illnesses.

"Water is a huge logistical problem for training and field missions," said Dr. Nisha Charkoudian, a research physiologist from the U.S. Army Research Institute of Environmental Medicine, known as USARIEM, Thermal and Mountain Medicine Division. "Obviously, planners do not want too much, but having too little can lead to serious problems. Dehydration exacerbates symptoms caused by heat and altitude exposure, and makes a lot of things worse, including the ability to perform physical tasks in hot and high-altitude environments."

To help solve this logistical problem, Charkoudian worked with researchers from USARIEM — Dr. Sam Chevront, Dr. Robert Kenefick and Ms. Laurie Blanchard — and a team from the Massachusetts Institute of Technology Lincoln Laboratory — Dr. Anthony Lapadula, Dr. Albert Swiston and Mr. Tajesh Patel — to develop an app that will help unit leaders accurately predict water needs with the goal of minimizing the burden of water transport and sustaining hydration.

"Research into heat stress has been going on for over 50 years at USARIEM," Charkoudian

said. "We have been providing guidance to the Department of Defense about sweat loss and hydration, and refining it for many years through TB MED 507. Paper doctrine provides generalized look-up tables generated from complicated equations. The app meets requests from the increasingly digital battlefield for paperless guidance that is simple, accurate, mission-specific and available in real time."

Called the Soldier Water Estimation Tool, or



SWET, this Android-based smartphone app is a decision aid that translates a complicated biophysical and physiological sweat prediction model into simple user inputs regarding the anticipated intensity of activity (low, medium, high, including example activities), three category choices of military clothing ensemble and weather conditions (air temperature, relative humidity and cloud cover).

The SWET app has user-friendly inputs and

provides the user with the amount of water required for the specified conditions in liters per hour. A separate "Mission Calculator" tab further simplifies planning by providing total amounts of water required for a given unit (number of people) for a given mission duration (total time, in hours). Total water amounts are provided in liters, one-quart canteens, two-quart canteens and gallons.

Charkoudian said this app was designed for unit leaders to determine group water needs. The average amount of water needed per person does not reflect individual differences, but the model error for individuals is estimated to be small. Soldiers should expect to see this app within the year on the Army's Nett Warrior platform.

"This will be one of the first apps rolled out in the Nett Warrior platform," Charkoudian said. "I am so excited to be doing stuff that is directly helping Soldiers in the field. I think that's just so cool."

In the meantime, Charkoudian said that the app has already undergone limited user testing with the Army Mountain Warfare School in Jericho, Vermont, where Soldiers gave very positive feedback. She is looking forward to more feedback once the app goes live, to make updates and possibly explore its uses in the commercial world.

"There is the potential here for future versions of SWET for sports and sports drink companies, for team sports, as well as for humanitarian and disaster-relief organizations," Charkoudian said. "People want apps; that's what they are excited about. It's something everyone can relate to."



Spc. Heyz Seeker (right) gets a drink from a hydration device during the Urban Warfare Orienting Course event of the Department of the Army Best Warrior Competition at Fort Lee, VA, Oct. 1-5.

Mission planners can calculate the appropriate amount of water to carry during missions with the Soldier Water Estimation Tool, or SWET, app (left), developed by researchers from the U.S. Army Research Institute of Environmental Medicine, in order to increase performance and prevent heat illnesses during missions.

Photos: T. Anthony Bell, Fort Lee Public Affairs Office



“Heat stress is a significant concern for military working dogs, both during training and deployment. If heat illness occurs, even if it is not fatal, MWDs are often retired from service, resulting in loss of a valuable resource that is costly with respect to both time and money..”

Kate O'Brien,
research physiologist, USARIEM

Working Dogs

USARIEM studying how to cool K-9s

Last summer, Ken Ballinger, a K-9 officer with the Plymouth County Sheriff's Department, was conducting a training session with working dogs on a hot and humid New England day.

For safety, Ballinger had arranged for two veterinarians and three paramedics to be on site. When the dogs were not working, they were resting in air-conditioned vehicles and checked on every 15 minutes. On one of these routine checks, Ballinger's dog, "Blitz," a 3-year-old Shepherd, did not respond.

The vehicle had failed, so that instead of blowing cool air, 200-degree engine air flowed into the cabin where Blitz was. Blitz was unconscious when he was pulled from the vehicle. Emergency treatment began immediately, including application of ice packs, administration of intravenous fluids and rapid transport to Angell Animal Medical Center, located only five minutes away.

An hour later, Blitz's core temperature was still 109 degrees, far above normal; yet within two weeks he was back to work. In the veterinary community, this was the highest temperature documented with survival.

"Heat stress is a significant concern for military working dogs, both during training and deployment," said Kate O'Brien, a research physiologist at the U.S. Army Research Institute of Environmental Medicine in Natick, Mass. "If heat illness occurs, even if it is not fatal, MWDs are often retired from service, resulting in loss of a valuable resource that is costly with respect to both time and money."

USARIEM's Biophysics and Biomedical Modeling Division is working with the Massachusetts Institute of Technology's Lincoln Laboratory to solve this problem through a program to examine thermal stress in military working dogs.

"Real-time physiological monitoring can be used in humans to identify individuals who are at risk of excessive heat strain," said O'Brien.

For example, O'Brien said, Weapons of Mass Destruction Civil Support Teams have used

handheld "buddy" displays to see when an individual is becoming too hot and could use that information for better mission management.

"A similar approach could be used with MWDs to send information to the handler when the dog is overheating," O'Brien said. "The handler could then take action to both avoid performance degradation and reduce risk of heat illness."

O'Brien said that while heat illness occurs less often in civil working dog populations, sometimes things happen despite your best efforts to prevent it.

A few months later, Blitz had an implanted temperature sensor in his chest. Data is transmitted so that handlers can monitor Blitz's temperature in real-time, as well as be alerted if he reaches a critical preset threshold temperature

"It may not be feasible to surgically implant every MWD

with a temperature sensor," O'Brien said.

"However, USARIEM has demonstrated in humans that heat tolerance can be tracked in real-time using data obtained from non-invasive physiological measurements in combination with algorithms and models that predict core temperature."

This capability for monitoring humans was developed through USARIEM's expertise in thermal physiology, biophysics and mathematical modeling. Expertise from MIT Lincoln Laboratory in signal processing, data storage and microprocessing contributed

to the methodology for transmitting this information to the individual. Together, USARIEM and MIT Lincoln Labs are currently working on a very low power, size and weight physiological status monitoring system for humans. This same approach is being applied to monitoring heat strain in MWDs.

"Through partnerships with the MWD community, local police K-9 units, and MIT Lincoln Labs, USARIEM will be developing products and strategies to reduce heat injuries and sustain performance in working dogs for military and law enforcement," O'Brien said.



The U.S. Army Research Institute of Environmental Medicine and MIT Lincoln Laboratories are involved with the program to evaluate thermal stress in Military Working Dogs, which is led by Kate O'Brien, a research physiologist with USARIEM's Biophysics and Biomedical Modeling Division, pictured left.

Photo (Right): Anthony Karis, USARIEM



USARIEM

seeks to improve bone health

Army and Air Force conduct joint study

By Kelly Sullivan, USARIEM / NATICK, Mass. (Jan. 6, 2013)

Researchers from the U.S. Army Research Institute of Environmental Medicine have teamed up with the Trainee Health Surveillance Flight 559th Medical Group's Basic Military Training Team at Joint Base San Antonio-Lackland, Texas, to determine whether increased vitamin D and calcium intake can improve bone health in military personnel.

Stress fractures and musculoskeletal injuries are among the leading causes of medical holdovers during basic military training, and often lead to attrition of military personnel early in their careers. As many as five percent of males and 20 percent of females may develop some sort of stress fracture during military training due to the novice warriors' inability to withstand unaccustomed, repeated stress to their bodies, such as marching with body armor.

"Optimizing bone health of military personnel is essential, especially during Basic Military Training and other military training activities," explained Dr. James McClung, a nutritional biochemist with USARIEM's Military Nutrition Division. "These injuries are costly to warfighters and to the military, as a significant portion of individuals that suffer from stress fracture leave military service and stress fracture results in substantial health care costs associated with treatment and rehabilitation."

Recent studies have linked vitamin D and calcium to bone health and the prevention of stress fractures. In a 2008 study conducted by Creighton University, in conjunction with the Navy, more than 5,000 female recruits underwent a trial in which they consumed either a supplement containing vitamin D and calcium or a placebo over the eight weeks of Navy boot camp.

During the course of that study, 270 stress fractures were observed in the placebo group, but only 226 stress fractures were observed in the group receiving the vitamin D and calcium supplement. Advanced analysis showed that vitamin D and calcium supplementation may have reduced the risk of stress fracture by up to 20 percent.

"We say 'may have reduced the risk' because missing from that study were biochemical indicators of nutritional health or functional indicators of bone health," McClung said. "There were just not enough data to use this study as the sole basis for implementing policy changes affecting vitamin D and calcium levels in the warfighter diet."

So, McClung and his team of researchers, managed by Dr. Erin Gaffney-Stomberg, a research fellow within the division, set out to explore the biochemical and functional basis for these findings, with the goal of providing Army and Air Force personnel with levels of vitamin D and calcium consistent with the Navy study. After conducting an initial study with the Army in 2012, McClung partnered with the team at JBSA-Lackland in October 2013, for more research.

Air Force recruits, both male and female, participated in a trial similar to the Navy study, but this time they were given a snack bar either fortified with vitamin D and calcium that was developed in collaboration with scientists from the Department of Defense Combat Feeding Directorate at the Natick Soldier Research, Development and Engineering Center, in Natick, Mass., or a placebo snack bar.

"Optimizing bone health of military personnel is essential, especially during Basic Military Training and other military training activities."

Dr. James McClung, nutritional biochemist, USARIEM

McClung's team of researchers collected physiological data from Airmen twice during their training, on day three of their reception phase of training and again immediately prior to graduation. Techniques included body composition assessment (using military standards), blood collection, a bone scan using a device called a peripheral quantitative computed tomography, and paper surveys. This round of collected data was sent to USARIEM's headquarters in Natick, Mass., as well Pennington Biomedical Research Institute, Baton Rouge, La., for assessment.

According to McClung, they had close to a 90 percent rate of compliance from Airmen in this study.

"We have had great support from everyone at Lackland for this study, from the leadership to the recruits," McClung said. "This is important because we have extended the scope of our knowledge beyond the Army, and we now have the basis to extend nutrition recommendations to the Air Force based upon data collected directly from their personnel."

The leadership at Lackland agrees that this collaboration is valuable and could not have been conducted in partnership with any other organization.

"As I reviewed the military literature on stress fractures and prevention, it was clear that Doctor McClung and the USARIEM team were the only assets in DoD who had published on nutrition and impacts on military training," said Thomas Leo Cropper, director of Trainee Health Surveillance Flight 559th Medical Group at Lackland. "We consulted them to gain access to the latest military science knowledge on nutrition and military performance to improve military training outcomes."

According to Cropper, stress fractures are costly because they can require multiple doctor visits and medical tests such as X-rays or MRIs, plus physical therapy, which can cost the Air Force more than \$6,000 per case. Added to that, trainees miss weeks to months of expensive military training while they wait to heal in medical hold and then exercise to regain fitness to meet military physical training standards required to graduate.

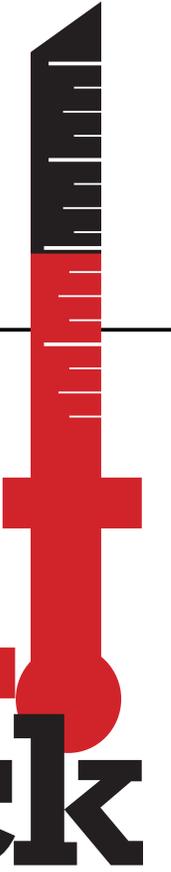
"Many trainees get demoralized after a stress fracture and quit," Cropper said. "If we can prevent stress fractures or other injuries, it is much better for all concerned."

McClung and his team plan to return to Lackland in spring 2014, to continue testing in the hopes of preventing future injuries. At the completion of the study, scientists from USARIEM will share those data with senior leaders from the DoD's medical and training commands in an effort to determine whether providing vitamin D and calcium beyond the current recommended daily allowance may be beneficial for the optimization of bone health during military training.

"Military personnel represent a unique population faced with sometimes intense physical demands," McClung said. "Our goal is that findings from these studies will provide the information necessary to determine the optimal vitamin D and calcium requirement of military personnel for the maintenance of bone health and prevention of stress fractures to keep warfighters mission ready for the long haul."

'Maj. Clo' sweats it out at Doriot Climatic Chamber

1 Feeling the heat at Natick



By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (Jan. 15, 2014)

If he's a bit of a hot head these days, you'll have to excuse him. "Maj. Clo" is just doing his job.

Lately, he's literally been feeling the heat at work, because Maj. Clo is the thermal test manikin at the U.S. Army Research Institute of Environmental Medicine.

Maj. Clo has been getting a real grilling recently as USARIEM researchers placed him under solar lamps at the Doriot Climatic Chambers of the Natick Soldier Research, Development and Engineering Center in an effort to measure the thermal burdens of different-colored garments.

"Different materials absorb different amounts of solar radiation," said Tony Karis, a research physical scientist at USARIEM, "and this testing will help us quantify how much solar radiation is being absorbed."

Doriot's Tropic Chamber became just the place to do that in January 2013, when it was outfitted with a Solar Simulation Unit that brought daylight conditions indoors.

The 18 1,500-watt metal halide vapor lamps, arranged in three rows of six apiece, allow Doriot to produce artificial sunlight that replicates different climates in every season at various times of day — in the mountains, desert and everywhere in between.

"All of the tests in the past that we've done for 50 years in this facility have been without sun," said Josh Bulotsky, Doriot's manager. "This is like real sunlight. You don't realize how really hot it is."

It was only a matter of time before Maj. Clo and his 5-foot-9-inch carbon fiber, epoxy resin and copper frame, featuring 200 sensors and simulated sweat pores, would be

deployed there.

"There (are) not too many places that have these solar lamps that we can actually use a full-size manikin," Karis said. "A lot of times, it's done on a smaller scale. To be able to use a full-size manikin in an operational room is something that — as far as I know — no other place is doing."

Karis explained that USARIEM researchers are measuring how much heat is being transmitted from the clothing to Maj. Clo.

"Another thing that complicates this is the coverage," Karis said. "As coverage changes, the absorbtivity changes, too. Short-sleeve shirt versus long-sleeve shirt, shorts versus long pants — each one of them, there's different coverage, so there are different thermal burdens to each ensemble."

Karis and his USARIEM colleagues have placed Maj. Clo in the chamber at 80 degrees and 50 percent relative humidity with a 3.5 mph breeze. Then they have hit him with either 1,000 or 500 watts of solar load.

"A thousand watts is a good choice for the highest value in most locations during the summer, but more extreme conditions may occur," Karis said. "We also did 500 watts, which may be a more representative value for conditions between late morning and early afternoon for the warmer part of the year."

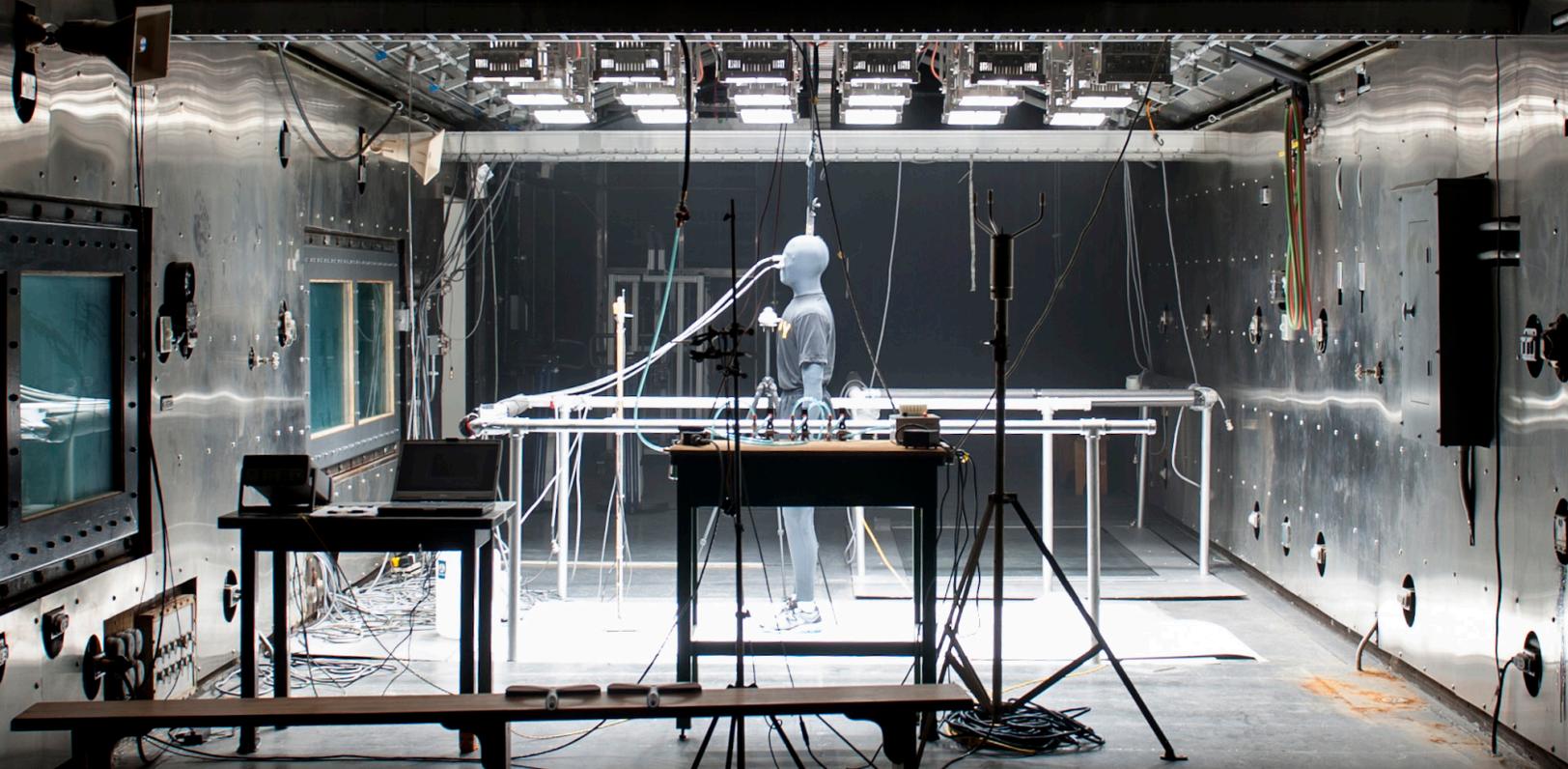
"The manikin measures heating over different parts of the body, and the heating just due to solar loading can vary widely for different parts of the body. But that's the idea — to monitor and measure the solar load on different garments and its effects on different parts of the body."

This validates models that USARIEM already has.

"It's nice to be reassured that your models are predicting correctly," Karis said. "We will use this information to make our models more robust."

Karis said USARIEM had done about a dozen tests with another half-dozen remaining. One day, the data could have real-world applications.

"The battlefield has changed from a jungle battlefield or woodland," Karis said. "Now we're in open desert or mountain regions where there's very little overhead coverage from plant life. So now you're in direct sunlight for the majority of the time."



“All of the tests in the past that we’ve done for 50 years in this facility have been without sun. This is like real sunlight. You don’t realize how really hot it is.”

Josh Bulotsky, Doriot’s manager

Sleepless in Natick

Study examines stress, Soldiers' immune systems

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (March 21, 2014)

Training and operations can put such tremendous physical and psychological stresses on warfighters that their immune systems may be compromised.

A study being conducted by the U.S. Army Research Institute of Environmental Medicine at Natick Soldier Systems Center will examine how sleep restriction — the stressor — affects wound healing and whether nutritional supplements can help offset the effects. In a sub-study, the effect of sleep restriction on friend-foe recognition during marksmanship is also being observed.

“Immune responsiveness is suppressed in warfighters exposed to physical and psychological stress,” said Tracey Smith, Ph.D., a research dietitian with USARIEM’s Military Nutrition Division, who used Ranger School and Special Forces Assessment School as examples. “Research has shown that modest improvement in immune responsiveness, as determined from blood markers, was noted when Soldiers were provided a nutritionally fortified energy bar during Special Forces Assessment School.”

Smith said the Special Forces research didn’t focus on whether nutrition helped wounds to heal or defend against a virus, however.

“Immune markers measured from blood samples provide an indication of systemic immune response,” said Smith, “but the systemic immune response does not necessarily reflect the functional status of the immune system — for example, wound healing time.”

In the study, male and female Soldiers were given suction blisters on their forearms. Some volunteers slept at least seven hours per night, and the current group is undergoing 50 hours of sleep restriction, with Soldiers allowed just two hours of sleep per night over that period.

“This was the amount of time that we thought would cause decrements in healing time and immune responsiveness at the wound site in young adults,” Smith said. “This model may provide a way to more effectively study effects of stress on wound healing, and a means to test prototype countermeasures, like nutrition interventions, to stress-related effects on healing.

“We are using the suction blister model as a tool for studying immune responsiveness of warfighters coping with stress, and nutrition interventions to mitigate decrements in immune responsiveness caused by stress.”

Capt. Adam Cooper, Ph.D., a research psychologist at USARIEM, piggybacked his marksmanship research on Smith’s study.

“We are interested in how sleep restriction differentially affects marksmanship performance during a simple versus mentally challenging friend-foe task,” Cooper said. “The factors we are examining are reaction time, accuracy and correct decision.

“Once it is known what factors are affected during low versus high mentally demanding marksmanship tasks, leaders can make more

informed decisions concerning what types of missions their Soldiers will be able to successfully complete given their current state of rest.”

Smith said that the marksmanship “keeps the volunteers awake, engaged and, hopefully, adds to the sleep restriction stressor.”

The USARIEM study is using 60 volunteer Soldiers, split into groups of four per session. Smith and her colleagues will soon examine preliminary data from eight volunteers to see if the sleep restriction is an adequate stressor to slow healing time. Once they are confident with the stressor, they will move on to test nutrition interventions to promote immune recovery.

“Blister wounds typically heal in five days for volunteers who receive adequate sleep,” Smith said. “We expect healing time to be delayed by one to two days in volunteers who are sleep restricted, and we expect that healing time will be back to five days in volunteers who consume a specially prepared nutrition beverage during sleep restriction and in the recovery period.”

Smith and her colleagues hope to provide warfighters with a food item or beverage that they can consume during and after periods of stress that will support their immune system and promote recovery.



Pvt. 2 Daniel Pardo dozes off after a period of sleep restriction in a study conducted by the U.S. Army Research Institute of Environmental Medicine to see how nutritional supplements might help wounds heal in warfighters under stress.



An Angel on the Battlefield

USARIEM Soldier honored for service in Iraq

By Mallory Roussel, USARIEM Public Affairs / NATICK, Mass. (Nov. 12, 2015)

When Sgt. 1st Class Adam Morelli learned he had been nominated as the Army's "Angel of the Battlefield" honoree, he was surprised.

"In my mind, I was thinking, 'It is not a big deal. I was just doing my job,'" Morelli recalled.

While the detachment sergeant from the U.S. Army Research Institute of Environmental Medicine portrays his accomplishments modestly, the Armed Services YMCA recognized him among other service men and women at the Ninth Annual Angels of the Battlefield Gala in Washington, D.C., on Nov. 4 for providing life-saving medical treatment on the battlefield.

"They were basing the award off my time in Iraq, when I was deployed there," Morelli said. "We had an incident in April of 2008 where there was a vehicle-borne improvised explosive device that had detonated next to the building near our compounds. I got there and I was the only medic on-scene because there was only one medic assigned per team."

Alone, Morelli provided triage and treatment to 28 wounded Soldiers and cared for another Soldier trapped on a rooftop while under enemy fire.

"Those 29 Soldiers are alive today because of the efforts of then Staff Sergeant Adam Morelli," said U.S. Army Chief of Staff Gen. Mark A. Milley, who presented Morelli with the honor.

Each year, the Angels of the Battlefield Gala honors medics, corpsmen and pararescuemen who administer lifesaving medical treatment and trauma care on the battlefield. The honorees are compassionate men and women who have risked their lives to protect other Soldiers. These Angels of the Battlefield are the reason why many Soldiers wounded in battle have made it home to their families and communities. To date, ASYMCA has honored over 450 medics, corpsmen and pararescuemen for their service.

"This recognition is truly an honor to receive on behalf of all Army medics," Morelli said. "We have medics saving lives every day. The

ASYMCA is an outstanding organization that supports Soldiers worldwide. For them to take the time to recognize medics is very humbling."

Not only has the Angel of the Battlefield recognition been humbling for Morelli, but it has also helped drive home the essential mission of USARIEM and Army Medicine: to help Soldiers, whether that is through research or action.

"For Army Medicine as a whole, as is in USARIEM, our job is to save lives on the battlefield," Morelli said. "Whether that is through prevention or treatment, our research at USARIEM helps Soldiers every day.

"I think that medics share the Army Values of selfless service and personal courage and hold those values very close. These are the tenets as to why we act in the way we do. We join the Army to help people and serve our country. The ASYMCA operates within those same values, as well. We are here to take care of Soldiers."



Excellent Junior Officer

Soldier earns Medical Service Corps Award of Excellence

By Kelly Field, USARIEM Public Affairs / NATICK, Mass. (May 19, 2015)

An officer from the U.S. Army Research Institute of Environmental Medicine has received top honors for excellence.

Capt. Carrie Quinn, a research physiologist with USARIEM's Thermal and Mountain Medicine Division, received the Medical Service Corps Award of Excellence Junior Officer Award during the annual Junior Officer Week gathering in Washington D.C. from April 27 to May 1. Quinn, who won this year's award for Medical Allied Sciences, was one of only nine recipients out of the more than 100 nominated this year.

"Captain Quinn is representative of the impressive military officers working with us here at USARIEM," said Maj. Rich Westrick, chief, Environmental Medicine Branch. "Her outstanding performance as a research physiologist while managing multiple additional duties made her an ideal candidate for the Award of Excellence. I'm extremely proud that she was recognized with this award."

Quinn, who serves multiple roles including principal investigator for TMMD, Institute intelligence officer and GEMS director, said she was awed and humbled to receive this award.

"I was just very honored to have my name called, to be included in this amazing group

of officers," said Quinn. "It was truly something incredible."

The Medical Service Corps award program provides personal recognition to outstanding junior MSC officers and warrant officers who have made significant contributions to the Army Medical Department mission and have performed in an exceptional manner.

Quinn credits the people around her for her success and truly appreciates all they have done to mentor and guide her while at USARIEM.

"Everything that I've accomplished has been a direct reflection of my leadership and those I work with," Quinn said. "USARIEM has been an excellent assignment for me, I've had very unique opportunities to take on leadership roles and build several programs from the ground up, and I'm grateful for the opportunity to represent them at a high level."

Since the program's initiation in 1982, the chief, MSC, has presented Awards of Excellence in various categories to recognize outstanding young officers and to encourage their future contributions to the corps. This year, junior officers were awarded in the health services maintenance technician

(warrant officer), health services administration, medical allied sciences, preventive medicine sciences, and clinical allied sciences categories.

Quinn said that she looks at receiving this award more as an opportunity to inspire other junior Army officers.

"When I was getting the award, I was thinking, 'This is huge. This is really something huge.' I absolutely owe it to every other MSC to pay it forward," Quinn said. "I've been handed an opportunity as an Award of Excellence recipient and a responsibility to advance the MSC through leadership."

"Several of us would like to work together throughout the next year on a capstone project that we will then present to next year's winners at their Junior Officer Week so that we can create this circle of excellence -- a pay it forward mentality."

USARIEM provides solutions to optimize warfighter health and performance through medical research. USARIEM is recognized by many DoD organizations as the trusted leader in medical research for warfighter health and performance.

For the fifth summer in a row, the U.S. Army Research Institute of Environmental Medicine -- with support from the Natick Soldier Research, Development and Engineering Center -- is hosting its Gains in the Education of Mathematics and Science Program, or GEMS. The program is held at the Natick Soldier Systems Center.

The GEMS program originated at Walter Reed in 2005 and has since been adopted by many other Army research installations. Through GEMS, USARIEM provides middle and high school students the opportunity to participate in age-appropriate, hands-on experiences in science, technology, engineering, and mathematics, or STEM. Advanced high school as well as college students serve as near-peer mentors who lead the programs and serve as role models for students.

This summer, USARIEM is hosting three GEMS sessions, giving students the chance to experience STEM in an interactive and meaningful way. Some of the experiences range from building a robot from toothbrushes to creating a chemical reaction resulting in molten iron.

"The GEMS staff and I are excited about science and are excited about engaging the minds of young scientists by applying complicated concepts in a particular way so that middle school students experience that 'lightbulb' moment," said Spc. Sonya Edler, a medical laboratory technician at USARIEM and the program director for this year's GEMS program.

Edler said she believes that the Natick Soldier Systems Center provides students with unique learning opportunities and is impressed with the dedication of both the students and staff.

"This summer we had 193 student interns (participants) and a total of 18 staff members who truly deserve the credit for the success of the program," said Edler. "The resource teacher, near-peer and assistant mentors are an honor to work with. Also, Kelly Field, our Public Affairs officer, and Joanna Graham, our NSRDEC (point of contact), have played critical roles in helping this program run seamlessly. The new (lead) officer in charge is Maj. Joseph Kardouni, who has truly immersed himself into the program and provides a huge military relevance to GEMS."

"It is a unique program that combines building up leadership skills and teaching science with young adults, as well as a broad introduction to STEM -- especially the application



of science and engineering to students in a variety of exciting ways," said Dan Eggers, the program/resource teacher for the GEMS program at USARIEM and a local high school teacher.

"The program gives kids a leg up when they return to their classroom, because they have already been exposed to complex topics,"

"The students and their parents always make the effort to thank our team for how awesome the program is and the fact that they leave here wanting more," said Edler.

"I love GEMS," said Sabrina, a student who was involved in the third GEMS session. "It's such a fun experience. GEMS really makes learning exciting."

Fun Down to a Science

Natick commences in another year of the GEMS program

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass. (Aug. 11, 2015)

said Lauren Francis, a student mentor for the program.

Jake Heinlein, along with Andrea McDonagh, is one of the head near-peer mentors. In his role, he designs and leads fun experiments with the students and helps other student mentors.

"What I find the most rewarding is seeing the students come back each year and seeing how they've grown and how their love for science has grown," said Heinlein.

Students participating in the Gains in the Education of Mathematics and Science, or GEMS, program witness a chemical reaction resulting in molten iron.



Best Foot Forward

Ruck marching from Boston to New York to prevent veteran suicides

By Bob Reinert, USAG Natick Public Affairs / NATICK, Mass. (Sept. 2, 2015)

Three Soldiers, who work at the U.S. Army Research Institute of Environmental Medicine at Natick Soldier Systems Center, have completed 200 miles of a ruck march from Boston to New York to raise awareness of veteran suicides.

Kristen Heavens, a Reserve first lieutenant who came up with the idea, Staff Sgt. Shaun Morand and Spc. Sonya Edler are part of a relay team from Active Heroes' Carry the Fallen-Team Minuteman, which left Sept. 8, and are sharing the 220-mile march from the Massachusetts State House in Boston to New York's Freedom Tower with approximately 50 pounds on their backs.

As of 6:15 a.m. Friday, the team was four miles away from the New York border. They should arrive in New York later on the 14th anniversary of 9/11 to raise awareness of veteran suicides and to remember all those who lost their lives on and since that fateful day in the fight against terrorism. They will then participate in the Carry the Fallen 9/11 Memorial Ruck in New York on Saturday.

Their hope is to reduce the 22 suicides occurring daily among veterans. That's more than 8,000 each year, or in excess of 100,000 since 9/11. The Boston-New York ruck march symbolically covers 10 miles for each of the 22 daily suicides, and it takes place during National Suicide Prevention Week.

By doing the ruck march, Heavens, Morand and Edler are honoring Justin Fitch, the re-

tired Army major, who finished his career at Natick and has terminal colon cancer. Fitch, the former Team Minuteman leader, has devoted his remaining days to ending veteran suicides. As they ruck march, the team is carrying Fitch's gear.

"He wakes up to pain every, single day - physical, mental, everything," said Heavens of Fitch. "Yet, he still chooses to drive on and still chooses to be positive."

Fitch, now living in Wisconsin, is obviously touched by what his former teammates are doing in his name.

"I am humbled and honored by this meaningful effort from such great members of my team," Fitch said. "While it has my name attached, it is not about me; it is about the 22-plus veterans committing suicide daily."

The three Soldiers from Natick, who are using leave and vacation time to do this ruck march, are pushing their own limits. While all of them have done charity rucks in the past - including Heavens' grueling 54.4-mile effort back and forth on the Boston Marathon course - none has tackled anything close to this epic trek through Massachusetts, Rhode Island, Heavens' and Morand's home state of Connecticut, and New York.

"The distance that we're traveling is much further than we'll have traveled in the past," Morand said. "You'll ruck for six hours, then you'll be logistics support for six hours, and then you'll sleep for six hours."

Three ruckers are marching at a time. They are followed by support crew in a pair of vans, one of which has seats removed to accommodate sleep.

On Saturday in New York, they will add a symbolic 9.11 miles in the 9/11 event.

"Getting started that morning is going to be tough," Morand said. "Getting your feet going that morning is going to be tough."

"We'll make it through that," Heavens said. "Nine miles after you've done 220 shouldn't be tremendous. I mean, we can kind of push through that."

If motivation wanes along the way, the three need only to remember the cause they are supporting.

"I think just the fact that we've got 22 veterans a day committing suicide is just appalling in this country," Morand said. "So, something needs to be done, and to raise that awareness is, I think, such a high priority."

Heavens agreed that it's all about focusing attention on veteran suicides.

"One of the biggest things I always say is, everybody has their baggage - it's all how you carry it," Heavens said. "And this is to kind of symbolize that we'll carry it with you. We want to help you, and we're here for you. We'll carry it for you."

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