

January 2016

NSSC This Month



U.S. Army Garrison Natick Public Affairs Office

Raising the BAR

**Natick
scientist adds
muscle to
research efforts**





Commander's Corner

Lt. Col. Ryan Raymond
USAG Natick Garrison Commander



Table of Contents

January 2016

NSSC This Month

Happy New Year!



As we close the first month of 2016, I would like to reflect a little on what I have learned in my first six months at this tremendous installation. First, we have an incredible team here working to improve the future American Soldier in ways that much of the Army cannot even begin to understand. Passion, dedication and pride in accomplishment are immediately apparent in each and every member of Team Natick with whom I have had the good fortune to converse. Second, this team is busy! There are a number of high-profile events occurring almost daily, and nearly every one leads to more work.

This past year has seen changes to our operating environment. The Army has made the conscious decision to reduce costs in providing installation services, in order to maximize the amount of money available to pursue operational readiness; essentially, diverting installation funding to operational units with the understanding that the operational unit will fund the installation services that are essential to its mission. I ask for leaders across the installation to help me capture the impacts and risks associated with these reductions so that we can minimize operational impact.

Also in 2015, we learned that the security threats we have faced for years overseas have the potential to affect us here at home. While we know of no specific threat to our installation, I ask that each of you remains vigilant. Please remember that there is a difference between "What we are" and "What we do." Team Natick is NOT a research and development center; we are a United States Army installation; research and development are a big part of what we do. Again, we have not been specifically targeted, nor do I feel that we face any unusual security risks; however, we are well served to remind ourselves of who we are – any potential enemy will surely view us as such. Please report to your unit and/or DES anything that doesn't seem right.

I am truly looking forward to seeing your accomplishments this year. My primary goal will be working to facilitate your success by fighting for resources and improving communication across the installation. I appreciate what each of you does for the Soldiers of today and tomorrow!

Lt. Col. Ryan Raymond
USAG Natick Garrison Commander

NSSC This Month

NSSC
Senior Mission Commander
[Brig. Gen. Thomas H. Todd III](#)

Garrison Commander
[Lt. Col. Ryan Raymond](#)

Command Sergeant Major
[Command Sgt. Maj. Erika M. Gholar](#)

Public Affairs Officer
[John Harlow](#)

About this newsletter
NSSC This Month is a monthly newsletter covering NSSC news within the Army and commercial media.

NSSC This Month is maintained by the USAG Natick Public Affairs Office.

Art Direction by Philip Fujawa, NSRDEC Strategic Communications.

To subscribe to *NSSC This Month*, please contact Bob Reinert at robert.j.reinert.civ@mail.mil.

On the Web: www.army.mil/natick

Photos by Dave Kamm, NSRDEC Strategic Communications, unless otherwise noted.

Cover photo: Tim O'Fallon



NSSC This Month

Doing Business 4
NSSC leaders speak at local event

NSRDEC, West Point team up 5
Endless possibilities seen for three-year partnership

Second Skin 6
Natick scientists collaborating with defense labs and academia on chem-bio protection

On the Mend 7
Natick investigates self-healing protective clothing

Village People 8
Making base camps more efficient, cost-effective

Raising the Bar 10
Natick scientist adds muscle to research efforts

Recipe for Success 12
USARIEM publishes MRE cookbook

Head First 14
Army team collaborates with NFL, industry

Mars Mission 16
NSRDEC Combat Feeding Directorate teams with NASA on space food

Reach for the Stars 18
Army seeks astronaut candidates



Doing Business

NSSC leaders speak at local event

By Bob Reinert, USAG Natick Public Affairs / DEVENS, Mass. (Dec. 17, 2015)

Three leaders from [Natick Soldier Systems Center](#) spoke to participants at the Air Force, Army, National Guard Small Business Forum held Dec. 11 at [Devens Common Center](#).

The purpose of the event, hosted by the Massachusetts Military Asset and Security Strategy Task Force, or [MASS-TF](#), was to show local businesses how to interact and contract with NSSC, [Hanscom Air Force Base](#) and the [Massachusetts National Guard](#).

Brig. Gen. Thomas H. Todd III, NSSC senior mission commander; Doug Tamilio, acting technical director of [Natick Soldier](#)

[Research, Development and Engineering Center](#); and Col. Tom Eccles, M.D., commander of [U.S. Army Research Institute of Environmental Medicine](#), briefed attendees on their respective organizations.

Marty Jones, president and chief executive officer of MassDevelopment, began the day by explaining MASS-TF's purpose.

"It was created about four years ago to really focus on our military installations, to make it clear to the federal government and the local people here on the installations that the commonwealth wants to be a partner in helping

them figure out how to continue to access small business, to be more cost-effective," Jones said.

Jones pointed out that a 2012 report by MASS-TF on the impact of the six military installations in Massachusetts showed that the bases contributed nearly \$9.4 billion to the commonwealth's economy during the previous year.

"Hanscom Air Force Base and Natick Soldier Systems (Center) are particularly bright examples of the intersection of academic, scientific and technological advances that we all pride ourselves (on) here in the commonwealth," Jones said.

Todd told the business representatives that Natick's job was to stay ahead of technology and how the Soldier interfaces with it.

"So, while we're developing new technologies, it's important to remember that the human is always at the center of those technologies," Todd said. "If the Soldier wears it, eats it, sleeps under it, has it airdropped to him or -- quite frankly -- interfaces with it, we're involved at Natick."

Tamilio talked about the challenges faced by NSRDEC in helping maintain the technical edge enjoyed by the American Soldier.

"There's not a better-protected, more lethal Soldier on the battlefield today," Tamilio said. "But I will tell you that it's close. We have some near peers that are pushing technology to the limits."

Eccles, meanwhile, spoke about USARIEM's role in optimizing Soldier performance to get the most out of a smaller Army.

"We're really all about Soldier health and performance in ... really, all environments," Eccles said. "Eighty percent of casualties, historically, are due to disease and non-battle injuries. Those are our areas of focus."

Chris Willenborg, executive director of MASS-TF, said that he expected the event to bear fruit in the future.

"Events like this one are crucial in connecting Massachusetts military installations and small businesses, both major drivers of the Commonwealth's economy," Willenborg said. "Thank you to the Air Force, Army and National Guard for the spirit of collaboration they've brought to this forum, and we look forward to the success stories that will come from these connections."



NSRDEC, West Point team up

Endless possibilities seen for three-year partnership

By NSRDEC Public Affairs / NATICK, Mass. (Dec. 18, 2015)

Henry Girolamo sees endless possibilities for developing new capabilities for the Soldier under the [Natick Soldier Research, Development and Engineering Center's](#) collaboration with the [United States Military Academy](#) at West Point.

Girolamo is the lead, Emerging Concepts & Technologies, [Warfighter Directorate](#), at NSRDEC, and he is the driving force behind the partnership. He developed and implemented the collaboration, serves as the NSRDEC point of contact and continues to manage the effort, which was formalized in 2014 under a Memorandum of Understanding, or MOU. The USMA key point of contact is Lt. Col. Phil Root with Lt. Col. Paul Evangelista serving as the alternate.

The three-year MOU involves joint research projects and the sharing of training sites, research staff, historical data, field equipment and facilities. At the end of each academic year, several NSRDEC technologies are deployed with cadets during USMA [Cadet Leadership Development Training](#).

For the academic year 2015 to 2016, NSRDEC/USMA will continue research begun last year under the MOU in several areas, including shelter technologies; Soldier microclimate conditioning; biomechanics-focused load carriage solutions; and anthropometric female helmet fit analysis. The new academic year would also continue NSRDEC/USMA's involvement with the [Defense Advanced Research Projects Agency's](#) Warrior Web program, which aims to develop a soft, lightweight under-suit that would protect against injury and reduce stress on joints. NSRDEC is working to ensure DARPA's technology can be integrated into existing Soldier equipment.

For the academic year 2015-16, NSRDEC and USMA have initiated three new areas of research, including meteorological sensing that supports aerial delivery systems; rotor

guards and landing chassis to improve durability and enable capabilities for the NSRDEC Soldier-Borne Sensor in micro-unmanned aerial vehicles; and enhancing the potential for vertical takeoff and landing of the platform for micro-unmanned aerial vehicle reconnaissance in subterranean tunnels.

"The NSRDEC-USMA collaboration will leave an indelible mark on twenty mechanical engineering cadets as they prepare to become lieutenants, as well as many more cadets throughout the Academy," said Root, director, Center for Innovation and Engineering Department of Civil & Mechanical Engineering at USMA. "The ability and willingness for NSRDEC to propose and support the relevant engineering projects helps prepare cadets for the incredibly complex world they will face after graduation."

"Working with USMA has been a great experience for both NSRDEC and the cadets that we've worked with," said Melvin Jee, team leader of the Tactical Shelters Team, [Expeditionary Basing and Collective Protection Directorate](#) at NSRDEC. "It gives an opportunity for the cadets to influence the design/concepts of equipment they may use later on in their career, and it gives NSRDEC access to future Army doctrine at the early stages of development, as well as to fresh ideas. If the collaboration goes well, we'll leave these future leaders with a positive view of NSRDEC, which will benefit the warfighters in the long run."

"NSRDEC/USMA collaborations continue to be an excellent (return on investment) for both organizations by both exposing cadets to the RDT&E/acquisition side of the Army



Photo: Wyss Institute at Harvard University

while also exposing future Army leaders to the importance of the NSRDEC mission and gaining a fresh set of eyes and support to a current technical challenging problem," said Richard Benney, director of the [Aerial Delivery Directorate](#) at NSRDEC.

NSRDEC subject matter experts provide expertise and constructive guidance to USMA cadet teams on optimal research approaches that maximize beneficial technology solutions for Soldiers. Girolamo believes the research conducted at USMA complements NSRDEC research and may result in beneficial and innovative improvements to NSRDEC products.

"NSRDEC has made it a win-win where the Soldier research we have the USMA cadets perform is needed by the Army," said Girolamo. "Where we have limited resources at NSRDEC, we align NSRDEC research needs with the USMA academic capability. NSRDEC subject matter experts provide guidance to the USMA cadets to maximize the operational utility of their research efforts, and by so doing, we actually aid in their capstone project success. NSRDEC simultaneously receives usable Soldier research. It's a good return on investment."

Second Skin

Natick scientists collaborating with defense labs and academia on chem-bio protection

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass. (Jan. 27, 2016)

Collaboration has long been second nature for researchers at the [Natick Soldier Research, Development and Engineering Center](#), and now this collaborative second nature is being applied to developing “second-skin,” chemical-biological, or CB, protection.

NSRDEC is working with the [Massachusetts Institute of Technology](#), the [University of California at Santa Barbara](#), the [Air Force Civil Engineer Center](#), and the U.S. Army [Edgewood Chemical Biological Center](#) to develop second skin, the next generation of chemical-biological protection for the warfighter. The project is sponsored by the [Defense Threat Reduction Agency](#), or DTRA, and is a high priority effort.

“The second skin will be a protective “skin” engineered with textile materials as a substrate that will adapt to the environment that the Soldier is in,” said Dr. Paola D’Angelo, a research bioengineer at NSRDEC. “The idea is that the skin will be lightweight, it will not retain heat, and it will be air and moisture permeable.”

“The material design is based on the use of responsive polymer gels, including organohydrogels and functional chemical species such as catalysts,” said Dr. Ramanathan “Nagu” Nagarajan, Senior Research Scientist for Soldier Nanomaterials at NSRDEC. “The second skin will be able to sense chemical and biological agents, which will trigger a response within the gels. The response will close the pores of the textile, keeping the chemical or biological agent from entering. During this protection state, the threats will also be inactivated, allowing the second skin to return to its normal state.”

“Anthrax, for instance, is one of the biggest threats,” said D’Angelo. “So we need to find a way to detect it and kill it onsite. So the second skin not only senses the chemical or biological agent but it also has a response. It has a protection component as well as a deactivation component to it.”

The technology will enhance Soldier safety by addressing multiple threats and will allow the Soldier to continue doing his or her job without interruption. The technology will be incorporated into one thin layer, which will reduce a Soldier’s logistical burden. It is designed to act autonomously without any Soldier intervention.

“The Air Force Civil Engineering Center collaborators are developing the catalyst particles to counter mustard agents at the surface of the second skin,” said Nagarajan. “The MIT collaborators are developing novel polymers to sense and inactivate anthrax spores at the second-skin surface. The MIT and UCSB collaborators are developing hydrogels and organohydrogels that will go into the second-skin interior to protect against nerve agents and blister agents while also sensing and inactivating them. NSRDEC researchers are integrating the components to create the second-skin material and, along with ECBC collaborators, are testing the performance of the second skin against chemical and biological threat agents.”

“It’s a great effort,” said D’Angelo. “It gives us the opportunity to work with collaborators from other government labs and with universities. We can leverage one another’s expertise. All of us working together is much more effective than working alone.”

“I collaborate with Paola on various aspects of the DTRA project, designing and synthesizing reactive polymers capable of killing bacteria and spores,” said Dr. Lev Bromberg, a research scientist in the Department of Chemical Engineering at MIT. “I prepare the samples, characterize properties and discuss Paola’s experimental results.”

Dr. David McGarvey, a research chemist at the Edgewood Chemical Biological Center, or ECBC, and ECBC’s Dr. William Creasy provided expertise in the testing of the technologies against hazardous chemicals.

“The greatest benefit of the collaboration is that it has allowed each of us to do what we do best,” said McGarvey. “Entering into a completely new area of research can be fun, but it takes time and resources to develop a new expertise. With very limited funding, our group of collaborators was able to quickly create and test a number of new technologies.”

The collaboration also gives university students and postdoctoral researchers the opportunity to work with top Army scientists, including NSRDEC’s Dr. Eugene Wilusz and Nagarajan.

“Working with Eugene and Nagu is an excellent experience and opportunity,” said Manos Gkikas, a postdoctoral researcher at MIT. “They are both very supportive and communicative.”

Communication is key to the collaboration.

“We meet frequently to generate ideas, share expertise, and to make sure what we are doing is compatible,” said D’Angelo.

“Program reviews led by the Defense Threat Reduction Agency Chem-Bio division were very helpful in allowing collaborators from many different parts of the nation to engage in face-to-face dialog about the program,” said McGarvey. “These discussions helped everyone understand the overall progress of the research and develop a deep understanding of the challenges each group was undertaking. With everyone in the same room, a number of very helpful brainstorming sessions took place that resulted in new approaches for the research problems each group faced.”

“Our group at MIT has been working with Natick for a number of years. We have established a good rapport and have been working on a number of projects . . .” said Bromberg. “We surely hope to continue working with Natick.”

“Everyone is coming together for the Soldier,” said D’Angelo. “It is a good feeling. I really like the interactions we have with Soldiers here and seeing what we are doing applied to the Soldiers. Sometimes if you are doing research for a company you don’t see it going anywhere. Here we see it in person. We see it being applied to protect Soldiers.”

On the Mend

Natick investigates self-healing protective clothing

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass.

Army researcher Quoc Truong wants to fill in the gaps in Soldier protective clothing — literally.

Truong is a physical scientist at the U.S. Army [Natick Soldier Research, Development and Engineering Center](#), or NSRDEC. He is collaborating with other researchers at NSRDEC, the [University of Massachusetts Lowell](#), and [Triton Systems, Inc.](#), on the technical development of self-healing coatings that contain micro-capsules of healing fluid, which will be used to mend chemical-biological, or CB, protective clothing.

“When Soldiers are wearing a chem-bio protective garment, they are basically isolating themselves from their environment and any harmful agents, such as nerve gases, viruses and bacteria,” Truong said. “Soldiers are very active and can encounter thorny bushes or other things that could result in pin-hole-sized damage to their chem-bio garment while carrying out their missions. The damage may not be visible to the human eye, but it is there.”

The self-healing technologies will enable cuts, tears and punctures in fabrics to quickly repair themselves. This means that the protective qualities of the garments will be far less apt to become compromised by tears and punctures. The technology will be incorporated into both the Joint Service Lightweight Integrated Suit Technology, or JSLIST, garment, and the Joint Protective Aircrew Ensemble, or JPACE, garment.

“The self-healing coatings can be a spray-on coating or a continuous coating — depending on the type of protective clothing they are applied on,” Truong said. “The idea is just like when a scratch breaks open the skin. Our body has the ability to heal and mend, make a scab and heal. The same idea applies to the self-mending fabric; when the fabric containing these self-healing materials gets cut, it comes back together and heals. It forms something very much like a scab on the skin except it is on the fabric.”

The technology combines innovative approaches to gap-closure with healing micro-capsules that are activated when torn to repair cuts and punctures. The self-healing layer contains reactive agents to deactivate dangerous threats, including deadly chemicals, and also acts to reform the physical barrier to bacteria and viruses. When integrated into a CB protective garment, the self-healing technologies help ensure that the CB protection is uninterrupted.

The JPACE’s protective mechanism is based on a selectively permeable membrane; therefore, the microcapsules are embedded into the selectively permeable membrane and/or in a supporting reactive selectively permeable membrane layer, which will act as a self-healing supporting barrier material. When the membrane breaks, these microcapsules open and mend the tear in about 60 seconds, filling the gap with the aid of the gap-closure technology. “This helps preserve the capabilities of the fabric,” Truong said. “The idea is to support chemical-biological protective clothing. The self-healing textile would have the ability to neutralize the chemical agents. The selectively permeable membrane structure acts like a barrier to agents, but allows warm/hot body sweat, i.e., moisture vapor, to be transported from the body to the environment outside of the protective clothing.”

The JSLIST chemical protective overgarment is based on a non-woven material that carries activated carbon spheres. Thus, it is air permeable and doesn’t lend easily to the use of



microcapsules. So, the JSLIST suit configuration has to be sprayed with microcapsules and a foaming agent.

Truong is dedicated to continuously improving safety for the Soldier.

“Ideas to help the Soldier come to me all the time,” Truong said. “It makes me feel good to know that some of these ideas can be transformed into protection for the Soldier.”

The technology also has commercial applications.

“For instance, this technology could be used to develop self-mending tents to ensure protection against the elements since holes would be repaired quickly,” Truong said. “It could also be used for commercial workers who handle chemicals, work in the rain, or work in extreme cold. Their protective clothing would be self-mending to keep them safe, dry and protected from the elements.”



Making base camps more efficient, cost-effective

Village People

By Bob Reinert, USAG Natick Public Affairs / NATICK, Mass. (Jan. 22, 2016)

As a former Army officer, Dave Roy knows that commanders seek to upgrade base camps as time passes.

“We’re taught, it is ingrained in us,” said Roy, “if you’re going to be in any one place for any amount of time, you improve your position.”

How those base camps in places such as [Afghanistan](#) and [Iraq](#) have expanded and shrunk differs greatly, however. Roy, a project manager at the [Natick Soldier Systems Center](#) with the Warren, Michigan-based [Product Director Contingency Base Infrastructure](#), or CBI, would like to help make the base camp planning processes, requisite materiel and long-term sustainment more predictable.

“The idea is to provide the Army with standardized base camp capabilities that are flexible enough to allow the maneuver commander, or the combatant commander, the freedom to develop his basing strategy in that area of operation,” Roy said. “By standardizing the capabilities, it would make it more cost-effective for that commander.”

“We’re providing designs and materiel definitions for a commander to utilize existing equipment to emplace a base camp.”

As Roy pointed out, military operations go through six phases — zero through five.

“The Army does an absolutely superb job of getting us from zero through phase three,” said Roy, adding that major combat operations are over in phases four and five.

Once stability operations get underway in a host nation, the basing solutions for a once mobile force might not be adequate for a more static posture.

“How do we adapt equipment that has been designed to support an Army on the move into a stationary base camp an Army uses to sustain and project combat power? A base camp is essentially a village.”

Dave Roy, CBI

“How do we adapt equipment that has been designed to support an Army on the move into a stationary base camp an Army uses to sustain and project combat power?” Roy said. “A base camp is essentially a village. How do I sustain that?”

According to Roy, CBI wants to do that by using materiel already in the Army inventory and anticipating what science and technology could produce in the coming years.

“Our vision is to be the [DoD](#) lead agency providing innovative, robust and efficient contingency basing solutions that meet any requirement for any location for any mission,” Roy said. “And that’s far-reaching.”

CBI has proposed three basing variants: extra small, for 50 to 299 personnel; small, for 300 to 1,999 personnel; and medium, for 2,000 to 5,999 personnel.

“As we’ve seen in 12 years, 14 years – Iraq and Afghanistan – that base camp will grow and shrink over time,” Roy said. “So that scalability and modularity goes both ways.”

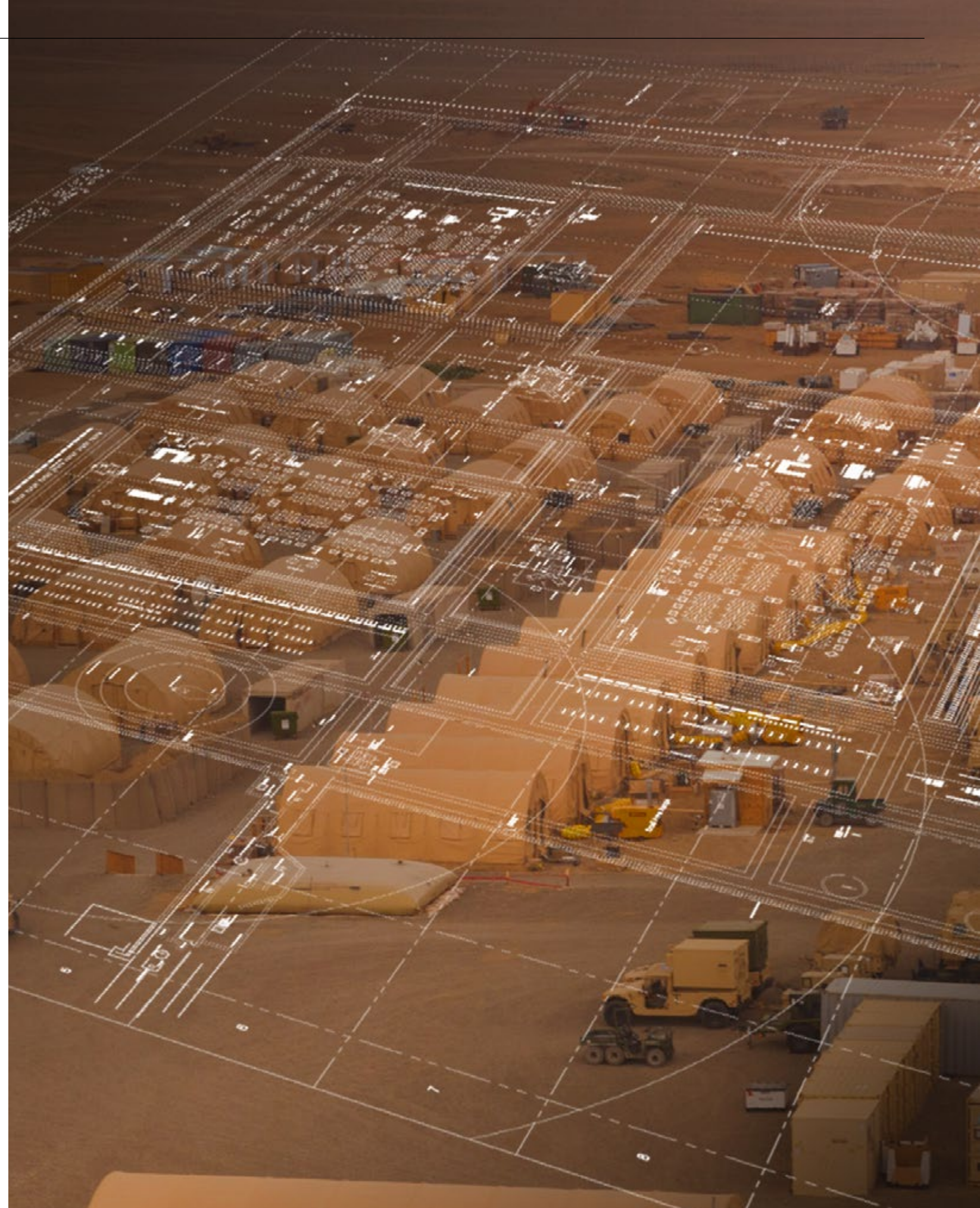
Commanders will be able to add expansion or enhancement packages to their base camps to accommodate their missions, local climates, and growth without degrading quality of life for Soldiers. For example, a [Stryker](#) brigade combat team in Europe would have different requirements than an infantry unit in the Middle East.

Roy said that CBI will provide a resource that was non-existent in the past.

“We can help those senior leaders ... answer those complex questions,” said Roy. “What am I getting, how much it’s going to cost, what are the resource consumption forecasts for these base camps, and when it’s going to show up.”

It all means more efficiency, which translates into cost savings in an era of increased fiscal constraints.

“We should be able to do for base camp designs what the American industrial base was able to do for us in [World War II](#),” Roy said. “Crank it out.”



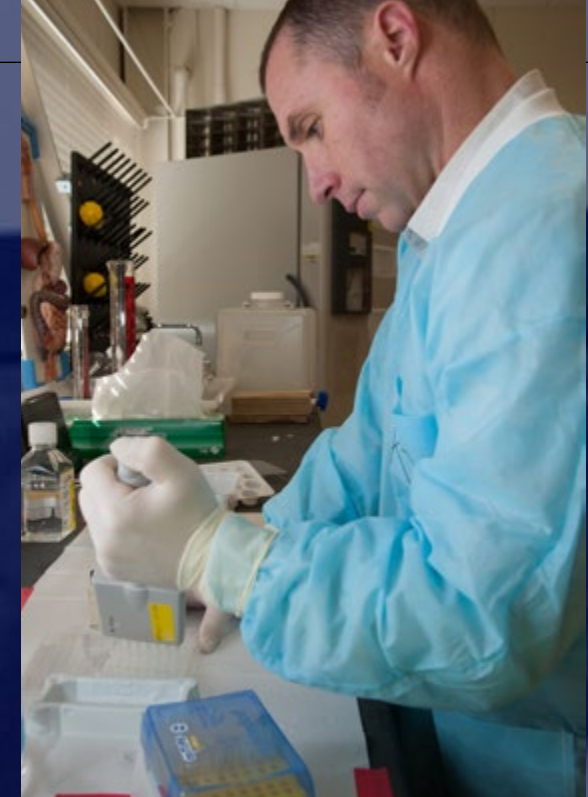


Photo: RDECOM

Raising the BAR

**Natick
scientist adds
muscle to
research efforts**

By Bob Reinert, USAG Natick Public Affairs /
NATICK, Mass. (Jan. 6, 2016)

Photo: Tim O'Fallon

W

When it comes to his station in life, Kevin O'Fallon, Ph.D., has raised the bar - both literally and figuratively.

In 2002, O'Fallon was a 22-year-old [Air Force](#) aircraft mechanic maintaining [A-10 Thunderbolt II](#) "Warthogs." Today, he can still recall lying on a flightline in Kuwait one night, looking up at the stars and wondering what to do with his life.

"How did I get here," O'Fallon remembered asking himself. "I realized, it's time to figure it out."

Fourteen years later, the [Operation Enduring Freedom](#) veteran has traded his grease-stained coveralls for a lab coat. Instead of the flightline, he now reports for work at the Integrative Physiology Laboratory in the [Combat Feeding Directorate](#) of the [Natick Soldier Research, Development and Engineering Center](#), where he does research to determine whether proper nutrition can help accelerate healing in skeletal muscle after exercise or injury.

"This is absolutely my dream job," said O'Fallon, 36. "I've worked really hard to get here. It's my intent to stay here."

His interest in the human body and how it functions dates back to his days of working out with his father, Tim O'Fallon, a former bodybuilder and Navy aircraft mechanic.

"My dad did an incredible job instilling in me that pursuit for maximum effort," O'Fallon said, "and really helping me become in tune with my body and being in it, and learning that it's so much more resilient than we give ourselves credit for being."

"We're not a family of quitters. There are times in your life when you kind of have to gut it out, and nobody's going to solve it but you."

O'Fallon has always approached athletics in the same relentless manner in which he pursued his bachelor's, master's and doctoral degrees in exercise science/kinesiology from the [University of Massachusetts](#). Dovetailing nicely with his professional work, the former wrestler, football player, triathlete and competitive cyclist took up Olympic-style weightlifting at age 31.

"Weightlifting is such a metaphor for life," O'Fallon said.

Returning to his native Reno, Nevada, early last month, the 5-foot-6-inch, 187-pound O'Fallon set a pair of personal records - in the clean and jerk and total weight - in the [American Open](#), his first national-level competition. He accomplished those feats in front of family members.

"What a special experience that was," O'Fallon said. "It was just so cool to be able to do that in my hometown."

Now he's back working with the world-class coaches and fellow athletes at a [Norwood \(Massachusetts\) Training Center](#) as he prepares to compete in the [2016 National Masters Weightlifting Championships](#) March 31-April 3 in Savannah, Georgia.

"It's been a really good relationship where I've learned so much from them with the weightlifting," O'Fallon said, "and they've learned just as much from me on the ... nutrition and muscle performance recovery aspect."

"I've learned to use myself as a test bed for anything that, through my science, I hypothesize may offer a performance or recovery benefit."

So his work as a research physiologist at Natick may one day affect the way he fuels his body in training and competitions.

"We're doing some really cool work in the lab right now to try to put together this broader continuum of muscle injury and then the ensuing regenerative and inflammatory responses and how we can influence wound healing or muscle recovery with nutrition," said O'Fallon, adding that chemicals from fruits and vegetables were the focus. "We're very interested in finding non-pharmacological ways, through food, to accelerate muscle recovery from exercise."

"We're essentially taking incredibly sophisticated systems of the body, and we're isolating them out, and we're asking very fundamental questions about how they work, how they respond to environmental stressors, and how we can influence them, and that's really the basis for all the future work that we're going to do."

As he looks ahead to that future research, he sometimes reaches into his past for a few tools.

"I learned how to apply the troubleshooting abilities that I gained as an aircraft mechanic to my science," O'Fallon said, "and how to apply my science to my understanding of life and the way we work as humans and the way just life on this planet seems to work."

O'Fallon said he hopes his research will help future warfighters return home healthier and recover faster when they are injured.

"I pinch myself a lot," O'Fallon said. "I cannot believe that I'm doing this and that we're doing this."

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

A Soldier digs into an MRE in Afghanistan.



Photo: Michael Seppin, DoD Combat Feeding Directorate

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 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.”



Head First

Army team collaborates with NFL, industry

By U.S. Army Edgewood Chemical Biological Center / ADELPHI, Md. (Dec. 21, 2015)

A U.S. [Army Research Laboratory](#) team of researchers was one of three awarded funding in the final phase of the [National Football League](#), [Under Armour](#) and [General Electric's](#) Head Health Challenge II with a chance to receive up to \$1 million toward head-protection research.

The relationship between ARL and the NFL, Under Armour and GE began in September 2014 when a small team of engineers and the laboratory were named Round One winners of Head Health Challenge II. ARL is working to further research and possibly develop a wearable head-to-body tether system that could reduce the injury potential of head-to-ground impacts.

Earlier this month, ARL members, along with teams from the [University of Washington](#) and [Viconic Sporting](#), were announced as final winners and received additional funding to advance their projects.

"The collaboration with the NFL, Under Armour and GE is just one example of the Army collaborating with industry, academia or international partners to tackle a common problem so we can move innovation forward for the Soldier and the nation," said Maj. Gen. John F. Wharton, commanding general of the [U.S. Army Research, Development and Engineering Command](#), or RDECOM.

The ARL team, part of the RDECOM, has become an eclectic mix since the

award. Engineers, co-op engineering students, a small business and an industrial designer from the U.S. Army Edgewood Chemical Biological Center have contributed to the overall research and testing program.

The core technology behind ARL's approach is a rate-activated strapping material that was invented at the laboratory. The strap stretches with low, elastic force at slow to moderate speeds, but resists with much higher force when pulled quickly. In the head-to-body tether concept, these straps permit voluntary head motion while inhibiting the violent head motions that are associated with injury.

"Our experiments show that peak head acceleration, an important correlating factor with concussion, can be reduced by 50 percent with our technology," said Dr. Eric Wetzel, the project's lead. "Over the next 12 to 18 months, we will be working with commercial partners to convert our laboratory concept into a wearable garment for sports and military applications."

The instrumented mannequin test rig that they use for the bulk of their experiments, in ARL's Rodman Materials Research facility at Aberdeen Proving Ground, Maryland, is designed to replicate a backward fall that causes the back of the head to strike the ground with high force and velocity. This falling scenario is a common cause of concussion in football and is also seen among

military paratroopers during a parachute landing.

The shear thickening fluid, which provides the speed-sensitive behavior, has been studied by ARL researchers for more than 15 years. The straps were more recently developed under Defense Advanced Research Projects Agency support to help protect ankles and knees from injury. According to Wetzel, the consistent pace of exploration throughout each of these projects has enabled the present program's success.

Wetzel, who is an avid football fan, said it would be gratifying to see his idea used on NFL players, but a more near-term possibility is a commercial product for improving safety in youth sports.

"The support of the Head Health Challenge II partners has been critical toward maturing our laboratory concepts into system concepts that could see positive societal application," Wetzel said.

Beyond sports, the ARL team is also eager to use the technology to mitigate head trauma for Soldiers.

"The reality of traumatic brain injury on the battlefield and the toll it takes on Soldiers and veterans is well documented," Wharton said. "We have to protect our Soldiers against unknown dangers, which means we can never stop searching for a better way or collaborating others who share an interest in this problem."



In the head-to-body tether concept, straps permit voluntary head motion while inhibiting the violent head motions that are associated with injury. The U.S. Army Edgewood Chemical Biological Center printed a 3-D model that illustrates the technology vision.

Photo: U.S. Army Edgewood Chemical Biological Center



Mars Mission

NSRDEC Combat Feeding Directorate teams with NASA on space food

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass. (Jan. 12, 2016)

Traveling to the second smallest planet in the solar system can give you a big appetite, not to mention special nutritional needs.

Researchers in the [Combat Feeding Directorate](#), or CFD, at the [Natick Soldier Research, Development and Engineering Center](#), or NSRDEC, are working on two projects for [NASA](#) to help meet the nutritional needs of astronauts at a space station and astronauts traveling to Mars.

NASA contacted CFD researchers for their expertise and provided a grant for a vitamin stabilization project to help ensure the nutritional needs of astronauts are met during potential missions to Mars.

In a separate project, CFD is also working to improve and reduce the weight and volume of a breakfast meal replacement bar, originally developed by NASA, which would also be used during Mars missions and at a space station.

“The work we have done on the vitamin stabilization project then generated NASA’s interest in us working on a meal replacement bar for the breakfast meal,” said Michelle Richardson, a senior food technologist at CFD.

CFD is uniquely qualified to develop and improve rations for NASA due to its extensive work on military rations, Richardson said.

“The work we do in CFD involves meeting the long storage requirements combined with the nutritional demands for Army rations,” said Ann Barrett, a CFD chemical engineer.

“The astronaut and the warfighter are both in austere environments, and they both need to be sustained,” Richardson said. “They both need food that has to last for several years.”

“They both have stressful as well as physically and cognitively challenging jobs,” Barrett said. “So there are a lot of congruencies between CFD and NASA in terms of the objectives for the foods.”

VITAMIN STABILIZATION

The mission to Mars provides many challenges in vitamin stabilization.

“You can make food that is stable, but vitamins are biological materials that degrade over time,” Barrett said. “Especially if there is cosmic radiation; then they are even more susceptible to degradation. Cosmic radiation can damage vitamins and create more of a need for antioxidant vitamins for the astronauts. This could result in malnutrition.”

The vitamins need to remain effective and intact during the astronauts’ time on Mars, and they also need to remain stable during travel to and from Mars.

“NASA is also interested in stockpiling food there for subsequent missions, which is why they want a five-year shelf life,” Barrett said.

CFD has developed a blueberry granola bar and a chocolate hazelnut drink mix to meet these requirements.

“We are looking at different chemical environments in the food to possibly help the vitamins last longer,” Barrett said. “So for each item - the bar and the drink - we have a low-fat version and a higher fat version. The vitamins that NASA is interested in are A, B1 [Thiamine], B9 [Folic Acid], Vitamin C and Vitamin E.

“The vitamins are encapsulated. We are also looking at the fat level. We have a lipid-based encapsulate and a starch-based encapsulate.”

Both the starch-coated vitamins and the lipid-coated vitamins were placed into low- and high-fat versions of the bar and the drink to see which combination results in the best vitamin preservation.

“We did preliminary testing and decided which versions were to be used in a five-year storage study,” Barrett said. “We settled on the fat-encapsulated vitamins to be placed in the lower fat foods. And the starch-encapsulated vitamins were placed in the higher fat foods.”

As part of the effort for NASA, Danielle Froio, a materials engineer at CFD, is also investigating the effects of processing techniques and packaging materials on vitamin stability in the selected low- and high-fat foods.

RAISING THE BREAKFAST BAR ON NUTRITION WHILE REDUCING THE VOLUME

CFD is working on a breakfast bar as a meal replacement to be used at a space station and possibly during a Mars mission. NASA developed the bar, and Natick is working on refining it.

"NASA is interested in a 10-percent weight reduction, and they achieved that through the bar, but they didn't have the capability to refine it," Froio said. "Natick is investigating two ways to reduce weight and volume. One is a conventional compression method, which uses high pressure.

"The other is a novel technology called sonic agglomeration that basically uses sonic waves to compress the bar and make the ingredients stick together. So, we are looking at those two technologies."

The resulting breakfast bar will be lighter weight and take up less volume, which is critical in space travel. The bars meet all the nutrient requirements for space flight and will be available in three flavors - barbecue nut, jalapeno nut and banana nut.

"The bar also needs to last for five years and taste good," Richardson said. "NASA is going to do shelf-life testing, sensory testing and nutrient testing. They are also going to do human exploration research analogs.

"An analog is actually an environment that mimics space. The bars will be tested by people in that simulated environment."

MISSION CRITICAL NUTRITION

Proper nutrition and vitamin stability are critical to the success of any space mission.

"Vitamins help with immunity," Richardson said. "It's also important that the astronauts don't lose muscle mass and bone density, which they are more prone to in a gravity-free environment."

"Antioxidants also help with neural function," Barrett said.

"Vitamins do a lot for the body," Richardson said. "So, without them on a five-year space mission, they would not be able to do their job and they would not be healthy."

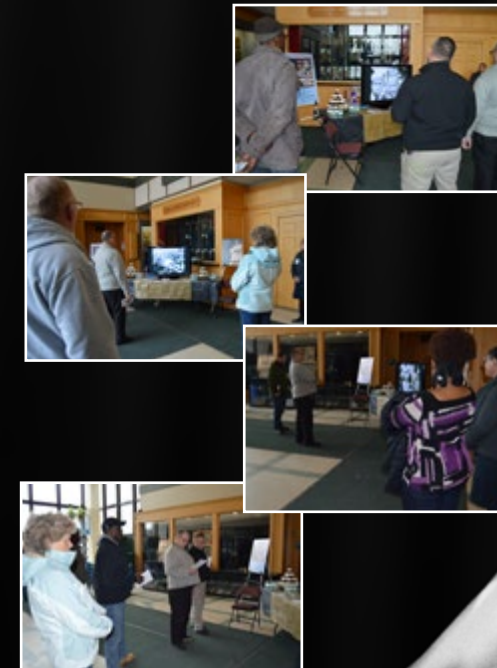
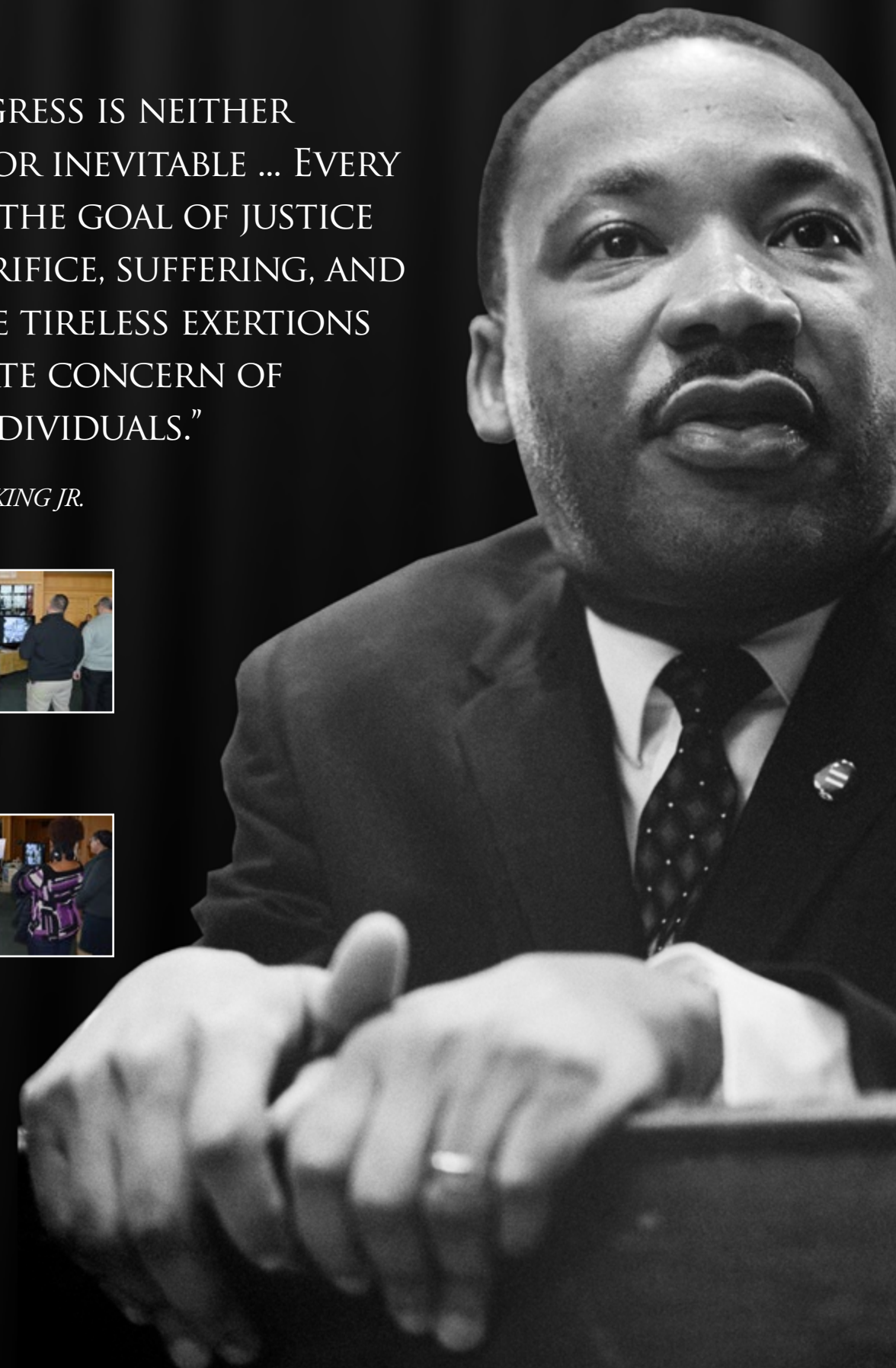
"We've done other things for NASA in the past," Barrett said. "It's a long collaboration. I think the possibility of exploring Mars is a very exciting thing."

"It's great that we can assist with the sustainment of that mission," Richardson said. "If they are not properly nourished, that is going to have a huge impact."



"HUMAN PROGRESS IS NEITHER AUTOMATIC NOR INEVITABLE ... EVERY STEP TOWARD THE GOAL OF JUSTICE REQUIRES SACRIFICE, SUFFERING, AND STRUGGLE; THE TIRELESS EXERTIONS AND PASSIONATE CONCERN OF DEDICATED INDIVIDUALS."

DR. MARTIN LUTHER KING JR.



The Natick Soldier Systems Center observed the birthday of Dr. Martin Luther King with a display in the lobby of Carney Hall. The theme was "Remember! Celebrate! Act! A Day On, Not a Day Off!" Dr. King, born Jan. 15, 1929, would have been 87 this year.

Background Photo: Marion S. Trikosko Event photo: Tazaynia Mouton

Reach for the Stars

Army seeks astronaut candidates

By Carrie E. David, SMDC/ARSTRAT / REDSTONE ARSENAL, Ala. (Jan. 8, 2016)

Are you a Soldier who wants to reach for the stars? It is possible, and the deadline for applications is approaching.

Soldiers who want to be considered for the [Army Astronaut Candidate Screening Board](#) must complete the two-part application process by Feb. 18.

According to MILPER Message #15-364, the application consists of an electronic submission directly to [NASA](#) through the [www.usajobs.gov](#) website and a paper application mailed to the Army Astronaut Candidate Screening Board.

Applicants must be a U.S. citizen between 62 inches and 75 inches tall. He or she must



Photo: NASA

hold a bachelor's degree from an accredited institution in engineering, biological science, physical science, computer science or mathematics. Degrees must be followed by at least three years of related, progressively responsible professional experience or at least 1,000 hours of pilot-in-command time in jet aircraft. An advanced degree is desirable and may be substituted for part of the experience requirement.

The following degrees are not considered qualifying: degrees in technology, degrees in

psychology except for clinical, physiological or experimental, degrees in nursing, degrees in exercise physiology or similar field, degrees in social science, and degrees in aviation, aviation management or similar fields.

Full application details are included in the MILPER message #15-364.

The [U.S. Army Space and Missile Defense Command/Army Forces Strategic Command](#) provides support to NASA with an Army astronaut detachment assigned to the [Johnson Space Center](#) in Houston.



2016 Bridgestone NHL Winter Classic

Members of the U.S. Army Research Institute of Environmental Medicine participated in the Joint Service Color Guard for the 2016 Bridgestone NHL Winter Classic at Gillette Stadium before the Boston Bruins and Montreal Canadiens took to the ice, Jan. 1.

Photos: MC2 Victoria Kinney, USS Constitution Public Affairs