

Natick researchers team up with Norwegian Army to measure nutritional needs during Arctic ski march

U.S. Army

NATICK, Mass. (March 27, 2013) -- A group of scientists from the U.S. Army Research Institute of Environmental Medicine recently returned from a field study in which they teamed up with the Norwegian Defense Research Establishment and the Norwegian Army from the Garnisonen i Sør-Varanger in Kirkenes, Norway, to assess the physiological demands of a multi-day winter training exercise.

Norwegian soldiers and U.S. Army Research Institute of Environmental Medicine's, or USARIEM's, researchers braved whiteout conditions and intense March winter weather -- sometimes with temperatures that were as low as minus 22 degrees -- during the Garnisonen i Sør-Varanger's, or GSV's, three-day ski march exercise along the Norwegian-Russian border in an effort that took more than a year of collaboration and planning.

"For this study we're very interested in recovery nutrition," said Andy Young, Ph.D., division chief for USARIEM's Military Nutrition Division. "[Norwegian Defense Research Establishment] had used the ski march successfully in other studies. They suggested that we collaborate with them on this study to document and quantify the level of physiological strain during this exercise to see if it would be appropriate for future tests of prototype 'recovery rations.'"

Every winter, the Norwegian Army sends companies of conscripted soldiers through cold-weather military training at GSV. This training includes a multi-day winter survival course that culminates with a three-day ski march along the border between Norway and Russia.

"This was an opportunity to assess physiological stress using an actual real-world training environment," said Stefan Pasiakos, Ph.D., a nutritional physiologist with MND. "Our objective was to characterize how physically challenging the actual training course was and how their bodies responded to the combination of extreme weather and sustained physical activity. This real-world scenario is difficult to duplicate in the laboratory."

As part of USARIEM's mission to enhance warfighter health and performance, researchers from MND are always looking for ways to assess nutrition requirements during real-world operational conditions.

"We thought this winter training event would be an ideal situation to characterize nutritional requirements of operational stress imposed by a combination of exercise while carrying heavy loads, environmental extremes and potentially inadequate food intake," Pasiakos said. "The resultant stress and potential energy imbalance

are important determinants of optimal nutrient composition of combat rations for these types of missions and conditions."

When a Soldier is highly stressed and performs high levels of physical activity, he or she may not consume enough calories, because there may not be enough food or simply because they are active all day and do not stop to eat.

"This can lead to a caloric deficit, which can compromise skeletal muscle and bone health, leading to decrements in physical performance and increased injury risk," Pasiakos said. "By better understanding these sometimes unavoidable physiological consequences of military operations, we aim to identify effective nutritional countermeasures suitable for incorporation in new combat rations."

In March 2013, months of planning and coordination between USARIEM, the Norwegian Defense Research Establishment, known as FFI, and GSV paid off. Four researchers from USARIEM's MND and one from the Thermal and Mountain Medicine Division left on a two-week trip to GSV on Norway's extremely cold border with Russia.

The first few days in Norway were spent recruiting soldier-volunteers to participate in the study and to get baseline testing done. While this was happening, Norwegian soldiers were training and preparing for the ski march that was now only days away by learning how to function in teams, executing military tasks and winter-survival drills in the field.

"GSV's command was extremely supportive, allowing us ample access to their soldiers and facilities," Pasiakos said. "Thirty soldiers volunteered and we completed all preliminary testing -- biological sampling, muscle power testing, cognitive testing, diet assessment and anthropometrics -- within the first two days of our trip. Our USARIEM and FFI team was exceptional; they were truly a great group to work with."

Volunteers were outfitted with physiological strain monitors and swallowed ingestible temperature pills to monitor activity and core temperature continuously during the ski march. Volunteers also consumed stable isotopes to measure energy expenditure and protein metabolism. Then Pasiakos, along with Svein Martini, a principal scientist from FFI, headed out into the cold to track their volunteers during the approximately 60-mile trek.

"These soldiers had a lot of ground to cover in a short time," Pasiakos said. "During the march, soldiers carried about 75-100 pounds on their backs. Most soldiers skied for about 12 hours during the first day. They would ski for 50 minutes and then have a 10-minute break. They would use the break to change into dry clothes and to eat something fast."

On the second day, the weather conditions worsened, with treacherous winds and blizzard-like conditions, making visibility extremely difficult. That night, the march had to be halted earlier than expected at a patrol station along the border.

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Published on Electronic Component News (<http://www.ecnmag.com>)

The soldiers and scientists skied on, continuing military training and research data collection until the end of the march on the third day. At the end of the trip, the soldiers had to go to the range and qualify with their weapons, while the USARIEM and FFI team assembled a field laboratory at Grense Jakobselv, another border patrol station, to make the last measurements on the volunteers and gather the last of the test samples.

The researchers then packed up and headed back to the states. Now home, Pasiakos is excited for the results of the study, hopes that preliminary data are available by early summer, and is open to the potential of future trips.

"We conducted a strong observational study; we just have to wait and see what the data tell us," Pasiakos said. "Getting a chance to work with a large group of soldiers and collect information that is valuable for the U.S. and Norwegian Army couldn't have been done in the lab. This was our chance to go out there and ask 'what's really happening?' This was a perfect opportunity to do that."

Source URL (retrieved on 09/19/2014 - 10:52am):

<http://www.ecnmag.com/news/2013/03/natick-researchers-team-norwegian-army-measure-nutritional-needs-during-arctic-ski-march>