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## Cold Weather Increases Risk Of Dehydration

UNH Study Gives Insight Into Why We Feel Less Thirsty

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DURHAM, N.H. -- Frostbite and hypothermia are not the only health hazards associated with frigidly cold temperatures. Cold weather studies at the University of New Hampshire show increased risk for dehydration, a condition more commonly associated with hot weather.

“People just don’t feel as thirsty when the weather is cold,” says Robert Kenefick, UNH associate professor of kinesiology. “When they don’t feel thirsty, they don’t drink as much, and this can cause dehydration.”

We lose a great deal of water from our bodies in the winter due to respiratory fluid loss through breathing. Our bodies also are working harder under the weight of extra clothing, and sweat evaporates quickly in cold, dry air.

The body is about two-thirds water, and when the total water level drops by only a few percent, we can become dehydrated. Kenefick says fluid deficits of 3 to 8 percent of body mass have been reported in individuals working in cold environments, and dehydration is a major problem with exercise in the cold.

Yet the loss of fluid from our bodies, which triggers thirst in warmer weather, does not elicit the same response when the temperatures dip. It’s not simply because we don’t feel hot, Kenefick says. His recent study, published in the journal *Medicine & Science in Sports & Exercise*, shows that cold actually alters thirst sensation.

“Fluid balance in our bodies often relies on the stimulation of thirst, resulting in voluntary fluid intake, as well as the kidneys conserving or excreting water,” Kenefick says. “This process is mediated by fluid-regulating hormones such as plasma arginine vasopressin (AVP).”

There are two factors that trigger the response of this fluid-regulating hormone. As our bodies lose water, sodium levels in the blood increase. Overall blood volume also decreases. These two responses trigger the hypothalamus to secrete AVP, which causes the kidneys to slow down their production of urine. This restores body fluid. At the same time, the hypothalamus signals the brain's cortex to create a thirst drive to force the increased water intake needed to restore the normal salt level.

To find out why the body reacts differently in the cold, Kenefick subjected individuals to the cold chambers at UNH, where they both exercised on a treadmill and rested. During cold exposure, he

explains, vasoconstriction takes place – the body decreases blood flow to the periphery of the body to decrease heat loss.

What he also discovered was that, because blood volume at the body's core increases, the brain does not detect blood volume decrease. Thus, the hormone AVP is not secreted at the same increased rate, despite elevated blood sodium. The kidneys get a diminished signal to conserve fluid, and thirst sensation is reduced by up to 40 percent.

“It's a trade off – maintaining the body's core temperature becomes more important than fluid balance,” Kenefick says. “Humans don't naturally hydrate themselves properly, and they can become very dehydrated in cold weather because there is little physiological stimulus to drink.”

Interestingly, animals like rats and dogs also show the same decreased thirst sensation in cold weather that human do, even though they will normally drink back all the fluid they have lost. They also experience a rise in central blood volume due to cold induced vasoconstriction.

Kenefick offers the same advice he tenders during the heat. Drink plenty of water, especially when exercising or working outdoors. A good way to monitor proper hydration is to examine urine output – the color should be nearly clear.