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The Secrets of Bear Hibernation

by Sara Reardon on 17 February 2011, 5:19 PM | Permanent Link | 0 Comments

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WASHINGTON, D.C.—On long, dark, cold winter days, you might feel like curling up to sleep for the next few months like a bear. But that's easier said than done. It won't be long before you get hungry, your heart gets tired, your muscles start to atrophy—and nature starts to call. If you were really a bear, however, none of these problems would affect you in the least.

ENLARGE IMAGE

Volunteer. A black bear in his artificial den helped researchers understand the physiology of hibernation in a near natural habitat.

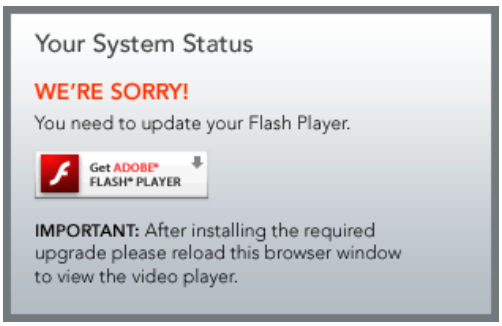
Credit: Øivind Tøien/Institute of Arctic Biology/University of Alaska, Fairbanks

Now researchers at the University of Alaska, Fairbanks, are figuring out just how bears manage the spectacular feat of hibernation. Here today at the annual meeting of the American Association for the Advancement of Science (which publishes *Science*NOW), Øivind Tøien and colleagues presented the first study continuously monitoring the physiology of black bears over an entire winter in a near-natural habitat. Their findings, also published online today in *Science*, could be useful for slowing the metabolic rate of an accident victim or bed-bound patient.

Five black bears learned the hard way that when they wander too close to civilization in search of picnic baskets or garbage cans, they may get picked up by the Alaska Department of Fish and Game and land in a research study. It wasn't a bad deal for these "nuisance" bears, though, that would have otherwise been shot. The researchers gave them artificial wooden dens that were dark, cold, and snug, just the way bears prefer, and so far out into the woods that lead researcher Tøien could reach them only on skis. They fitted the bears with sensors to record their temperature and heart rate, and the dens with infrared cameras and other sensors that monitored the bears' movement, oxygen consumption, and even their snoring (see video).

After monitoring the bears for 5 months, the team found that unlike ground squirrels and other small hibernators, whose body temperature drops almost to freezing during hibernation, bears' body temperature drops by only about 6°C. Yet their metabolism and oxygen consumption dropped by 75%, suggesting that another mechanism is involved in conserving their energy.

The bears made a lot of effort to conserve this much energy. While sleeping, they took only one or two breaths per minute. As they inhaled, their hearts did a quick flutter and then stopped until



Sweet dreams. Infrared cameras and microphones showed that although the bears don't move much, they sure do snore. Credit: Øivind Tøien/Institute of Arctic Biology/University of Alaska, Fairbanks

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the next breath—resulting in a heart rate of about four beats per minute. Finally, the researchers found that during the few weeks before and after going into hibernation, the bears enter an intermediate metabolic state: wandering around and eating like normal but with lowered metabolism. If this state could be replicated in humans, said cardiologist O. Lynne Nelson of Washington State University, Pullman, who was not involved in the research, it could help patients with impaired heart function live a more active life.

Senior author Brian Barnes, a zoophysiologist at the University of Alaska, Fairbanks, said that lowering metabolic needs in humans could help extend the "golden hour" after an accident when medical treatment is most effective. "You could imagine a golden day or a golden week."

In addition to medical uses, understanding the hibernation state could be useful for long-term space travel. "If you're trying to make a human like a bear, you can mimic what the bear's doing," says Henry Harlow, an ecophysiologist at the University of Wyoming in Laramie, who was not involved in the study.

The authors said that a fair amount of research still remains to be done, however. They are continuing to study blood pressure and brain activity in hibernating bears to understand how their brains continue to function with low oxygen. They are also performing molecular studies to pinpoint genes that may be involved in controlling hibernation, because it's currently a mystery how the bears manage to conserve their bone and muscle mass so precisely.

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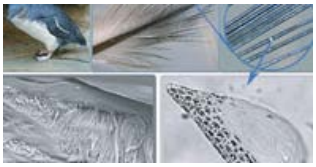

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