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Hibernating Bears 'A Metabolic Marvel'

by JOE PALCA



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Oivind Toien/Institute of Arctic Biology, University of Alaska, Fairbanks

An American black bear from the Kenai Peninsula in Alaska. A new study found that a bear's metabolism in hibernation drops by nearly 75 percent while its body temperature falls just slightly.

February 18, 2011

text size A A A

For the first time, scientists say they have been able to monitor a bear's vital signs continuously during a six-month period of hibernation. To their surprise, the researchers discovered that despite lowering its metabolism by 75 percent, a hibernating bear's internal temperature barely drops at all.

Yes, Bears Snore

It turns out that in addition to a drastically reduced metabolism, bears in hibernation also snore. Have a listen.

The bear study took place at the University of Alaska, Fairbanks. The bears spent the winter in a hibernaculum — basically a big box. The researchers weren't sure whether the bears would be willing to spend the winter in this small, artificial cave.

"We anticipated they might just tear the place up or go on strike or something," says Brian Barnes, one of the authors of the new study. "But they actually showed very natural behavior of getting ready to hibernate. They curl up, they go to sleep. They begin to quiet their heart rate, slow their breathing and their metabolic rate plunges."

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Credit: Oivind Toien, Institute of Arctic Biology, University of Alaska Fairbanks

...factors appear to be responsible. First, a bear has a lot of fat and thick fur, so it is well-insulated. Second, when a bear's internal temperature drops below about 90 degrees Fahrenheit (99 degrees is normal for a bear), it starts to shiver. The shivering produces heat, and the bear's temperature rises a few degrees. This periodic shivering occurs throughout the winter.

'A Closed System'

Barnes says just about everything a bear does while hibernating is remarkable.

"Bears don't eat, drink, urinate or defecate for six or seven months," he says. They make their own water, probably by metabolizing fat, and they get rid of wastes by breaking them down internally. "They're a closed system. All they need is air, and they can do just fine. They're a metabolic marvel," he says.



Enlarge Oivind Toien/Institute of Arctic Biology, University of Alaska, Fairbanks
Researchers studied a bear, like this one, in an artificial den called a hibernaculum.

The fact that a bear could reduce its metabolism so much with such a small drop in temperature was a surprise. Barnes says two

One of the things bears do with waste is to use the calcium in it to keep their bones strong. A human who is bedridden for months will start to lose bone mass, but Seth Donahue, a professor of biomedical engineering at Michigan Technological University, says his research shows that doesn't happen with bears.

"Basically we found that there were no negative consequences of six months of hibernation on the bone strength or mineral content," says Donahue.

It's not just the bones in bears that stay strong throughout the winter.

"They have this neat capacity to preserve their muscle mass as well as muscle strength," says Hank Harlow at the University of Wyoming. Preserving muscle size and strength is also pretty remarkable. Human muscles will shrink if they aren't used regularly, and Harlow says it would be a boon to medicine if scientists could figure out how a bear keeps that from happening.

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Craig Heller, a professor of biology at Stanford University and an author of the new bear paper, says for people bedridden for long periods, or who are contemplating a long space voyage such as going to Mars and back, figuring out how to make a human more like a hibernating bear would have some advantages.

"One would be lowering the energy requirement so you don't need as much food and water and resources, but another is just reducing the

boredom," says Heller.

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Recent First



Larry Waters (Lencho) wrote:

Every bear has a character of its own depending on its emotional state the same bear may display diametrically opposite behavior in similar situations This does not mean they are unpredictable, but simply that they are not machines Matthias Breiter: Bears- A Year In The Life

Mr. Breiter's book- Bears- A Year In The Life - is one of the best. He's a scientist who also writes beautifully.

Friday, February 18, 2011 12:14:30

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Penny Lane (crooowww) wrote:

Too bad people are still allowed to hunt bears.

We're just the worst species on the planet.

Friday, February 18, 2011 12:12:41

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Larry Waters (Lencho) wrote:

A friend of mine staying in a mountain cabin & heard something on the porch outside. She opened the door & there was a bear standing there looking right back at her. My friend and the bear both "screamed" at the same time and each ran the other way.

(bears don't scream-it probably grunted or growled)

Friday, February 18, 2011 12:03:32

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Ed Alonzo (boink) wrote:

I thought it had already been decided that a trip to Mars would be a one way ticket. The



persons selected would have full knowledge they would not be returning to Earth during their remaining lifetime.

Friday, February 18, 2011 11:58:21

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Mye Flatley (P_U_Wallpaper) wrote:

The rabbits in the Fairbanks area go in and out of their dens with temperature. When the temperatures are warm, around 0 °degrees, F, they are out and chewing the bark off any smaller twigs they can reach. When it is cold, -20° to -50°, they stay in their holes. The determining factor in being out or in is not the coldness of the air against their furry skin. It is the temperature of the air in the lungs. Anything that makes the air in the lungs warmer helps. The den helps, but even more, putting the nose inside a furry limb helps. ♪♪~*~*~*♪♪

Friday, February 18, 2011 11:50:34

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Peter Melzer (HPM) wrote:

Presumably, the bears build up brown fat in the fall to be used for maintaining body temperature during winter. I suppose, melatonin regulates the physiological preparation for hibernation.

Read more here:

<http://brainmindinst.blogspot.com/2008/06/brain-giant-self-medicating-gland.html>

Friday, February 18, 2011 11:26:22

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Larry Waters (Lencho) wrote:

Black bears make their dens in a variety of places: hollow standing trees live/dead, under a fallen tree, caves, or they will burrow under roots or logs, and sometimes just a scrape in the ground.

The den has just enough room to contain bear and is lined with leaves, grass, lichen, rotten wood, ferns

The bear may close entrance with leaves or grass, as camouflages & heat retention.

Friday, February 18, 2011 10:53:59

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Larry Waters (Lencho) wrote:

Black Bears are shy and usually turn and amble away if approached. Curiosity and hunger is often mistaken for aggression. Nat. Center for Health Statistics: each person killed by a black bear in N. America, 60 are killed by domestic dogs, 180 by bees, and 350 by lightning. Peter Tyson

Friday, February 18, 2011 10:38:11

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Jan Jepson (publican99) wrote:

Although you must have received many emails by now, let me be one more to correct you. I do notice that the transcript has been corrected, but Mr. Palca's reference to "Michigan Technical University" is entirely incorrect. It is "Michigan Technological University", located in Houghton, Michigan. It is an important, well-known research institution and Mr. Palca, as a long-time science reporter should have known better.

Friday, February 18, 2011 09:54:04

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Larry Waters (Lencho) wrote:

Black Bears: Intelligent, curious & adaptable. Navigation ability superior to humans. Excellent long-term memory. Can generalize to the simple concept level. Some biologists believe the bear's intelligence is at or near the higher primate level.

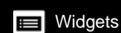
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