

# Hibernating bears protect bones by reducing resorption

July 8 2015

---

Even a short period of inactivity can be extremely bad for our bones, and for astronauts facing months in zero gravity, the risks are serious. But there is an animal that has already solved all of the problems faced by immobile humans. Black bears routinely hibernate for 6 months without stirring, and although it can take several weeks for them to regain their full metabolic vigour, their bones seem largely unaffected by the lengthy period of inactivity. Yet, how these impressive beasts protect their bones was a mystery, with previous studies yielding contradictory results.

Intrigued by [bone regeneration](#), Seth Donahue from Colorado State University, USA, and an international team of collaborators decided to monitor the blood levels of specific enzymes and hormones that are known to contribute to bone formation and resorption to find out how bears protect their bones during [hibernation](#). They discovered that instead of continually rebuilding the bone, hibernating bears suppress resorption of [bone tissue](#) to maintain their skeleton and the team publishes their discovery in *The Journal of Experimental Biology*.

The team captured 13 female bears over four hibernation seasons, and collected blood and bone samples from the animals before releasing them back into the wild the following spring. Carefully analysing the blood samples for bone-specific alkaline phosphatase (BSALP) and tartrate-resistant acid phosphatase (TRACP) - which indicate bone rebuilding - the team found that the blood enzyme levels fell in the hibernating bears, suggesting that the hibernating animals were suppressing bone remodelling. And when the team analysed the levels of

bone-regenerating osteoblast cells at the surface of the bone, they plummeted from 2% before hibernation to 0.15% during hibernation. However, the levels of cocaine and amphetamine regulated transcript (CART) - which is known to reduce [bone resorption](#) - increased 15-fold during hibernation. So, instead of constantly rebuilding, the bears were protecting their bones by suppressing resorption of the tissue. The team also found that the bears' blood calcium levels varied little from season to season, suggesting that the animals balance [bone](#) resorption and formation during hibernation to maintain stable blood calcium levels, which are also essential for healthy organ function and fat and energy metabolism.

'Hibernating [bears](#) are metabolic marvels', say Donahue and his colleagues, adding that these animals appear to be immune to two major epidemics sweeping across the world - obesity and inactivity - suggesting that we could learn a thing or two from these fantastic creatures.

**More information:** McGee-Lawrence, M., Buckendahl, P., Carpenter, C., Henriksen, K., Vaughan, M. and Donahue, S. (2015). Suppressed bone remodeling in black bears conserves energy and bone mass during hibernation. *J. Exp. Biol.* 215, 2067-2074.

[jeb.biologists.org/lookup/doi/10.1242/jeb.120725](http://jeb.biologists.org/lookup/doi/10.1242/jeb.120725)

Provided by The Company of Biologists

Citation: Hibernating bears protect bones by reducing resorption (2015, July 8) retrieved 25 April 2024 from <https://phys.org/news/2015-07-hibernating-bones-resorption.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.