Scientists uncover secrets of hibernation

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The garden dormouse is native to Europe and lives mainly in the forest. Credit: Stefan Stumpfel / Vetmeduni Vienna

For hibernating mammals, the pre-winter months are a race against time to accumulate enough energy reserves to last until spring. Offspring born late in the year have much less time to achieve this. Scientists from the Research Institute of Wildlife Ecology at the Vetmeduni Vienna have discovered that power-napping can help late-born garden dormice

overcome these unfavourable odds. The scientists also found a link between time spent at higher temperatures and ageing. The results were published in the Journal *Proceedings of the Royal Society B*.

During hibernation, dormice enter into 'torpor' to save energy and water. In this state, the dormice become inactive and show a marked decrease in their metabolic rate, causing their body temperature to reduce.

Torpor was then found to be a strategy used when food availability was limited. The researchers compared two groups of juveniles born late in the season – one able to feed freely and the other intermittently fasted on alternate days. The fasted dormice showed considerably greater use of torpor, enabling them to maintain high growth rates and accumulate sufficient fat reserves. "The longer an animal stays in torpor, the more energy it saves", says Sylvain Giroud, who led the study.

Torpor use was measured using temperature loggers placed in the nests of the animals, which detected the sharp drop in body temperature occurring during torpor.

"Torpor was only viewed as a means to save energy and water, but during the last decade other functions have emerged. These include promoting growth during early life and fattening prior to hibernation, as well as slowing ageing processes" added Giroud.

Indeed, torpor and hibernation are associated with slowing ageing processes and increase of longevity. In their study, the researchers have also provided the first evidence for a functional link between time spent at high body temperature (euthermic) and ageing processes over winter. "Our data indicate that the main effects of hibernation on ageing processes are linked to euthermic episodes which are associated with the shortening of telomeres, an indicator of ageing", the researchers concluded.

Ongoing research of Giroud's group is now focusing on comparing late-born juvenile garden dormice with their early-born counterparts. The early-born juveniles are expected to use less torpor, to grow at a lower rate and to reach higher fattening levels prior to winter hibernation. Giroud and his colleagues are going to investigate the impact of lower growth rates and higher pre-hibernation fattening on ageing. "We hope to unravel the mechanisms involved in torpor use and ageing processes in individuals facing contrasted environmental conditions during their early life", says Giroud.

More information: "Late-born intermittently fasted juvenile garden dormice use torpor to grow and fatten prior to hibernation: consequences for ageing processes." *Proc. R. Soc. B* 22 December 2014 DOI: 10.1098/rspb.2014.1131

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