

INSIDE JEB

Stress does not cause dormouse mums to skip a litter



Edible dormice with pups. Photo credit: Jessica Cornils.

Beechnuts and acorns are a big hit with edible dormice (*Glis glis*). Packed full of nutrition, the calorific kernels enable feasting dormouse youngsters to pile on the pounds quickly in preparation for their first long hibernation; but there's a catch. 'Oak and beech trees typically cannot produce massive amounts of seeds in two consecutive years', says Jessica Cornils from the University of Veterinary Medicine, Austria, potentially placing dormouse youngsters at risk in years when the seed harvest fails. However, vigilant dormouse mothers can avert disaster. '[They] have the ability to anticipate food quality in the upcoming autumn', says Thomas Ruf, also from the University of Veterinary Medicine, explaining that the females then avoid producing litters in the years when the harvest will fail. Yet how dormouse females regulate their fertility was unclear. Knowing that stress can be a powerful contraceptive, Cornils, Ruf and Claudia Bieber decided to find out whether the risks from foraging more extensively in years when the nut harvest will be meagre could account for dormice mothers skipping litters.

First, Cornils had to develop a technique for measuring the stress experienced by the animals as they went about their daily routine. Reasoning that she might be able to detect stress hormones in the animals'

faeces, Cornils and colleague Franz Hoelzl retrieved seven female dormice from a nearby wood. 'It took us two or more hours to transport the animals back to the institute, including a bumpy ride on gravel roads, which should be sufficient to trigger a stress response', says Cornils. Then she had to wake every four hours for a week to collect faeces samples. 'After the first night, one of my colleagues asked if I was OK', she chuckles. Once the gruelling seven days were over, she and Hanno Gerritsmann soaked each piece of poo in methanol to collect any hormones and found that the levels excreted during the first night after the animals' arrival in the lab were particularly high, indicating how stressed they had been during the preceding day.

Cornils then geared up to measure the stress levels of dormice in the wild from 2012 to 2014. Tagging female occupants of over 100 nest boxes located throughout the local wood, Cornils and Hoelzl visited each dormouse home once a fortnight between spring and autumn of each year to check every animal's age, mass and whether they had pups, in addition to collecting any poo that the animals produced conveniently while being weighed. In the meantime, the beech wood also proved remarkably cooperative, yielding

a bumper beechnut crop in 2013, in contrast to the preceding and following years when the harvest failed or was poor. In addition, the team provided the female dormice with free food – sunflower seeds – directly in their nest boxes during the 2014 poor harvest to find out whether the amount of food available to the would-be mothers affected their stress.

However, after painstakingly analysing the amounts of stress hormones in the rodent's poo with Ruf, Nikolaus Huber and Franz Schwarzenberger, Cornils was astonished that the dormice were most chilled (had the lowest stress levels) when the beechnut harvest failed. In contrast, the stress levels of the mothers tending pups was 10 times higher. Cornils suspects that, during the beechnut famine, some of the females kept their stress levels low by resuming hibernation within a matter of weeks while others probably entered mini-hibernations each day and foraged at night to avoid predators and save energy. In addition, when Richard Zink compared the danger represented by a burgeoning tawny owl population, the team was surprised that the risk of predation did not raise the rodents' stress levels.

So, stress does not seem to drive the females' decision to skip a litter when the beechnut harvest fails and Cornils says, 'We think that edible dormice reproduce despite having heightened stress hormone levels, because the situation is otherwise optimal'.

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Cornils, J. S., Hoelzl, F., Huber, N., Zink, R., Gerritsmann, H., Bieber, C., Schwarzenberger, F. and Ruf, T. (2018). The insensitive dormouse: reproduction skipping is not caused by chronic stress in *Glis glis*. *J. Exp. Biol.* **221**, jeb183558.

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