

## Tree swallow study: Stressful events have long-term health impacts

August 28 2018, by Krishna Ramanujan

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A tree swallow returns to its nest box to incubate eggs. The nest's opening is surrounded by an antenna, which was coupled with a tracking tag on the bird. Using this design on each nest box and bird, the researchers recorded more than 177,000 feeding visits for 63 females in 2015. Credit: Maren Vitousek

Little is known about how brief yet acute stressors—such as war, natural disasters and terror attacks—affect those exposed to them, though

human experience suggests they have long-term impacts.

Two recent studies of tree swallows uncover long-term consequences of such passing but major stressful events. Both studies provide information on how major stressful events have lasting effects and why some individuals are more susceptible to those impacts than others.

"We aren't looking at humans in either of these studies, but this research certainly could have implications for how humans respond to [stress](#)," said Maren Vitousek, assistant professor in the Department of Ecology and Evolutionary Biology. "The basic way that most vertebrates respond to stress is quite similar. We often see similar things predicting stress resilience in humans and in other animals."

The first study was published in *Proceedings of the Royal Society B*. Vitousek is the paper's first author.

The researchers developed a new method for manipulating [hormone levels](#) in free-living [birds](#): They dissolved a stress hormone (glucocorticoid) in a gel and put it on eggs in tree swallow nests. The females, the only ones who incubate, absorbed the hormone through their skin. They were given five separate doses for an hour each early in their reproductive periods.

After absorbing the hormone, females fed their offspring at lower rates once they hatched, which led to much smaller offspring compared to two types of controls (one type with gel but no hormone on an egg and the other undisturbed). The smaller offspring in turn had lower survival rates.

"The take-home message here is that the hormones that birds would be exposed to if they had a short-term stressor do have these long-term effects," Vitousek said.

The researchers also found that birds exposed to higher doses of glucocorticoid were more likely to endure lingering impacts, she said. This result suggests that individuals who naturally mount a stronger hormonal response to brief challenges may be at greater risk of suffering from lingering effects of stress, Vitousek said.

The second study, published in the *Royal Society's Biology Letters*, used similar methods to examine conditions that predict susceptibility to stress and why some individuals cope with stress better than others.

In this study, led by first author and postdoctoral associate Conor Taff, birds were caught and the researchers measured baseline stress hormone levels, how high they increased from the stress of capture and how quickly they returned to normal levels. The birds were then released and exposed to glucocorticoid on eggs, using the same protocol as the previous study. After these birds absorbed the hormone, the researchers measured how fast they recovered to their baseline [hormone](#) levels.

There was a lot of variation among the birds, but a pattern revealed birds that were better able to turn off that initial stress response to capture also returned to baseline levels faster following glucocorticoid exposure.

"Individuals that are more naturally stress resilient are those that are better able to turn off this response to begin with," Vitousek said.

Future work will focus on the role of social interactions in stress. "Birds that are more socially connected are more stress-resilient, so we're interested in whether those social interactions are actually causally effecting stress resilience or not," Vitousek said.

**More information:** Maren N. Vitousek et al, The lingering impact of stress: brief acute glucocorticoid exposure has sustained, dose-dependent effects on reproduction, *Proceedings of the Royal Society B: Biological*

*Sciences* (2018). [DOI: 10.1098/rspb.2018.0722](https://doi.org/10.1098/rspb.2018.0722)

Provided by Cornell University

Citation: Tree swallow study: Stressful events have long-term health impacts (2018, August 28)  
retrieved 23 April 2024 from

<https://phys.org/news/2018-08-tree-swallow-stressful-events-long-term.html>

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