

# Scientists predict 'optimal' organism stress levels

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Scientists have created an evolutionary model to predict how animals should react in stressful situations.

Almost all organisms have fast-acting stress responses, which help them respond to threats—but being stressed uses energy, and [chronic stress](#) can be damaging.

The new study—by an international team including the University of Exeter—suggests most animals remain stressed for longer than is optimal after a stress-inducing incident.

The reasons for this are not clear, but one possibility is that there is a limit to how quickly the body can remove [stress hormones](#) from circulation.

"We have created one of the first mathematical models to understand how organisms have evolved to deal with stressful events," said Dr. Tim Fawcett, of the University of Exeter.

"It combines existing research on stress physiology in a variety of organisms with analysis of optimal responses that balance the costs and benefits of stress.

"We know stress responses vary hugely between different species and even among individuals of the same species—as we see in humans.

"Our study is a step towards understanding why stress responses are so variable."

The researchers define stress as the process of an organism responding to "stressors" (threats and challenges in their environment), including both detection and the [stress response](#) itself.

A key point highlighted in the study is the importance of how predictable threats are.

The model suggests that an animal living in a dangerous environment should have a high "baseline" stress level, while an animal in a safer environment would benefit from being able to raise and reduce stress levels rapidly.

"Our approach reveals environmental predictability and physiological limits as key factors shaping the evolution of stress responses," said lead author Professor Barbara Taborsky, of the University of Bern.

"More research is needed to advance [scientific understanding](#) of how this core physiological system has evolved."

The paper, published in the journal *Trends in Ecology & Evolution*, is entitled: "Towards an evolutionary theory of stress responses."

**More information:** Barbara Taborsky et al, Towards an Evolutionary Theory of Stress Responses, *Trends in Ecology & Evolution* (2020). [DOI: 10.1016/j.tree.2020.09.003](https://doi.org/10.1016/j.tree.2020.09.003)

Provided by University of Exeter

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