

# Stressed lemurs have worse chances of survival

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High levels of hair cortisol—a sign of long-term stress—are associated with reduced survival in wild grey mouse lemurs (*Microcebus murinus*), according to a study published in the open access journal *BMC Ecology*.

Researchers at the German Primate Centre and Georg-August University Göttingen, Germany found that grey mouse lemurs with high levels of the [stress hormone cortisol](#) in their fur were less likely to survive both long-term and over the reproductive season.

Dr Josué Rakotoniaina, the corresponding author said "Despite the wide use of [stress hormone levels](#) as an index of health and condition, this study is among the first to correlate an index of chronic stress with survival in a wild population of lemurs. This was only possible by combining [hair cortisol](#) levels with several years of life history data that was gathered from a long-term monitoring project of mouse lemurs."

Lemurs with low hair cortisol levels had on average a 13.9% higher chance to survive than those with high levels of hair cortisol. Lemurs with very good [body condition](#)—that is optimal body mass and size—survived on average 13.7% better than lemurs with poor body condition and females survived, on average, better than males. Variations in parasitism, such as the number of parasite infections, were not linked to survival.

Dr Rakotoniaina added: "Our findings indicate that hair cortisol concentrations are a much better predictor of survival, and thus a better index of health, than other commonly used health indicators. Cortisol is taken up by hair as it grows so its concentration in a hair sample allows assessment of overall cortisol levels over time rather than—as single samples of blood, saliva or urine do—at one time point."

To test their hypothesis that high hair cortisol concentration as a measure of long-term stress is related to individual survival, the researchers studied a population of grey mouse lemurs in Kirindy Forest, Madagascar from 2012 to 2014. They assessed the relationship between hair cortisol concentration and long-term survival in 171 lemurs, while the effect of body condition on long-term survival was assessed in a sub-

sample of 149, and the link between all health indicators (hair cortisol level, body condition and parasitism) and survival during the mating season was assessed in a group of 48 lemurs.

The researchers suggest that the benefits of having low stress levels may be even more pronounced prior to the mating season. Individuals that are more affected by challenging [conditions](#) may not be able to cope with the additional [stress](#) during mating season which is particularly challenging for male mouse lemurs.

Although the exact mechanism by which cortisol is built into hair is not yet fully understood and the observational nature of the study does not allow conclusions about the causes of mortality, the findings suggest that hair cortisol concentration may be a valid indicator of health in wild [lemur](#) populations.

Dr. Rakotoniaina said: "This important information could facilitate conservation decisions as it provides conservationists with an essential tool that could be used to detect issues emerging at the population level and ultimately predict wild populations' responses to environmental challenges."

**More information:** Josué H. Rakotoniaina et al. Hair cortisol concentrations correlate negatively with survival in a wild primate population, *BMC Ecology* (2017). [DOI: 10.1186/s12898-017-0140-1](https://doi.org/10.1186/s12898-017-0140-1)

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