

# Faster heartbeat helps deer mice to survive at high altitudes

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Mice living at high altitudes in the American West carry a genetic variant that increases their heart rate, helping them cope with the low oxygen levels that occur at high elevations. Rena Schweizer of the

University of Montana and colleagues report these findings in a new study published 30th October in *PLOS Genetics*.

Mountains and plateaus are challenging environments for animals due to cold temperatures and reduced oxygen concentrations in the air. In the current study, researchers investigated genetic changes in North American deer mice that are linked to physiological changes that help them cope with too little oxygen. By sequencing samples from 100 mice living at different elevations, they identified a variant of the gene *Epas1*, which is much more common in deer mice living at high altitudes than in lowland populations. Mice with the "highland" version of the gene have a higher heart rate when exposed to [low oxygen levels](#), which increases the amount of oxygen circulating in the bloodstream.

The new study is the first to show a relationship between naturally occurring genetic variations in *Epas1* and changes to the heart rate, and suggests that *Epas1* may aid long-term survival of high-altitude deer mice. *Epas1* has also been implicated in respiratory and cardiovascular adaptations in Tibetans living at [high altitudes](#) on the Qinghai-Tibetan plateau, when compared to closely related lowland Han Chinese populations.

"Our study addresses a really important question about how adaptation occurs on complex physiology that is controlled by multiple interacting system," said author Rena Schweizer. "*Epas1* may aid long-term survival of high-altitude deer mice, and is a case by which a relatively simple genetic change in a control gene may alter adaptive traits. Our future work on *Epas1* is aimed at exploring the specific mechanisms by which the protein-altering mutation affects [heart rate](#), and whether the mutation affects any other traits that we did not previously measure."

**More information:** Schweizer RM, Velotta JP, Ivy CM, Jones MR, Muir SM, Bradburd GS, et al. (2019) Physiological and genomic

evidence that selection on the transcription factor *Epas1* has altered cardiovascular function in high-altitude deer mice. *PLoS Genet* 15(10): e1008420. [doi.org/10.1371/journal.pgen.1008420](https://doi.org/10.1371/journal.pgen.1008420)

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