Researchers Find Rapid Evolution is Aiding Cancer-Stricken Tasmanian Devils

University of Idaho media relations

MOSCOW, Idaho — Aug. 30, 2016 — Over the past 20 years, tens of thousands of the world's Tasmanian devils have died of a contagious cancer that spreads when the animals bite each other.

Scientists predicted the cancer, devil facial tumor disease, would drive the species to extinction — but a new study from the University of Idaho, Washington State University and the University of Tasmania shows Tasmanian devils are evolving rapidly in response to the threat. The study was published today in Nature Communications.

Paul Hohenlohe, an assistant professor of biological sciences in the UI College of Science, contributed to the project his expertise in searching for signs of evolutionary change across animal genomes, the full set of genes in an organism's DNA.

"If a disease comes in and knocks out 90 percent of the individuals, you might predict the 10 percent who survive are somehow genetically different," Hohenlohe said. "What we were looking for was the parts of the genome that show that difference."

WSU's Andrew Storfer, an evolutionary geneticist and disease ecologist, began studying the devil's response to devil facial tumor disease while in Tasmania and invited Hohenlohe to collaborate on the genetic sequencing arm of the research, using UI's advanced genomic analysis tools.

Tasmanian researchers sent samples from three groups of devils. Hohenlohe used technologies in UI's Genomics Resources Core and Computational Resources Core to scan the genomes of nearly 300 individual animals, comparing close to a million snippets of DNA across each animal.

The scan found two pieces of the Tasmanian devil genome that showed signs of evolutionary change in response to the cancer and the force of natural selection it imposed. Over the course of just a handful of generations, more Tasmanian devils were born with genetic differences at these two gene sites, which are related to immune function and cancer risk in humans and other mammals. This is statistically unlikely to have happened by chance, according to the study.

"It suggests there may be genetic variants in the species that could lead to resistance to the disease," Hohenlohe said. "It provides hope that Tasmanian devils will evolve in the face of the disease and persist in the wild."

Storfer added, "The results are exciting insomuch as they inform biology with regard to the potential for rapid evolutionary change in today's dramatically changing world. Additionally, we are hopeful that our study may help with Tasmanian devil conservation efforts."

These changes are surprising because Tasmanian devils as a species have little genetic variation due to their low numbers and small habitat range, but what variation they had was enough to allow them to adapt.

"This emphasizes that evolution can be extremely rapid, whether it's in response to environmental change or disease, if the genetic variation is present to allow it to happen," Hohenlohe said. "The traditional concept of evolution is a very long-term, gradual process. Even within the scientific community, that's how it was considered until fairly recently. But there are more and more examples of rapid, observable evolution happening in natural populations."

To read more about this project, visit www.uidaho.edu/sci or news.wsu.edu.