

Ancient penguin DNA raises doubts about accuracy of genetic dating techniques

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Adelie penguins have survived in Antarctica for thousands of years and are invaluable for genetic research.

Penguins that died 44,000 years ago in Antarctica have provided extraordinary frozen DNA samples that challenge the accuracy of traditional genetic aging measurements, and suggest those approaches have been routinely underestimating the age of many specimens by 200 to 600 percent.

In other words, a biological specimen determined by traditional [DNA testing](#) to be 100,000 years old may actually be 200,000 to 600,000 years old, researchers suggest in a new report in *Trends in Genetics*, a professional journal.

The findings raise doubts about the accuracy of many evolutionary rates

based on conventional types of genetic analysis.

"Some earlier work based on small amounts of DNA indicated this same problem, but now we have more conclusive evidence based on the study of almost an entire [mitochondrial genome](#)," said Dee Denver, an [evolutionary biologist](#) with the Center for Genome Research and Biocomputing at Oregon State University.

"The observations in this report appear to be fundamental and should extend to most animal species," he added. "We believe that traditional DNA dating techniques are fundamentally flawed, and that the rates of evolution are in fact much faster than conventional technologies have led us to believe."

The findings, researchers say, are primarily a challenge to the techniques used to determine the age of a sample by genetic analysis alone, rather than by other observations about fossils. In particular, they may force a widespread re-examination of determinations about when one species split off from another, if that determination was based largely on [genetic evidence](#).

For years, researchers have been using their understanding of the rates of [genetic mutations](#) in cells to help date ancient biological samples, and in what's called "phylogenetic comparison," used that information along with [fossil evidence](#) to determine the dates of fossils and the history of evolution. The rates of [molecular evolution](#) "underpin much of modern evolutionary biology," the researchers noted in their report.

"For the genetic analysis to be accurate, however, you must have the right molecular clock rate," Denver said. "We now think that many genetic changes were happening that conventional DNA analysis did not capture. They were fairly easy to use and apply but also too indirect, and inaccurate as a result."

This conclusion, researchers said, was forced by the study of many penguin bones that were well preserved by sub-freezing temperatures in Antarctica. These penguins live in massive rookeries, have inhabited the same areas for thousands of years, and it was comparatively simple to identify bones of different ages just by digging deeper in areas where they died and their bones piled up.

For their study, the scientists used a range of mitochondrial DNA found in bones ranging from 250 years to about 44,000 years old.

"In a temperate zone when an animal dies and falls to the ground, their DNA might degrade within a year," Denver said. "In Antarctica the same remains are well-preserved for tens of thousands of years. It's a remarkable scientific resource."

A precise study of this ancient DNA was compared to the known ages of the bones, and produced results that were far different than conventional analysis would have suggested. Researchers also determined that different types of DNA sequences changed at different rates.

Aside from raising doubts about the accuracy of many specimens dated with conventional approaches, the study may give researchers tools to improve their future dating estimates, Denver said.

Source: Oregon State University ([news](#) : [web](#))

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