

Fossils of horse teeth indicate 'you are what you eat'

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Fossil records verify a long-standing theory that horses evolved through natural selection, according to groundbreaking research by two anatomy professors at New York College of Osteopathic Medicine (NYCOM) of New York Institute of Technology.

Working with colleagues from Massachusetts and Spain, Matthew Muhlbachler, Ph.D., and Nikos Solounias, Ph.D. arrived at the conclusion after examining the teeth of 6,500 [fossil horses](#) representing 222 different populations of more than 70 extinct horse species. The records, spanning the past 55 million years, indicate a "critical" lag time between the evolution of horse teeth and dietary changes resulting from [climate change](#). The breakthrough findings were chosen for publication in the March 4 issue of the prestigious bi-weekly international journal *Science*.

"One of the advantages of studying extinct creatures like prehistoric horses is we can look at how animals responded to their environments over millions of years—something that biologists who study living species cannot do," Muhlbachler said, adding that the biggest surprise of the study was that while some of the extinct populations they examined had extremely abrasive diets, much of the time, it seemed horses had it surprisingly easy. This suggests that "strong natural selection" for different types of teeth only happened occasionally during brief intervals in horse history.

Solounias helped develop a methodology known as dental mesowear

analysis to reconstruct the diets of extinct species by measuring food-related wear and tear on fossil teeth. He and Muhlbachler used the process to investigate wear patterns on the molars of thousands of fossil horses. They later analyzed their data alongside records of North American climate changes that would have shifted the animals' diets from rainforest fruits and woody, leafy vegetation to the more abrasive diets found in grasslands.

"Lag time in the evolution of horse teeth in comparison to dietary changes is critical," Muhlbachler explained. "We found that evolutionary changes in tooth anatomy lag behind the dietary changes by a million years or more."

While paleontologists have long held horses as classic examples of evolution through [natural selection](#), the theory has been difficult to test because the majority of horse species are extinct. However, Muhlbachler and Solounias' observation that dental changes in horses follow their dietary changes is consistent with evolution due to adaptation.

"'You are what you eat': we hear this all the time, but now we know it is true," explained Thomas Scandalis, Dean of NYCOM. "This study shows that the evolutionary path of horses as we know them today was affected by the food available to their prehistoric ancestors."

The duo's research shows that not only has the number of horse species been greatly reduced in the past few million years, but also that the diets of horses have been narrowly restricted. "Living horses are anything but typical examples of the dietary ecology of this once great group of mammals," Solounias said.

More information: The study is summarized in a paper titled "Dietary Change and Evolution of Horses in North America."

Provided by New York Institute of Technology

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