

Here's something fishy: Tooth enamel evolved from fish scales

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A dentist attends a boy in Surcubamba, Peru, May 21, 2015. Photo: AP Photo/Rodrigo Abd

Teeth are covered by a thin layer of enamel. Enamel is a hard substance that protects teeth from wear and tear. It is the hardest substance in the human body. Scientists have long wondered how enamel evolved. They want to understand how it grew and changed over many years.

A new study published in late September offers a new theory. According to the study's authors, the enamel that is found on the surface of teeth evolved from the scales on the skin of fish.

Scientists already knew there were similarities between teeth and fish scales. Sharks, for example, are covered in dermal denticles, or "skin teeth." Dermal denticles are overlapping tooth-like scales that let sharks cut through water with little drag.

Scientists Have Studied Enamel For Years

Some fishes, such as the North American gar (also known as *Lepisosteus*), have scales that are covered with ganoine. Ganoine is a substance similar to human tooth enamel. Ganoine was also on the scales of some ancient bony fish, which later evolved into land animals.

The new study takes a closer look at ganoine, and shines new light on the evolutionary origins of enamel.

Ahlberg says scientists have been studying enamel since the middle of the 20th century. Most of this research focused on the historical record of living creatures. In the new study, Ahlberg and his team also used a new kind of science: genomics. It is the study of genetic information stored in DNA.

A Substance Very Similar To Enamel

The scientists studied the genes of the gar. They found that the fish has the genes for two of the three building blocks for enamel. These genes are part of the blueprint for the gar's scales.

This indicated that ganoine, the substance coating the fish's scales, was very similar to the enamel found on teeth. Ahlberg said that by looking at the fish's genes, he and his team concluded that ganoine "was, indeed, enamel."

Having shown that ganoine is enamel, the team then looked at records of ancient fish to determine how long ganoine has been in fishes' scales. They examined the *Psarolepis* from China and the *Andreolepis* from Sweden, two fish that are over 400 million years old. In *Andreolepis*, only the scales showed signs of enamel. In *Psarolepis*, even though some of the fish's scales carried enamel, the teeth did not.

Study Suggests Enamel First Appeared In Fish Scales

Ahlberg explained that these are two of the earliest known bony fishes. "The fact that they both lack tooth enamel is thus highly significant," he said. It suggests that enamel most likely did not first appear in teeth. Rather, it probably first appeared in scales.

Ahlberg and his team plan to continue researching both genes to better understand the history of how animals evolved.

He noted that this history includes many surprises. The new study shows that tissue that develops in one part of the body can spread to other parts of the body and take on new jobs.