

# Stomach bugs in ancient corpse teach scientists about human migration

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TOP: Ötzi the Iceman on a sheet-covered autopsy table. MIDDLE: A portrait reconstruction of the Iceman by Thilo Parg. BOTTOM: Naturalistic reconstruction of Ötzi by Thilo Parg, Courtesy of South Tyrol Museum of Archaeology.

Ötzi the legendary “Iceman” was mummified on a glacier 5,300 years ago. He wasn't entirely alone. With him were gut bacteria known to cause some serious tummy trouble.

## Genome Of A Germ

These bacteria, *Helicobacter pylori*, are providing new evidence about Ötzi's diet and poor health. Intriguingly, they could also help scientists better understand who his people were and how they came to live in the region.

One of these scientists is Albert Zink, who studied Ötzi. “When we looked at the genome of the Iceman's *H. pylori* bacteria, we found that it's quite a virulent strain,” he says. “In modern patients it can cause stomach ulcers, gastric carcinoma and some pretty severe stomach diseases.”

Ötzi “probably had a quite severe *H. pylori* infection in his stomach,” Zink adds. However, there is not enough evidence to determine “how much he really suffered.”

## **A Wealth Of Information**

Discovered in the 1990s, Ötzi lived in what are today the Eastern Italian Alps, where he was naturally mummified by ice after his violent death. The body is astonishingly well preserved. It has provided scientists with a wealth of information about the Iceman's life and death during the Copper Age.

For instance, various examinations have revealed his age, how he died, what he wore and what he ate. Scientists know he suffered from heart and gum disease, among other illnesses. His genome has been studied, relatives have been found and his 61 tattoos have been mapped.

The latest discovery adds to knowledge about the Iceman's health woes, and also offers hints about human migration patterns into Europe. The *H. pylori* bacteria are frequently found in human stomachs. As a result, their development into different strains can be used to help reconstruct migration patterns.

## **Spread Of Bacteria, And Languages**

Global patterns of *H. pylori* strains have already been found to match existing evidence of ancient human migrations. For example, scientists have studied bacteria found in the people of the Pacific. The spread of the bacteria mirrors the way different languages spread across this vast region.

To study the Iceman's gut bugs, Zink first completely thawed the mummy. Then he took 12 samples from the corpse, including the last foods he ate and parts of his organs.

What he found was a surprisingly pure strain of the stomach bug. It's closely related to the version found in modern Asian populations. By contrast, the modern European strain of *H. pylori* seems to be a mix of ancient Asian and African strains. This suggests that pure African strains of the bacteria arrived in Europe only within the past few thousand years.

## **Waves Of Migration**

"It was believed that the mixture of the ancestral African and Asian strains had already occurred maybe 10,000 years ago," Zink says. But his analysis tells a different story.

The Iceman's unmixed stomach bacteria are consistent with recent studies, said co-author Yoshan Moodley. They suggest that major migrations into Europe took place "shortly after the Iceman's time."

Moodley said that these migration waves introduced new strains of *H. pylori* to Europe. Eventually, these strains "recombined with already present strains to become the modern European population."

More than 10 years ago, scientist Daniel Falush published a study about *H. pylori* strains. His paper suggested that ancient strains originally arose individually in Africa, Central Asia and East Asia. Falush argued that modern strains were created when these ancient strains mixed through human migrations.

### **Prediction Proven Correct**

Back in 2003, scientists made this sort of "wild claim" that European *H. pylori* were mixed from one Asian source and one African source, Falush says. "That was thought to be quite a funny thing for bacteria at the time," he notes.

"But now they've gone back more than 5,000 years in time and found that Ötzi had bacteria that's nearly purely representative of that Central Asian strain." The prediction that later bacteria were mixed seems to be correct, he says.

### **"Why Was It Successful?"**

The question now is how the ancestral African strain arrived in Europe, Falush adds. "We originally guessed it was during the Neolithic migration," he says. That happened around 9,000 years ago. "But it appears that was wrong, because this genome says it probably happened within the past 5,000 years."

Once it arrived, the African strain must have been particularly successful, since it spread right through Europe, he adds. "But it's far from obvious why an African bacterium would spread this way. Why was it successful, and what were the patterns of contact between people?"

These are exactly the kinds of mysteries scientists continue to explore. They hope future studies of the Iceman, and his gut bacteria, might help solve them.