Ancient plague genomes reveal the origins of the Black Death

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In 1347, plague first entered the Mediterranean via trade ships transporting goods from the territories of the Golden Horde in the Black Sea. The disease then disseminated across Europe, the Middle East and northern Africa claiming up to 60% of the population in a large-scale outbreak known as the Black Death. This first wave further extended into a 500-year-long pandemic, the so-called Second Plague Pandemic, which lasted until the early 19th century.

The origins of the Second Plague Pandemic have long been debated. One of the most popular theories has supported its source in East Asia, specifically in China. To the contrary, the only so-far available archaeological findings come from Central Asia, close to Lake Issyk Kul, in what is now Kyrgyzstan. These findings show that an epidemic devastated a local trading community in the years 1338 and 1339. Specifically, excavations that took place almost 140 years ago revealed tombstones indicating that individuals died in those years of an unknown epidemic or "pestilence." Since their first discovery, the tombstones inscribed in Syriac language, have been a cornerstone of controversy among scholars regarding their relevance to the Black Death of Europe.

In their study published in *Nature*, an international team of researchers analyzed ancient DNA from human remains as well as historical and archaeological data from two sites that were found to contain "pestilence" inscriptions. The team's first results were very encouraging, as DNA from the plague bacterium, Yersinia pestis, was identified in individuals with the year 1338 inscribed on their tombstones. "We could finally show that the epidemic mentioned on the tombstones was indeed caused by plague," says Phil Slavin, one of the senior authors of the study and historian at the University of Sterling, U.K.

Researchers find Black Death's source strain

But could this have been the origin of the Black
Death? Researchers have previously associated the Black Death's initiation with a massive diversification of plague strains, a so-called Big Bang event of plague diversity. But the exact date of this event could not be precisely estimated, and was thought to have happened sometime between the 10th and 14th centuries.

The team now pieced together complete ancient plague genomes from the sites in Kyrgyzstan and investigated how they might relate with this Big Bang event. "We found that the ancient strains from Kyrgyzstan are positioned exactly at the node of this massive diversification event. In other words, we found the Black Death's source strain and we even know its exact date [meaning the year 1338]", says Maria Spyrou, lead author and researcher at the University of Tübingen.

"We found that modern strains most closely related to the ancient strain are today found in plague reservoirs around the Tian Shan mountains, so very close to where the ancient strain was found. This points to an origin of Black Death's ancestor in Central Asia," explains Johannes Krause, senior author of the study and director at the Max Planck Institute for Evolutionary Anthropology.

The study demonstrates how investigations of well-defined archaeological contexts, and close collaborations among historians, archaeologists and geneticists can resolve big mysteries of our past, such as the infamous Black Death's origins, with unprecedented precision.


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