

Tales from the crypt: Mummies reveal TB's Roman lineage

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This photomicrograph reveals Mycobacterium tuberculosis bacteria using acid-fast Ziehl-Neelsen stain; Magnified 1000 X. The acid-fast stains depend on the ability of mycobacteria to retain dye when treated with mineral acid or an acid-alcohol solution such as the Ziehl-Neelsen, or the Kinyoun stains that are carbolfuchsin methods specific for M. tuberculosis. Credit: public domain

Samples from mummies in a Hungarian crypt have revealed that multiple tuberculosis strains derived from a single Roman ancestor that circulated in 18th-century Europe, scientists said Tuesday.

Their findings, published in the journal *Nature Communications*, drew on a remarkable, if gruesome, source.

In 1994, workers restoring a Dominican church in Vac, Hungary, stumbled upon the remains of more than 200 people whose corpses had become naturally mummified.

The individuals, many of them wealthy Catholics, had been placed fully clothed in coffins in the church crypt just north of the capital Budapest between 1731 and 1838.

A microclimate of exceptionally dry air prevented the bodies and garments from rotting.

In many cases, the individuals' names and details about their death were available from records—making it a treasure trove for epidemiologists with valuable clues about how diseases spread in earlier times.

The researchers extracted samples from 26 of the Vac bodies with markers for TB infection. Eight yielded a sample good enough to enable genetic sequencing of *Mycobacterium tuberculosis* germs.

What emerged is a tableau of a disease that fully lives up to its reputation in folklore.

TB was raging in 18th-century Europe, even before urbanisation and crowded housing made it a killer on a much greater scale, the investigators found.

M. tuberculosis was first described in 1882 by the German microbiologist Robert Koch.

TB, or consumption as it was then called, killed one person in seven,

Koch wrote.

"Microbiological analysis of samples from contemporary TB patients usually report a single strain of tuberculosis per patient," said Mark Pallen of the University of Warwick medical school in central England, who led the new probe.

"By contrast, five of the eight bodies in our study yielded more than one type of tuberculosis—remarkably, from one individual, we obtained evidence of three distinct strains."

All the samples carried a genetic signature of a notorious tuberculosis strain called Lineage 4, which today accounts for more than a million TB cases every year in Europe and the Americas.

By building a family tree of the germ, the team dated the bacterial ancestor to the late Roman period.

"(It) confirmed the genotypic continuity of an infection that has ravaged the heart of Europe since prehistoric times," said Pallen.

The Roman dating supports recent scientific estimates that tuberculosis first emerged about 6,000 years ago.

Other experts had suggested that it spread to humans tens of thousands of years ago.

Eerie find

Walled up and forgotten for about 150 years, the coffins were discovered when a construction worker tapped on a wall during renovation work 21 years ago. When he found the wall was hollow he removed a brick to investigate.

Part of the wall gave way to reveal coffins, many decorated with skulls, stacked from floor to ceiling.

They were found to contain 265 mummified former denizens of Vac, from priests to ordinary townsfolk.

Mummification may have been aided by wood chips placed in the bottom of the coffins, which absorbed bodily fluids, and a natural anti-microbial agents in the pine resin in the coffins.

The mummies are housed at the Hungarian Natural History Museum, which took part in the study.

Previous research, based on marks on the mummies' bones left by TB infection, found that incidence of the disease in Vac surged from about 1760.

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