

Child Mummy May Change Timeline for Smallpox

By ACSH Staff — December 9, 2016



Kiril Cachovski of the Lithuanian Mummy Project, 2015

By Katherine Gammon

(Inside Science) -- Sometime in the mid-1600s, a small child died. Because the child was part of the noble class, the remains were placed in a crypt in the Dominican Church of the Holy Spirit in Vilnius, Lithuania. Many of the remains in that crypt decomposed, but some -- like the child -- were naturally mummified by the low humidity and low temperature conditions.

Now that small body is telling secrets about one of the deadliest scourges to ever plague mankind. That's according to a new report published yesterday in the journal [Current Biology](#)^[1], providing clues about the origins and spread of smallpox -- all due to tissue samples from the mummified remains of one of its tiniest victims.

"When most people think about mummies, they think about Egypt," said Ana Duggan, a postdoctoral fellow in the McMaster Ancient DNA Centre, part of McMaster University in Ontario, Canada. But the chemicals used in ancient Egypt make it nearly impossible to extract DNA from remains. In the Vilnius crypt, the conditions were ideal for preserving genetic material.

Tissue samples from the Lithuanian child were sent to the McMaster Ancient DNA Centre. Researchers were originally looking for a virus called polyoma. They were surprised to find that the samples contained a small number of fragments of variola virus -- the genetic remains of infection with the virus that causes smallpox.

The researchers were able to capture and sequence the viral DNA, allowing them to reconstruct one of the oldest viral genomes in the world. Although the smallpox virus in the sample was highly fragmented and deteriorated, the lab still had to gain permission from the World Health

Organization to get permission to continue with their work. There are only two labs in the world with live virus samples of smallpox -- one in the United States and one in Russia.

The team mapped the ancient virus to a 20th-century strain, and found another surprise: The two strains had less genetic diversity than expected, finding a recent common ancestor around 1580.

Conventional wisdom had placed the emergence of smallpox at around 10,000 years ago -- alongside the rise of agriculture and the jump in populations. Rashes suggesting smallpox had been found on Egyptian mummies, for example. Duggan said the new data don't necessarily make the 10,000-year time frame incorrect, but they do raise questions: "It does seem to suggest that there is less genetic diversity that you might assume if disease had been around with millennia." She said, for example, that the rashes on mummies could have been due to chicken pox or measles.

Anne Stone, an anthropologist at Arizona State University, said that with viruses that have been largely eradicated like smallpox, ancient DNA data helps scientists understand the diversity of viral strains in the past. This is particularly important since by the time scientists started collecting strains for study in the 20th century, most of the diversity of the virus was perhaps already extinct. "Getting the larger picture of the diversity of a pathogen, as well as the pressures caused by vaccines or antibiotics, helps us understand the evolution of the pathogen," she said. "Smallpox has not been well studied in terms of population genetics just because there are few strains that are still being maintained (and that in and of itself is controversial)."

Smallpox, which had no animal host, relied solely on person-to-person transmission. The major form of the virus often killed 35 percent of the people who contracted it and ravaged populations, killing as many as 300 million people during the 20th century alone. After a vaccine was first introduced in 1796, the virus again changed, splitting into [two forms](#) [2], variola major and variola minor. Stone said this is the part of the study she finds most interesting -- the impact of vaccination as well as global trade travel on viral diversity.

After giant global efforts to halt the so-called red plague throughout the 19th and 20th centuries, the Global Commission for Certification of Smallpox Eradication reported that the disease had been eradicated Dec. 9, 1979.

Three decades ago, [Ann Carmichael](#) [3], a historian who specializes in epidemiology, wrote a paper suggesting that smallpox might have a later evolution than previously thought.

"At the time, I had just started doing archival research on causes of death during the late medieval renaissance era, and I couldn't find smallpox," which was strange, she said. "If smallpox is present, and it's variola major, you should see epidemics."

Carmichael, who was not involved in the new research, said she was impressed at how the study delved into the new field of archeogenomics. Historians poring over texts have to make scientific guesses about pathology based on fuzzy data, but new methods offer a better way. "It seems to be a race among major teams looking for a better picture, a clearer snapshot of our human past in history and prehistory," she said.

[Dr. Inger Damon](#) [4], director of the Centers for Disease Control and Prevention's Division of High-

Consequence Pathogens and Pathology, in Atlanta, agreed that the report shows advances in methods to obtain genomic information from ancient tissue samples. “The authors have a number of useful insights about the application of molecular dating methods and how they might apply to zoonotic diseases,” said Damon, who was not involved in the study.

It turns out, mummies are useful sources of biological material. Mummies in the Vilnius crypt were also found to have tuberculosis, hardened arteries and parasites. The crypt itself has a strange history: It was the topic of town folklore starting in the 19th century, was explored by university students in the 1930s, was used as a bomb shelter by locals during World War II, and was eventually analyzed by a forensic scientist -- who was also a spy -- in 1963, according to [Dario Piombino-Mascali](#),^[5] Visiting Researcher in Biological Anthropology at Vilnius University and a co-author of the new paper.

The researchers still don't know for sure what killed the mummified child. Duggan said that the remains had no telltale rash, so the smallpox might have been a new infection or an old one that the child survived. Variola is unique because it has such a history with human populations, but researchers know remarkably little about where it came from or when it jumped into human populations, said Duggan. The mysteries of the virus may continue into the next century.

This [article](#)^[6] was originally published at [Inside Science](#)^[7].

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[2] https://www.eurekalert.org/pub_releases/2016-12/mu-sot120216.php

[3] <http://www.indiana.edu/~hpscdept/people/carmichael.shtml>

[4] <http://www.cdc.gov/media/spokesperson/damon/index.html>

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