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Ancient Egyptian mummies give up the last of their secrets

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Our group together with an international team of scientists successfully recovered and analyzed ancient DNA from Egyptian mummies dating from approximately 1400 BC to 400 AD, establishing ancient Egyptian mummies as a reliable source for genetic material to study the ancient past. The study, published in Nature Communications, found that modern Egyptians share more ancestry with Sub-Saharan Africans than ancient Egyptians did, whereas ancient Egyptians were found to be most closely related to ancient people from the Near East.

Ancient Egypt conjures up images of pyramids and pharaohs, vast deserts and the lush Nile River. Egypt has long been an area of intense study, with a rich and well-documented history that has been exhaustively studied through archaeology. Monumental architecture, lavish tombs, beautiful hieroglyphic texts -- these have all contributed to our modern understanding of, and fascination with, Ancient Egypt. However, for understanding the people that created this ancient culture and their genetic relationship to other populations one important component has been missing - reliable ancient DNA.

Ancient Egyptian mummies could provide a source for the retrieval of ancient DNA, though genetic studies of these mummies have been hampered by bad preservation and contamination with modern human DNA. Although some of the first extractions of ancient DNA were from mummified remains, scientists have raised doubts as to whether genetic data, especially nuclear genome data, from mummies would be reliable, even if it could be recovered. The hot Egyptian climate, the high humidity levels in many tombs and some of the chemicals used in mummification techniques contribute to DNA degradation and are thought to make the long-term survival of DNA in Egyptian mummies unlikely. To face the general skepticism regarding the potential preservation of DNA our team used rigorous methods such as strict contamination tests and chemical modifications typical for ancient DNA to ensure that the DNA recovered was authentic.

We sampled 151 mummified individuals from the archaeological site of Abusir el-Meleq, along the Nile River in Middle Egypt. In total, we recovered mitochondrial genomes from 90 individuals, and genome-wide datasets from three individuals. We were able to use the data gathered to test previous hypotheses drawn from archaeological and historical data, and from studies of modern DNA.

In particular, we were interested in looking at changes and continuities in the genetic makeup of the ancient inhabitants of Abusir el-Meleq. We tried to determine whether the repeated conquests and domination by Alexander the Great and other foreign powers, including the Romans, Arabs, and Assyrians, had made an impact on the genetic structure of the ancient Egyptian population. Surprisingly, the Abusir el-Meleq community did not undergo any major genetic shifts during the 1,300 year timespan studied, suggesting that the population remained genetically relatively unaffected by foreign conquest and rule.

The study also found that ancient Egyptians were most closely related to contemporaneous ancient populations in the Levant, and were also closely related to even older populations from the Anatolian Peninsula and Europe. The data shows that modern Egyptians share approximately 8% more ancestry on the nuclear level with Sub-Saharan African populations than the ancient Egyptians.

This suggests that an increase in Sub-Saharan African gene flow into Egypt occurred within the last 1,500 years. Possible causal factors may have been improved mobility down the Nile River, increased long-distance trade between Sub-Saharan Africa and Egypt, and the trans-Saharan slave trade that began approximately 1,500 years ago.

The success of this study countered prior skepticism about the possibility of recovering reliable ancient DNA from Egyptian mummies. The use of high-throughput DNA sequencing and robust authentication methods enabled us to overcome the potential issues of degradation and contamination caused by climate and mummification methods as well as to ensure the ancient origin and reliability of the data. The study thus shows that Egyptian mummies can be a reliable source of ancient DNA, and can greatly contribute to a more accurate and refined understanding of Egypt's population history.