Separating Neandertal DNA from modern human contamination

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Retrieval of ancient DNA molecules is usually performed with special precautions to prevent DNA from researchers or the environment to get mixed in with the DNA from the fossil. However, many ancient fossils have been lying in museum collection for decades, and are contaminated with present-day human DNA before they enter the DNA-laboratory.

A new method presented in the online edition of the journal *PNAS* this week provides a solution to this problem. A statistical model for how degradation can be detected in DNA sequences is shown to be able to isolate DNA from ancient bones even when it is vastly outnumbered by modern-day DNA contamination—not in the laboratory, but in the computer.

"Many extremely interesting DNA data sets from ancient humans never see the light of day because of contamination. The idea behind this method was to change that", says Pontus Skoglund, lead author of the study and PhD in evolutionary genetics at Uppsala University.

To apply the method on a real-world fossil, Pontus Skoglund and his supervisor Mattias Jakobsson, professor at the Department of Evolutionary biology at Uppsala University and senior author of the study, teamed up with Johannes Krause and Svante Pääbo at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, who had a sequenced mitochondrial DNA from a Neandertal bone from Okladnikov cave in the Altai mountains in Siberia, but found that there was also modern human DNA in the bone. Application of the new

method allowed the modern human DNA to be removed, and the complete mitochondrial genome of the Okladnikov individual showed that it was closely related to other Neandertals in Europe.

The drawback currently is that the DNA must be at least a thousand years old to allow separation from modern-day DNA, so studies of recent historical individuals still face many challenges.

"There are many really interesting ancient human remains that we can rescue from severe contamination with this method. And the method is not limited to Neanderthals, even remains of anatomically modern humans that are contaminated by modern-day humans can be rescued", says Mattias Jakobsson.

More information: Separating endogenous ancient DNA from modern day contamination in a Siberian Neandertal. Skoglund, P.; Jakobsson, M.; Northoff, B.H.; Pääbo, S.; Krause, J.; Shunkov, M.V.; Derevianko, A.P; *PNAS* Online Early Edition the week of Jan 27, 2014. www.pnas.org/cgi/doi/10.1073/pnas.1318934111

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