Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19715

Mineralogical Controls over aDNA Recovery from Cave Sediments

FLORIAN EXLER[1], DANIEL M. FERNANDES[1], RICHARD KIMBER[1], VICTORIA OBERREITER[1], SUSANNA K. SAWYER[1], NARESH KUMAR[2], RON PINHASI[1] AND STEPHAN M. KRAEMER[1]

[1]University of Vienna

[2]Wageningen University

Presenting Author: flo.exler@univie.ac.at

The discovery that ancient DNA (aDNA) can survive for as long as two million years[1], has enabled us to study the origins of our early ancestors and to reconstruct ancient ecosystems. Sediments have emerged as a promising source of ancient mammalian DNA, including ancient human DNA, enabling the recovery of aDNA in the absence of observable skeletal material.[2] This offers the exciting opportunity to extract aDNA without the destructive sampling of precious skeletal material and to expand our investigation into the geographical distribution of ancient humans and animals to sites where no macroscopic skeletal material is preserved. A promising source of sedimentary aDNA are sediments from karst caves as these are relatively closed geochemical systems that served as refuges for both ancient humans and animals.

However, the source of aDNA within sediments, and the mechanisms controlling long-term aDNA preservation, are poorly understood. Though model systems have been established in the lab, the complexity of a sediment and the long term effects on DNA stability are hard to reproduce. This results in an untargeted approach to aDNA extraction from sediments, limiting the efficiency of the processes and potentially resulting in loss of valuable genetic information.

In this study, we focused on sediments from three geographically distinct caves with known human and/or mammalian activity. We investigate the relationship between sediment physico-chemical properties and aDNA recovery across these different sites. aDNA was extracted and analysed from a range of samples from each site using mitochondrial mammalian DNA capture. Additionally, sediment samples were thoroughly characterized in order to identify sediment physico-chemical characteristics that exert controls over aDNA recovery or absence. Our experimental data provides new insights into the relationship between sediment properties and their potential for aDNA extraction and analysis. Such information will enable a more targeted approach to the analysis and recovery of aDNA from sediments, that will result in better aDNA extraction yields and potentially the recovery of well preserved fragments which will in turn increase the amount of genetic information we can recover.

[1] K.H. Kjær et al. (2022), *Nature* 612, 283–291.

[2] V. Slon et al. (2017), *Science* 356, 605–608.