Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18541

Characterization of archaeological sediments to facilitate the *a priori* selection of samples for ancient DNA analyses

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The recovery of ancient DNA (aDNA) from sediments deposited at archaeological sites has been shown to be a promising alternative approach to sampling skeletal remains for palaeogenetic investigations (e.g., Slon et al 2017; Gelabert et al., 2021; Vernot et al., 2021). Yet, the source of the DNA fragments in sediments, and the factors that lead to their preservation over time, remain poorly understood. As a result, sample selection in the field tends to be mostly haphazard, contributing to the wide variation in the success of aDNA recovery from archaeological sediments.

We propose a novel approach to field sampling of sediments, to improve the speed and efficiency of screening samples for aDNA analysis. Our approach leverages the characterization of sediments via X-ray fluorescence (XRF) - a non-destructive analytical technique used to determine the elemental composition of materials. Our goal was to build a model by which the elemental composition of the sediment, that can be rapidly assessed in the field using a portable XRF scanner, is used to predict the presence and yields of ancient DNA fragments. The approach was tested on sediment samples collected at several archaeological sites in the southern Levant, differing from each other in terms of context (e.g., environmental parameters, type of site), as well as in the extent of aDNA preservation in them. Preliminary results suggest that considering the elemental composition of sediments while collecting samples in the field could lead to significantly higher success rates of aDNA recovery.

Acknowledgements:

This study is funded by the John Templeton Foundation (grant #62571 to V.S.)

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