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Original article

Identifying archaeological leather – discussing the potential of grain pattern analysis and zooarchaeology by mass spectrometry (ZooMS) through a case study involving medieval shoe parts from Denmark

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ABSTRACT

In this paper, two species identification methods are compared and discussed based on a case study of medieval archaeological leather shoe parts from the Danish cities of Ribe, Viborg and Odense. The species identifications are performed by both morphological grain pattern analysis using stereomicroscopy and zooarchaeology by mass spectrometry (ZooMS), which identifies species based on small structural differences in collagen type I, creating unique fingerprints of genera and in some cases species. Of the 105 shoe parts analysed and sampled, only 37 shoe parts were found to have preserved grain patterns. Grain pattern analysis was in some cases complicated by the lack of hair holes, degraded grain and the presence of soil particles. The varying morphological appearance and condition of the grain patterns are demonstrated through a series of stereomicroscope colour photos at 10x enlargement. The microscope photos reveal considerable complexity and variety in the morphological appearance of the decayed archaeological leather in comparison with well-preserved modern leather. The colour photo examples of the grain pattern and ZooMS-identified leather may help to improve the grain pattern analysis of archaeological leather in future. Where grain patterns were preserved, a good correlation between the two methods was observed. ZooMS had a high overall success rate and has a large potential for species identification of archaeological leather. In the cases where grain pattern analysis was problematic, ZooMS was found superior for species identification. Even though grain pattern analysis had a lower success rate, in a few cases it did produce results at a higher taxonomic level than ZooMS identification. Moreover, grain pattern analysis provided additional contextual information. In conclusion, an interdisciplinary approach is recommended for conservators, archaeologists and other researchers of cultural heritage wishing to find the most potential way to identify different species. The identification method used should be tailored to suit each given archaeological leather assemblage depending on the degree of preservation, object type and context of the material in question, as well as the available expertise, time and budget.

1. Introduction

Leather (i.e. processed and tanned animal skin and hide) has been utilised for various purposes such as clothing, shoes, belts, rims, boats, furnishing throughout history. Leather thus provides evidence of various aspects of human activities, needs, preferences, evidence of leather-making technology and the exploitation of the animal resources available [1]. The raw material chosen for all these purposes depends on availability, the transformation process involved in turning animal skins or hides into final leather products, the purpose of the object in question and possibly fashion and taste [2]. Consequently, the ability to identify the animal species used in archaeological leather is an essential aspect of post-excavation conservation and reporting, including the interpretation of the objects found and their context and further research.

Various methods have been used for the species identification of leather, one of the earliest being morphological analysis of the grain pattern on the surface of the leather. Grain pattern

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