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Archaeological Wool Textiles Investigated by Proteomics

Since the origins of sheep domestication and sheep breeding, wool has been categorised for its quality traits, such as fineness, strength, and crimp. Key parameters include fibre diameter and curvature, which influence the spinning capability and the cohesion of fibres. Changes in the types and qualities of wool available at different periods in different regions have been plotted both by archaeologists working on the excavated textiles and by historians researching documentary sources. Archaeologists have been using the distribution of fibre diameters to classify wool into fleece types, but this analysis can barely describe the 50 or more wool grades found in historical records. This analysis is made even more complicated by the processing of wool and by the archaeological context that affect the physical and chemical properties of the fibres.

Wool is composed of > 90% protein; its proteome contains different types and families of proteins of which the relative proportions determine the structure and properties of the fibres. Proteomics attempts both qualitative and quantitative comparisons of the protein composition of the wool fibres themselves. We demonstrate here that new proteomics based tools can help to study ancient textiles in different ways. We (i) assess the potential of proteomics to discriminate ancient wool fibres, (ii) examine the impact of processing and dyeing on the fibre proteome (and the effect that these processes may have on diagenesis), (iii) assess the extent to which use history and burial governs changes in the fibre proteome.

- (i) This study is aimed at creating proteome maps for selected breeds and highlighting the differentiation in the protein composition. Significant progress has been made towards complete coverage of the protein sequences composing sheep wool. The development of the wool protein database makes proteomics tools such as mass spectrometry (MS) highly suitable for the study of the wool properties. Significant differences in the distribution and expression of proteins are apparent when ancient sheep breeds such as Soay and North Ronaldsay are compared to Merino. The results will be linked to fibre types and wool quality that will be compared to historically documented fibre types and archaeological textiles from major textile centres and regional markets.

- (ii) We explore the potential impact of diagenesis on ancient proteomes using artificial degradation of experimentally dyed wools by studying the impact of photodegradation and discoloration on wool in the presence of dyes, and in association with mordants.

- (iii) We evaluate chemical deterioration and biodegradation on wool, dyed and undyed, experimentally buried for a certain number of years.

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