



## Identifying trace amounts of brain-tissue-specific proteins in emulsion cured animal skins

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Multiple cultures around the globe – from the Tungus people in NE Asia to the Zulus in South Africa, as well as those in North and South America use the ancient technique of emulsion (organ) curing for leather. Touching five continents, emulsion curing demonstrates a cross-cultural desire for a durable, flexible, water-resistant material. This efficient technique exploits the natural emulsifying agents (lipids), generally from brain/spinal cord, to preserve animal skin against putrefaction. Despite the abundance of emulsion-cured leather worldwide, throughout history, and in museums, there is no scientific method to accurately identify or characterize this complex material. Understanding the mechanisms of deterioration and effects of curing on leather proteins at the molecular level will improve the conservation, storage, and display of these objects.

An extraction protocol and liquid chromatography tandem mass spectrometry (LC-MS/MS) method was developed to distinguish trace amounts of brain tissue-specific proteins from the overwhelming collagen signal from the leather. This was done using minimal sample sizes compatible with irreplaceable cultural heritage collections. This work will describe the challenges of trace protein analysis and the steps for identifying tissue-specific protein markers. The method was used to characterize a 19th century Taiwanese painted leather wall hanging from The Metropolitan Museum of Art (accession #09.3) among others, making it the first 'unknown' object to be definitively identified as brain-cured leather.

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