B173 The Identification of Silk Forgeries

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After attending this presentation, attendees will better understand how to use Capillary Electrophoresis/Mass Spectrometry (CE/MS) to identify naturally aged vs. artificially aged silk.

This presentation will impact the forensic science community by introducing proteomics techniques and explaining how they could be used in forgeries.

Forgery in art and cultural heritage is almost as old as the objects themselves; however, cultural heritage forgery is seldom investigated in forensic settings. The identification of the forgery is similar to the forensic analysis of documents, inks, and paints and similar to age identification of proteinaceous specimens, such as hair or teeth. In this presentation, one of the most famous cases of silk forgery in the United States will be discussed as will the analytical techniques developed and used to identify the real and forged specimens. Forgery identification includes the identification of the materials, dyes, and age of the specimens.

In 1924-1925, a number of medieval Islamic silks were excavated from tombs at a site called Bibi Shahrbanu near Rayy, Iran. Although these silks were not necessarily all from the Buyid dynasty, as a collective they are referred to as the "Buyid" silks as they are thought to be from that approximate time period. Additional pieces surfaced in the 1940s, but doubts arose regarding the authenticity of some of the fragments, which led to discussions among curators, art historians and dealers. Accurate dating of many Buyid fragments has yet to be ascertained.

Recently, several new techniques for dating proteinaceous historical artifacts have been developed using modern separation/mass spectrometry and proteomics techniques.[1] By using these techniques, several biomarkers of natural aging in proteinaceous cultural heritage objects were identified. The dating study is based on racemization and deamidation of amino acids in proteinaceous specimens. CE/MS was used to measure D-amino acid/L-amino acid (D/L) of Aspartic Acid (Asp) and a proteomics technique was employed to measure the deamidation rate of asparagine in silk proteins. To test the authenticity of the Bibi Shahrbanu silk, 12 samples from the Textile Museum in Washington, DC, were analyzed and the change in racemization and deamidation in both authentic and unknown silk samples was compared. These results were also compared to the rate of racemization and deamidation of the artificially aged silk proteins. Modern silk samples were aged using pH, heat, and radiation. Thirteen silk fragments were HCl digested and analyzed by chiral CE/MS and the D/L Asp was measured. For the deamidation study, these samples were enzymatically digested and analyzed by proteomics techniques. Two of the fragments that were originally purchased by the museum were among these samples. One of these fragments was carbon dated and used as the control. The results were consistent with the skepticism regarding the authenticity of nine fragments and pointed to the possibility that they were artificially aged to look older. The results of this investigation will be discussed.

Reference(s):

1. Moini M., Rollman C., France C. Dating Human Bone; Is Racemization Dating Species Specific? *Anal Chem.* 2013, 85, 11211-5.

Silk Forgery, Proteomics, Racemization Dating