

Indigenous Pharmaceutical Culture in Chinese Medical Archaeology

Jingyu Li

Key Laboratory of Cultural Heritage Research and Conservation, School of Cultural Heritage, Northwest University, Xi'an, China & McDonald Institute for Archaeological Research, Department of Archaeology, University of Cambridge, Cambridge, England

Xue Ling

Key Laboratory of Cultural Heritage Research and Conservation, School of Cultural Heritage, Northwest University, Xi'an, China

Congcang Zhao

Key Laboratory of Cultural Heritage Research and Conservation, School of Cultural Heritage, Northwest University, Xi'an, China

Marcos Martínón-Torres

McDonald Institute for Archaeological Research, Department of Archaeology, University of Cambridge

Xu Cao

Key Laboratory of Cultural Heritage Research and Conservation, School of Cultural Heritage, Northwest University, Xi'an, China

Shuning Huang

Key Laboratory of Cultural Heritage Research and Conservation, School of Cultural Heritage, Northwest University, Xi'an, China

Abstract

Chinese medical archaeology investigates ancient medical knowledge and practices through material remains, examining the associated systems of belief, politics, and concepts of life. This study focuses on China's millennia-old tradition of medicinal ingestion, a practice rooted in Daoism and intertwined with dynastic politics. In medical archaeology, empirical interpretation relies on a robust chain of evidence, which in turn depends on precise scientific analysis.

This study employs multiple analytical techniques, including XPS, FTIR, Raman spectroscopy, and SRS imaging, to systematically investigate medical-related remains from various sites. In the study of Wushi Powder (Five Stone Powder) residues from a Southern Dynasty tomb in Xiangyang, Hubei, a combination of techniques confirmed it as a mineral-plant composite preparation, representing the first scientific evidence of Wushi Powder as such a formulation. Rooted in Daoist external alchemy and later incorporated into Chinese medicine, its formulation with five minerals embodies a uniquely Chinese pharmaceutical philosophy: each mineral possesses its own nature: warming, cooling, neutral, astringent, etc. Used alone, each would disrupt balance, but together they form a balanced system of harmonising cold and heat. At a Daoist temple site from the Song-Yuan period (13th–14th century) on Mount Mao in Jiangsu, flotation combined with XPS and Raman spectroscopy identified PbO (litharge) residues within uniquely shaped pottery vessels characterised by pointed bottoms, thick walls, and wide mouths, confirming them as “Yangcheng jars”, specialised vessels used in Daoist external alchemy for high-temperature mineral processing. Notably, the “ginseng decoction cup” used by Ming dynasty physicians shares the same form, revealing the indigenisation and transmission of Daoist alchemical techniques into mainstream Chinese pharmaceutical practice.

However, these inorganic analytical methods face limitations when dealing with trace, complex organic residues prone to fluorescence interference. To address this challenge, this study introduces Stimulated Raman Scattering (SRS) microscopy. In the analysis of residues on surgical instruments (scissors and tweezers) excavated from the tomb of Xia Quan (1348-1411 CE), a Ming dynasty physician in Jiangyin, Jiangsu, SRS successfully detected characteristic -CN and -CH₂ peaks matching the reference spectrum of aconitine. Combined with historical records showing that Aconitum (Caowu/Chuanwu) was the core