A77 The Role of Stable Isotope Analysis in Forensic Cases From Flagstaff, Arizona

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Learning Overview: After attending this presentation, attendees will better understand the viability of stable isotope analysis in a forensics context, specifically assessing its potential to aid in forensic identification.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by illuminating whether stable isotope analysis has the potential to be used in a forensics context in assisting with identification.

Coconino County, AZ, has a unique forensic profile. Home to a major state university that draws in students from a plethora of other states and countries, the Grand Canyon, which attracts millions of international and national visitors, as well as the Navajo and Hopi Native American reservations, the county handles numerous deaths each year of individuals from varying backgrounds. Those remains obtained by the Coconino County Medical Examiner's Office are often identifiable; however, those that are unable to be forensically identified are kept in storage and constantly reassessed for identification. Historically, analysis of stable isotopes has been a useful tool in various fields, including archaeology, to gain insight into the geological and biological information for both human and faunal remains. Because of the pertinent data regarding migration and diet that can be obtained from stable isotope studies, analysis of various stable isotopes in unidentifiable human remains allows for the building of biological backgrounds that can potentially assist in forensic identification.

Twenty-one femoral and dental samples from unidentifiable human remains were obtained from the Coconino County Medical Examiner's Office and transferred to Northern Arizona University's Paleodiet Lab. Teeth, which form in childhood and adolescence, allow for isotopic studies of the beginning of life, and, due to the remodeling of bones in the body, the isotopic levels from the last decade of life can be researched. Eleven individuals were studied, with six having a paired dental and femoral sample, allowing for the assessment of isotopic values throughout the life course. Additionally, the processing of remains allowed for the verification of provenience information cataloged by the Medical Examiner's Office, including estimated age and sex. Each sample was processed, followed by collagen and carbonate analysis for each femoral sample and carbonate analysis for dental samples. Furthermore, 11 samples were prepared for strontium and lead analysis. Upon obtaining the data from analysis, strontium and oxygen isotope levels were compared with recently developed isoscapes for both the United States and various other states in Western Europe to assess patterns of migration. Trends in carbonate and collagen data were also measured against known literature for dietary patterns of different regional populations in the United States.

The importance of this study's results is multifaceted. Primarily, a check on the accuracy of provenience data collected by the Coconino County Medical Examiner's Office was conducted, updating the records held for each individual. Isotopically, information on dietary patterns and geographic migrations were obtained. Results consistent with dietary patterns of individuals from the Navajo reservation were seen, as well as possible consistencies with Western European diets. Additionally, analysis of regional water intake potentially aided in geographic data obtained for individuals. Furthermore, valuable data regarding the relevance of stable isotope studies in contemporary human studies was seen, as trends in breastfeeding and weaning that are consistent with American trends were confirmed isotopically. With the increase of globalization potentially undermining isotopic studies on contemporary populations, this study demonstrates that there is information that can be gathered that can aid in forensic identifications.

Isotope, Unidentifiable, Identification