A120 Spatial Distributions of Stable Isotope Ratios in Tap Water From Mexico for Region of Origin Predictions of Unidentified Border Crossers

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Learning Overview: The goal of this presentation is to determine the accuracy in a reference database of isotope ratios of tap water from Mexico for predicting region of origin of deceased undocumented border crossers.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by presenting novel approaches and data on regionally different isotopic values from Mexican tap water as a tool to predict region of origin for unidentified foreign nationals who died along the United States-Mexico border.

As part of this larger project, 306 tap water samples from 51 towns and cities were collected throughout Mexico during a six-week period. At least three samples were collected from each locale to evaluate local variation as well as interregional variation within Mexico. Ninety-five hair samples from 30 towns were collected as well. Furthermore, 55 samples from 16 unidentified border crossers currently held at the Pima Country Office of the Medical Examiner in Tucson, AZ, were collected. Samples were analyzed at the Vrije Universiteit Amsterdam (Netherlands) and the Stable Isotope Ratio Facility for Environmental Research/Spatio-Temporal Isotope Analytics Lab (SIRFER/SPATIAL) at the University of Utah using Thermal Ionization Mass Spectrometer (TIMS) and Elemental Analysis-Isotope Ratio Mass Spectrometry (EA-IRMS).

In this presentation, the results of the oxygen and hydrogen isotopic data will be presented. To display the isotopic variation of Mexico, the results were used to create multi-layered isoscapes for the two isotopic elements in the tap water samples using arcGIS®. Furthermore, the isoscapes using oxygen and hydrogen generated from proxy data were compared to the theoretical isoscapes derived from precipitation records and geological maps. This comparison to existing data was used to explore the potential improvement of models that have been developed previously.

The goal is to incorporate the data into a larger network of tap water and human hair isoscapes to establish probability densities for exploring the most probable regions of origins for the deceased undocumented migrants. Therefore, the isotopic results from ten samples of known origin were overlaid with the established isoscapes to test the model and evaluate the accuracy of the predications in the derived isoscapes. The samples consist of ten teeth, five of which are archaeological specimens and five from identified forensic anthropological cases.

Furthermore, this presentation will discuss the challenges in tap water collection in Mexico as well as the use of tap water for the development of isoscapes. This presentation sets the stage for the remaining parts of this research, the development of human hair and tap water isoscapes for a variety of isotopic elements to aid the identification of deceased undocumented migrants. This will be accomplished by presenting a multi-isotope approach that provides sufficient points of reference to narrow the geographic origin of the deceased undocumented migrants. Overall, it is expected that the diligent multidisciplinary approach of forensic anthropology, biochemistry, hydrology, and geostatistics will together provide all the necessary information to ultimately repatriate the remains of the deceased.

Isotope Analysis, Undocumented Border Crossers, Forensic Anthropology