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Evaluating O, C, and N isotopes in human hair as a forensic tool to reconstruct travel

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Oxygen isotope ratios in the proteins of human scalp hair have been proposed and modeled as a tool for reconstructing the movements of humans and evaluating the likelihood that an individual is a resident or non-resident of a particular geographic region. Carbon and nitrogen isotope ratios reflect dietary input and complement oxygen isotope data interpretation when it is necessary to distinguish potential location overlap among continents. The combination of a time sequence analysis in hair segments and spatial models that describe predicted geographic variation in hair isotope values represents a potentially powerful tool for forensic investigations. The applications of this technique have thus far been to provide assistance to law enforcement with information on the predicted geographical travel histories of unidentified murder victims. Here we review multiple homicide cases from the USA where stable isotope analysis of hair has been applied and for which we now know the travel histories of the murder victims. Here we provide information on the robustness of the original data sets used to test these models by evaluating the travel histories of randomly collected hair discarded in Utah barbershops.