



Physical Anthropology Section - 2014

H65 Strontium Isotopes and Geolocation: The Pathway for Identification of Victims in Medellín, Colombia

Kristen Row*, 2046 Plymouth Road, Manhattan, KS 66503; Jonathan D. Bethard, PhD, Boston Univ School of Medicine, Dept of Anatomy & Neurobiology, 72 E Concord Street, L1004, Boston, MA 02118; and Adam B. Hall, PhD, Boston University School of Medicine, 72 E Concord Street, L-1004, Boston, MA 02118

After attending this presentation, attendees will understand the necessity for new ways of identification of victims in Colombia, have a better understanding of strontium isotope analysis, and understand that isotope analysis on modern populations has limitations and that more research is needed.

This presentation will impact the forensic science community by serving as a starting place for future research with strontium isotopes on modern populations.

The goal of this study was to determine if strontium isotope analysis ($^{87}\text{Sr}/^{86}\text{Sr}$) is useful when applied to modern dental enamel samples, specifically from Medellín, Colombia. Strontium isotope analysis has been used extensively in the archaeological literature with only a few studies in the forensic literature. A preliminary study by Juarez was one of the first to use modern samples from Mexico to determine the origin of border crossers.¹ As with that, there is a need for identification of individuals whose remains are found in Colombia, due to the conflict that has taken thousands of lives. Samples for this study consisted of 75 teeth from 61 individuals drawn from the Antioquia Modern Skeletal Reference Collection. This collection was developed to advance the knowledge of the Colombian population by developing standards and validation studies. The dental enamel samples were prepared using the procedures laid out by Balasse *et al.* to remove organics and adsorbed carbonates.² The samples were then transferred to a Thermal Ionization Mass Spectrometer (TIMS) at Boston University in the Earth Science Department, in order to run strontium columns to collect any strontium in the sample and then to run the sample through the TIMS. Standards and blank samples were run along with the study samples to test cleanliness of the equipment. The overall mean ($^{87}\text{Sr}/^{86}\text{Sr}$) for all samples in the study are 0.70739 +/- 0.00159. The samples were grouped by department, but due to the small sample size of many of the departments, the samples were grouped into the department Antioquia and all other samples. The overall strontium ($^{87}\text{Sr}/^{86}\text{Sr}$) mean of Antioquia samples is 0.70746 +/- 0.00174, and Non-Antioquia sample mean = 0.70704 +/- 0.00104. A Mann-Whitney U test, which is the non-parametric equivalent of a *t*-test, determined there is no significant difference between these two groups. The data was divided into samples from the city of Medellín against samples from other cities, or Non-Medellín; these groups have strontium isotope ($^{87}\text{Sr}/^{86}\text{Sr}$) means of 0.70748 +/- 0.00207 and 0.70710 +/- 0.00105, respectively. It was determined that these groups are not significantly different. Overall, the results are inconclusive due to small sample sizes. More samples from other geographic locations in Colombia are needed to accurately sort populations in Colombia. There are numerous factors that affect the strontium isotope signature in teeth, and modernization, specifically imported food and bottled water, has an effect on strontium isotope ratios in dental enamel of individuals. In order for this method to be either disregarded in forensic studies or utilized in forensics, more research with other modern populations needs to be performed.

References:

1. Juarez CA. Strontium and geolocation, the pathway to identification for deceased undocumented Mexican border-crossers: A preliminary report. *J. Forensic Sci* 2008;53(1):46-49.
 2. Balasse M, Ambrose SH, Smith AB, Price TD. The seasonal mobility for prehistoric herders in the southwestern Cape of South Africa assessed by isotopic analysis of sheep tooth enamel. *J Arch Sci* 2002;29:917-32.
-

Strontium, Colombia, Isotopes