

# FORENSIC ISOTOPE ANALYSIS IN COLOMBIA: CAPACITY BUILDING THROUGH RESEARCH AND EDUCATION



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## KEY WORDS

Forensic, Stable isotopes, Colombia, Training, Collaboration

## ABSTRACT

The objective of this Humanitarian and Human Rights Resource Center (HHRRC) funded project is to validate water isoscape predictions of geographic residence history in Colombia using hair samples collected from across the country. The research process has provided additional benefits that include a student exchange and specialized training in isotope sample preparation for the principal investigator (PI). Here we discuss the process and positive impacts of this collaborative work.

## INTRODUCTION

This research focuses on building isotopic reference databases for carbon (C), nitrogen (N), hydrogen (H), oxygen (O), and strontium (Sr) present in the hair of living individuals in Colombia. The aim is to better understand the potential of isotopic ratios from human tissue samples to guide identification efforts for unknown human remains.

The data from this research will assist with the validation of a predictive model developed by EQUITAS using drinking water samples collected across Colombia during a previous research effort also supported by the HHRRC.



Map of Colombia with locations where hair samples were collected in 2023 shaded in green.

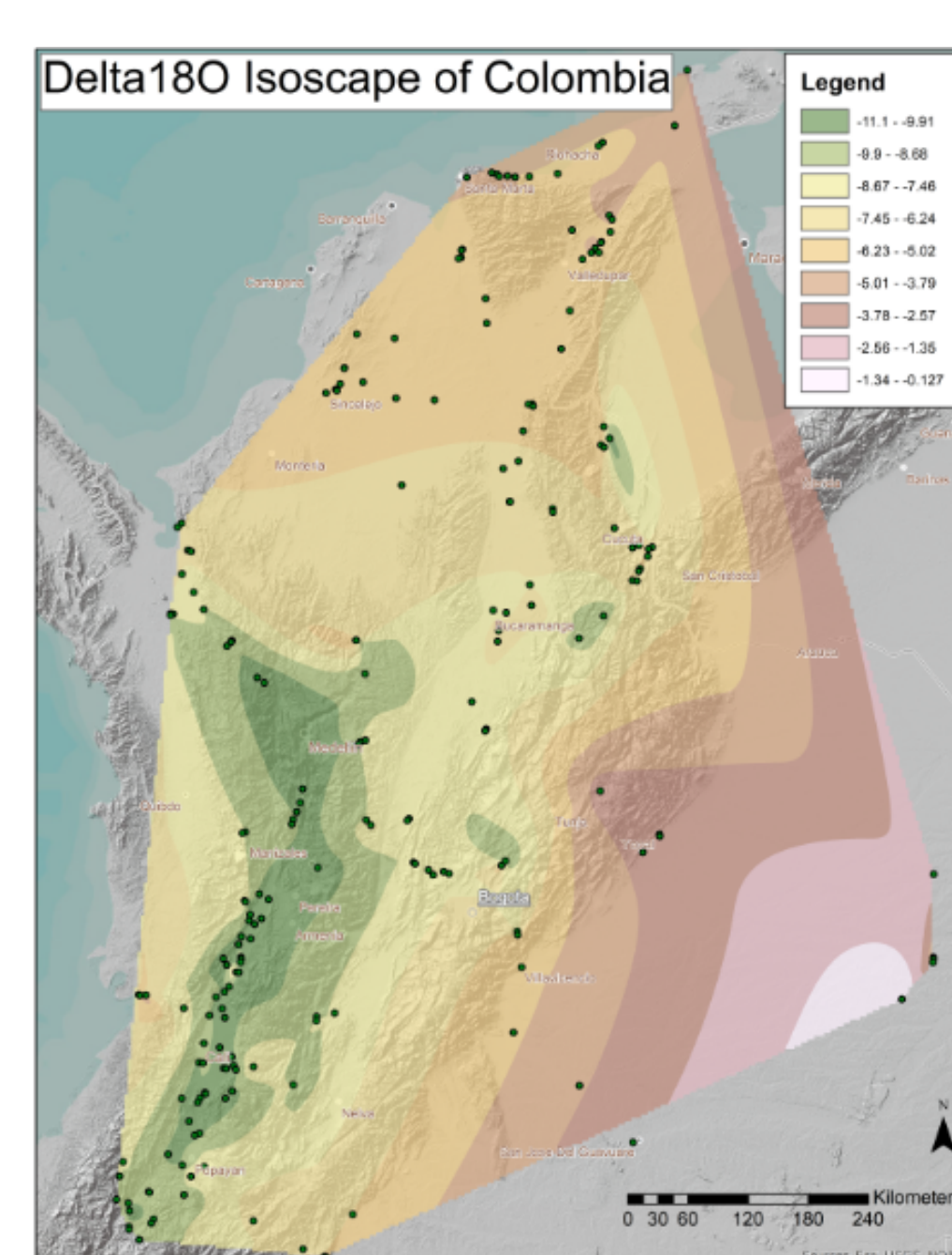
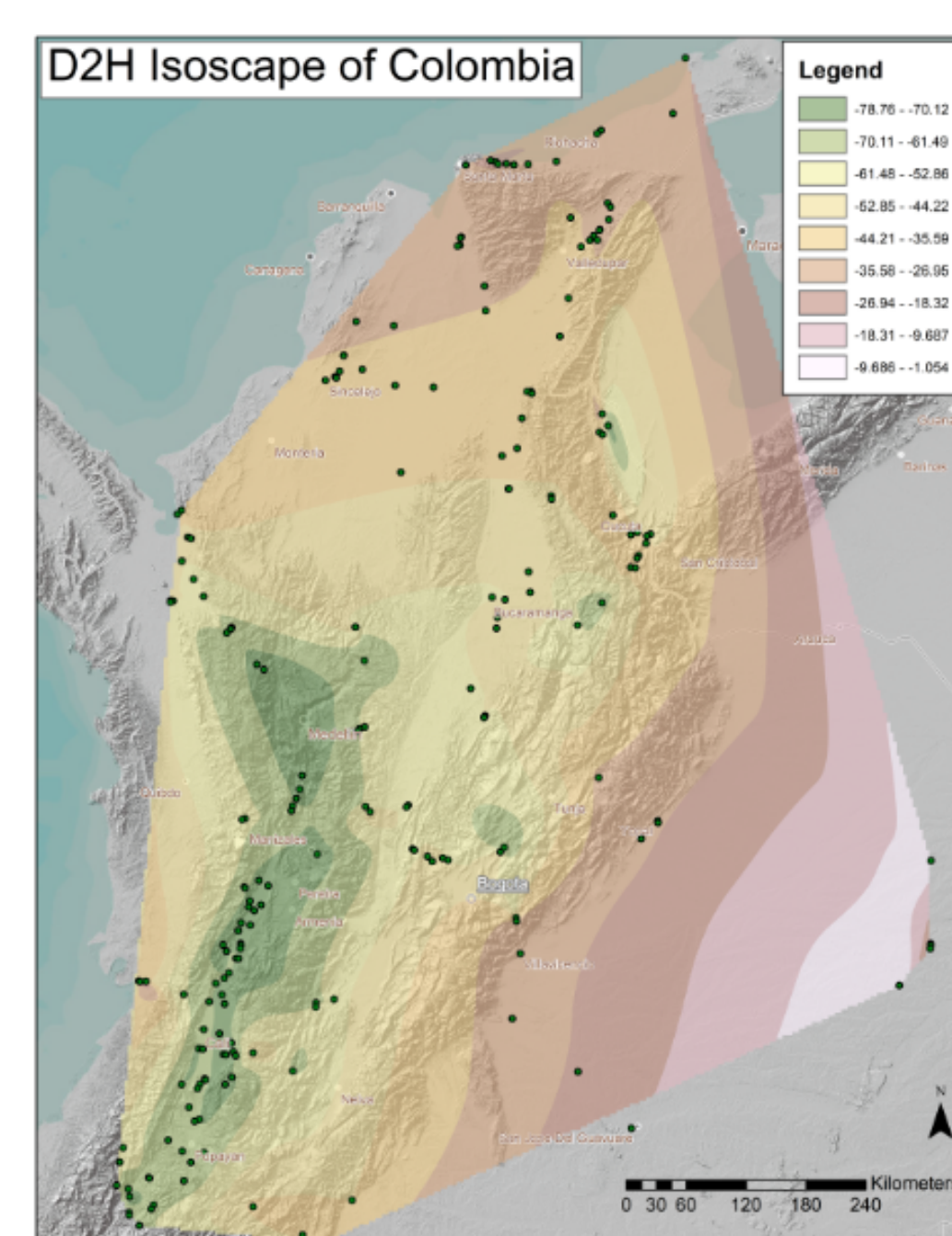


Sample collection process. Image from data collection efforts in Leticia, Amazonas 2023.

## CAPACITY BUILDING AND COLLABORATION

The project has notably allowed the PI to establish a vital network of organizations and practitioners in the forensic field, including HHRRC, Vanderbilt University, EQUITAS, the International Committee of the Red Cross (ICRC), and the University of Granada, contributing to individual and collective development. Successful coordination and collaboration in sample preparation has improved process efficiency for future research.

Collaborative efforts have expanded the project's scope by utilizing the resources and expertise of multiple stakeholders, facilitating quality assurance through information exchange. It is anticipated that reliable and meaningful results will be disseminated in the future that will address issues relevant to human identification processes in Colombia, and more broadly other locations globally that have been impacted by displacement and violence.



Examples of preliminary hydrogen and oxygen isoscapes developed by EQUITAS

## RESEARCH METHODS

Hair samples were obtained from donors representing diverse geographical areas within the country. Study participants provided information about residence and travel history, basic medical information, dietary habits, and drinking water sources consumed regularly by answering questions on a written survey.

The hair samples were prepared for analysis at Vanderbilt University during a visit by the PI to the university for training. Following analysis, the results will be compared with the water isoscapes generated by EQUITAS.

## EDUCATION

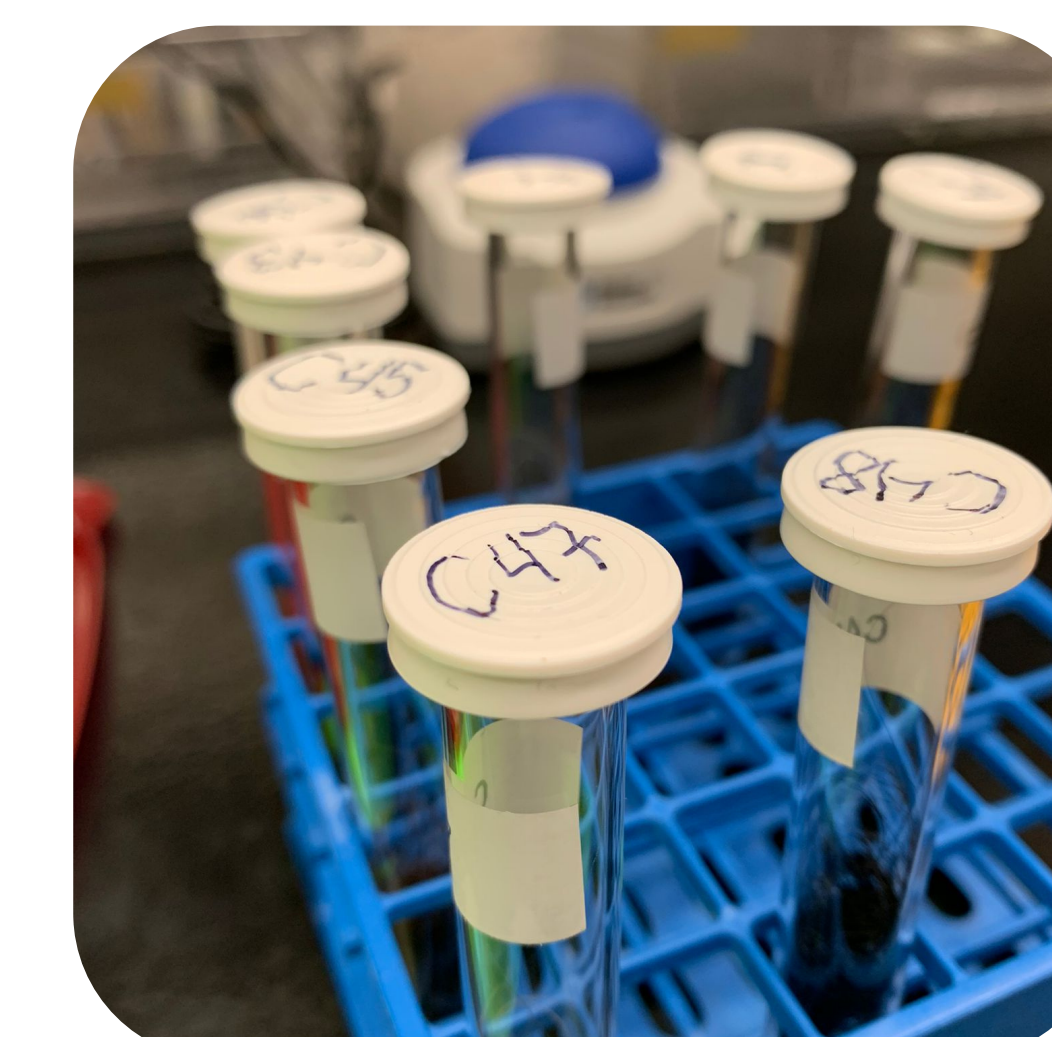
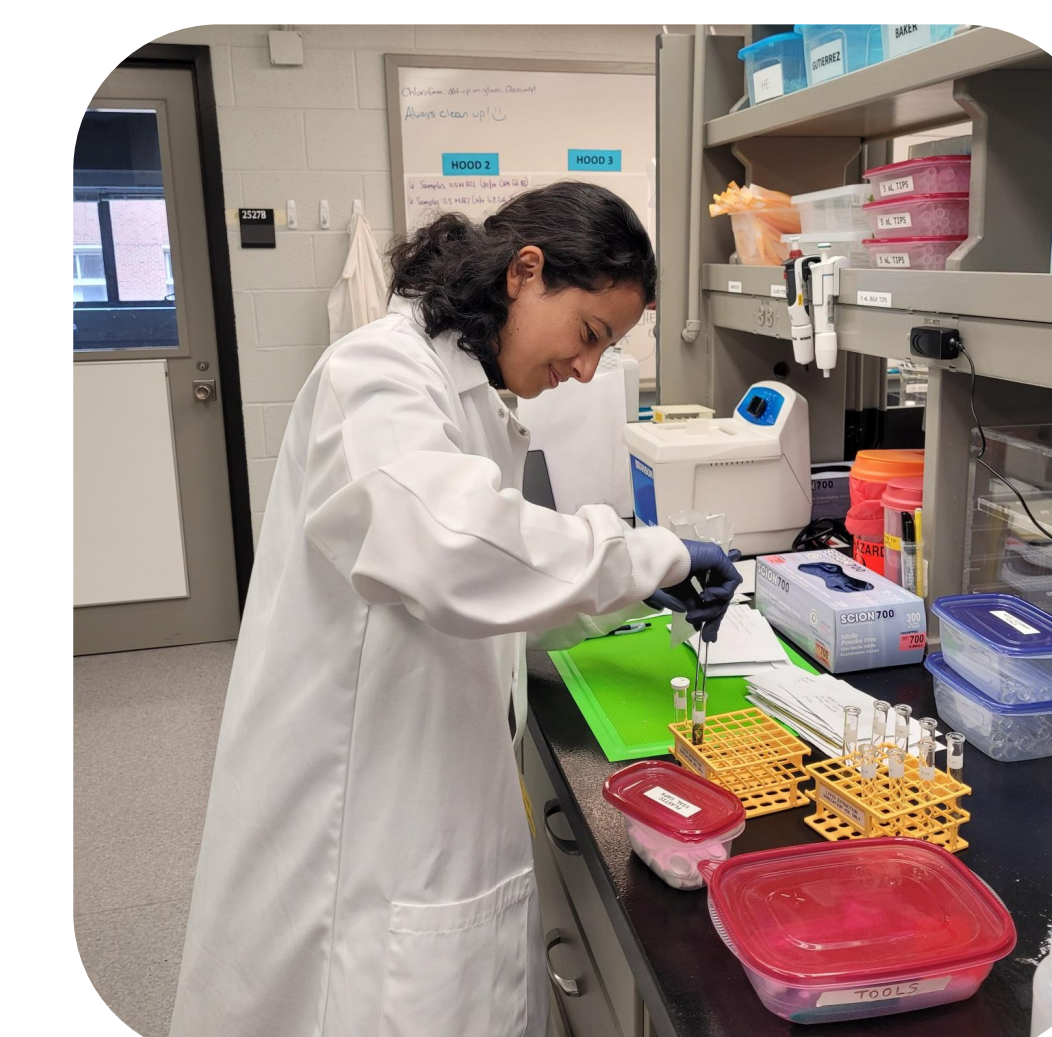
The present study is part of PI Natalia Camacho's doctoral dissertation in the Biomedicine program at the University of Granada in Spain. Through this project, she has enriched her skillset of basic sample preparation and analytical methods used in stable isotope analysis for forensic applications.

Additionally, she has gained a better understanding of disappearance dynamics in Colombia, the volumes of unidentified bodies found due to the rugged geology of the country, and particularly, she has connected with networks of researchers demonstrating the feasibility of contributing to the forensic field through novel methodologies.

## TRAINING

The laboratory visit and training lasted for a period of 1.5. During this time, the preparation of thirty hair samples was initiated. This effort aimed to ensure that the results obtained in this study are derived from samples prepared according to best practices currently utilized in forensic isotope labs.

Another positive impact of the visit is the expansion of the project's scope, as collaboration among researchers has allowed the PI to leverage the resources and expertise of multiple authorities in the field of forensic isotope analysis.



Images of the sample preparation process at Vanderbilt University, Nashville, TN USA.

## REFERENCES

Orozco, D. et al. (2022). Construction of a National Hydrogen and Oxygen Isoscape for Colombia as a Baseline for the Identification of Region of Origin of Unidentified Victims of the Internal Armed Conflict. <https://forensiccoe.org/hhrc-poster-session-2022/#poster6>