

Poster 68

Shedding light on Portugal's first major forensic case: elemental analysis of biological samples 132 years later

Â. Silva-Bessa ^{1,2,3}, R. Azevedo ⁴, A. Almeida ⁴ and R. J. Dinis-Oliveira ^{2,3,5,6,*}

¹ University of Coimbra, Centre for Functional Ecology, Laboratory of Forensic Anthropology, Department of Life Sciences, Coimbra, Portugal

² UCIBIO-REQUIMTE, Laboratory of Toxicology, Department of Biological Sciences, Faculty of Pharmacy, University of Porto, Porto, Portugal

³ TOXRUN – Toxicology Research Unit, University Institute of Health Sciences, CESPU, CRL, Gandra, Portugal

⁴ LAQV-REQUIMTE, Laboratory of Applied Chemistry, Department of Chemical Sciences, Faculty of Pharmacy, University of Porto, Porto, Portugal

⁵ Department of Public Health and Forensic Sciences, and Medical Education, Faculty of Medicine, University of Porto, Porto, Portugal

⁶ MTG Research and Development Lab, Porto, Portugal

* Correspondence: ricardo.dinis@iucs.cespu.pt

Abstract

Background: In the late 19th century, Vicente Urbino de Freitas was accused of the death of his nephew, Mário Guilherme Augusto de Sampaio, and his brother-in-law, José António de Sampaio Junior [1-3]. Despite the controversy at the time surrounding the testimonies, autopsy reports and toxicological analyses carried out, Urbino de Freitas was found guilty. After an extensive research and consolidation of all historical records, Sampaio Junior's body was found buried at the Cemetery of Agramonte, Porto, in 2020. Permission for a new autopsy was granted, and biological samples were collected for further analysis. **Objective:** The main objective of this study was to perform an elemental analysis of the deceased's biological samples aiming to find additional relevant information regarding the possible cause-of-death, 132 years later. **Methods:** A total of thirteen freeze-dried soft and hard tissues (0.4-0.5 g) were mineralized using a microwave-assisted acid digestion procedure. The concentration of twenty-seven trace elements was determined by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) using a Thermo Fisher Scientific iCAPTMQ instrument (Waltham, MA, USA). Data analysis was performed using the R programming language. Here we present and discuss the results for Li, Fe, Co, Ni, Cu, Zn, Hg, and Pb. **Results:** Overall, the concentration of elements differed considerably according to the analysed specimen. Fe and Pb concentrations varied from 0.20 to 1.02 mg/g (mean=0.50; SD=0.29) and from 0.63 to 52.6 mg/g (mean=8.7; SD=14.3), respectively. **Conclusions:** This study provides important information on the levels of various metals in the cadaveric remains of a famous and old forensic case. However, this work has some limitations associated with the degradation of the biological materials and their possible postmortem contamination, mainly due to prolonged exposure to the coffin. Further analyses are needed and will be conducted on teeth due to their lower susceptibility to postmortem exchanges with the surrounding environment.

Keywords: Flores Street crime; José António de Sampaio Junior; exhumation; autopsy; trace elements

Acknowledgments

The first author was financed by FCT, grant number SFRH/BD/143242/2019.

References

1. Dinis-Oliveira, R.J. Portugal's first major forensic case and the genesis of forensic toxicology: 10 years of research to reconstruct the event. *Forensic Sci. Res.* **2019**, 4(1), 69-81.

2. Dinis-Oliveira, R.J. Analysis of the testimonial evidence of Portugal's first major forensic case: part II. *Forensic Sci. Res.* **2020**, 5(4), 266-285.
3. Dinis-Oliveira, R.J. Analysis of the autopsy, toxicological, and psychiatric reports of Portugal's first major forensic case: part III. *Forensic Sci. Res.* **2021**, 6(3), 250-272.



In *Scientific Letters*, works are published under a CC-BY license (Creative Commons Attribution 4.0 International License at <https://creativecommons.org/licenses/by/4.0/>), the most open license available. The users can share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material for any purpose, even commercially), as long as they give appropriate credit, provide a link to the license, and indicate if changes were made (read the full text of the license terms and conditions of use at <https://creativecommons.org/licenses/by/4.0/legalcode>).