

# Hair In Toxicology: An Important Bio-monitor

J Radioanal Nucl Chem (2011) 287:769–772  
DOI 10.1007/s10967-010-0822-z

## Determination of As by instrumental neutron activation analysis in sectioned hair samples for forensic purposes: chronic or acute poisoning?

J. Kučera · K. Kofroňová

Received: 19 August 2010 / Published online: 16 September 2010  
© Akadémiai Kiadó, Budapest, Hungary 2010

**Abstract** Autopsy of 29-year old woman suspicious of committing suicide by the ingestion of  $As_2O_3$  yielded contradictory findings. All pathological findings as well as clinical symptoms suggested acute poisoning, while a highly elevated As level of  $26.4 \mu\text{g g}^{-1}$  in her hair collected at the autopsy, which was determined with inductively coupled plasma mass spectrometry indicated chronic poisoning. To elucidate this discrepancy, instrumental neutron activation analysis (INAA) with proven accuracy was performed of another set of sectioned hair samples. Levels of As found by INAA in the range of  $0.16\text{--}0.26 \mu\text{g g}^{-1}$  excluded chronic poisoning, because the person died after approximately 14 h after the  $As_2O_3$  ingestion. Two reasons for the discordant As results obtained by ICP-MS and INAA are considered: (1) accidental, non-removed contamination of hair on the  $As_2O_3$  ingestion; (2) erroneous performance of ICP-MS.

**Keywords** Instrumental neutron activation analysis · Hair · Arsenic poisoning · Forensic application

### Introduction

The elemental composition of human hair is markedly influenced by the ingestion of or exposure to a variety of chemical compounds from the natural or occupational environments. Due to the ease with which hair samples can be collected, transported, stored, and analyzed, hair analysis has frequently been used as an indicator of exposure to heavy metals of individuals and populations [1, 2]. However, the interpretation of hair analysis results is intricate, because the exogenous and endogenous deposition of elements in this tissue is difficult to distinguish and there is no washing procedure, which would completely remove the exogenous contamination without influencing the endogenous element contents. Therefore, to obtain comparable data on elemental composition of hair for environmental and biomedical studies, standardized sampling and washing procedures, such as one proposed by the International Atomic Energy Agency (IAEA) [3], should be employed. The use of hair analysis to identify systemic intoxication with some elements, especially As, Cd, Hg, Pb, and Tl has attracted attention of toxicologists and forensic specialists. Since the hair growth rate (and the element deposition rate) is reasonably well known, hair can be considered as a filament, which bears the time resolved record of the exposure to and/or the absorbed dose of toxic metals. In forensic applications, hair analysis has been used several times to determine whether arsenic poisoning was acute or chronic (indicating suicide or murder) [4] or whether chronic arsenicism was due to drug-intoxication (e.g. treatment with Fowler's solution) or criminal poisoning [5]. In the US, measurement of As in sectioned hair samples by INAA were used in two murder trials as an evidence of first-degree murder and the defendants were sentenced to death [6] or life imprisonment [7]. The use of hair analysis to

J. Kučera (✉)  
Nuclear Physics Institute, ASCR, 250 68 Řež,  
Czech Republic  
e-mail: kucera@ujf.cas.cz

J. Kučera  
Research Centre Řež, Ltd, 250 68 Řež, Czech Republic

K. Kofroňová  
Police of the Czech Republic, Office of Criminal Police  
and Investigations, Prague, Czech Republic

Springer

Hair in Toxicology: an important bio?monitor is a scientific and practical book. Hair testing began slowly about 28 years ago, initiated perhaps by Baumgartner's. Hair in toxicology: an important bio?monitor. Article (PDF Available) in Journal of Epidemiology & Community Health 61(6) June with Reads. Source.Hair in Toxicology: An Important Biomonitor is the first book of its kind devoted exclusively to in-depth analysis of the hair shaft as an important tool for a diverse .Hair in Toxicology: An Important Biomonitor is the first book of its kind devoted exclusively to in-depth analysis of the hair shaft as an important.Hair in Toxicology: An Important Bio-Monitor Devoted exclusively to in-depth analysis of the hair shaft as an important tool for a diverse range of scientific.Review of: Hair in Toxicology: An Important Bio?Monitor by Tobin DJ. Christine Moore Ph.D. Toxicology Research and Development.Hair in Toxicology. An Important Bio-monitor. Edited by. Desmond John Tobin University of Bradford, UK. ISBN A catalogue record for this book is.hair in toxicology an important bio monitor issues in toxicology. Education WorldBook Center. WorldBook ID 0bc. Education WorldBook Center. Hair In.buy hair in toxicology an important bio monitor issues in toxicology on amazoncom free shipping on qualified orders pdf free hair in toxicology an important bio.By Desmond John Tobin, Diana Anderson, Pascal Kintz, Marion Vallain, Stefanos N Kales, David Christiani, Vladimir Bencko, Tamsin.the editor of a book devoted to hair has to engage in a little bit of buying, This book, entitled Hair in Toxicology An Important Bio-Monitor, is part of a new.ISBN Title: HAIR IN TOXICOLOGY AN IMPORTANT BIOMONITOR By Royal Society Of Chemistry NEW. Author: Royal Society of Chemistry.Vanadium levels in hair and blood of normal and exposed persons. Science of the Total Hair in toxicology. An important bio-monitor. The Royal Society of.Hair in Toxicology: a tremendous Biomonitor is the 1st ebook of its style dedicated completely to in-depth research of the hair shaft as a.Hair in Toxicology: An Important Bio-Monitor Issues in Toxicology: zikovic.com: Desmond John Tobin, Diana Anderson, Pascal Kintz: Books.

[\[PDF\] Guidelines For User Surveys: A Technical Manual For Fish And Game Councils](#)

[\[PDF\] Archaic Chinese Bronzes In Australian And New Zealand Collections](#)

[\[PDF\] Compte-rendu Des Observations Gaeologiques Faites Dans La Raegion Du Saguenay](#)

[\[PDF\] Mixing The Waters: Environment, Politics, And The Building Of The Tennessee-Tombigbee Waterway](#)

[\[PDF\] Solar And Space Physics And Its Role In Space Exploration](#)

[\[PDF\] Collecting New Zealand Sea-shells](#)

[\[PDF\] Longman Mathematics Handbook: The Language And Concepts Of Mathematics Explained](#)