

Carina Ladeira\*, Susana Viegas

# Human Biomonitoring – An overview on biomarkers and their application in Occupational and Environmental Health

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**Abstract:** Human biomonitoring (HBM) is a scientifically-developed approach for assessing human exposures to natural and synthetic compounds from environment, occupation, and lifestyle. It relies on the measurement of particular substances or biological breakdown products, known as metabolites, in human tissues and/or fluids, and also includes the study of their effects and the possible influence of individual susceptibility as response modulators. HBM is a growing area of knowledge used for exposure and risk assessment in environmental and occupational health, and its importance has been increasing as a result of advancements in the ability to measure greater numbers of chemicals in the human body and tissues. In order to achieve this purpose, HBM focuses on the use of biomarkers as measurable indicators of early changes in biological systems. However, because data interpretation requires caution, it is strongly recommended that the interpretation of HBM results be combined with air monitoring data or pharmacokinetic modelling in order to better understand exposure sources and the metabolism of chemicals.

**Keywords:** Human biomonitoring, biomarkers, genotoxicity, exposure, environment, occupational.

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## 1 Introduction

Human biomonitoring (HBM) has its roots in the analysis of biological samples, aimed at looking for markers of pharmaceutical compounds and occupational exposures, in an effort to prevent the health effects of exposure to substances [1, 2]. Biological monitoring is defined as the repeated, controlled measurement of chemical or biochemical markers in fluids, tissues or other accessible samples from subjects exposed (or exposed in the past, or to be exposed) to chemical, physical or biological risk factors in the workplace and/or the general environment [3,4]. The major goals of many research programs on biomonitoring are to develop and validate biomarkers that reflect specific exposures, and to predict the risk of disease in individuals and in population groups [5]. The power of HBM to identify spatial and temporal trends in human exposures has successfully provided exposure and risk information, in order to inform public health decisions and/or initiate policy measures, and to focus on the protection of susceptible populations, such as children and pregnant mothers [7, 8]. Classical examples are the ban of lead from gasoline, recommendations to avoid mercury-containing amalgam teeth fillings in children, the restriction of phthalate use in plastics and many others. Additionally, biomonitoring data could be used for screening purposes and prioritization of chemicals for further research or regulation [6].

Biomonitoring has many advantages over environmental monitoring; for example, biological samples reveal integrated effects of repeated exposure. Biomonitoring data directly reflect the total body burden or biological effects resulting from all routes of exposure - inhalation, absorption through the skin, and ingestion, including hand-to-mouth transfer in children - and interindividual variability in exposure levels, metabolism and excretion rates. Such data also reflect modifying influences in physiology, bioavailability, bioaccumulation and persistency, which can magnify

# Biomarkers And Occupational Health

**Xiaolong Qi**



## **Biomarkers And Occupational Health:**

Biomarkers and Occupational Health Mary Janet Normandy, John P. Peeters, Mortimer L. Mendelsohn, 1995-01-16  
Biomarkers have emerged as an exciting tool in disease prevention particularly in the workplace They may be used to document workers exposure to toxins signal the onset of health effects or identify individuals with susceptibility to certain environmental threats But the uncertainty is as great as the potential Are biomarkers suitable for widespread use How can they be deployed in diverse contexts How can biological information about workers be handled fairly and ethically  
Biomarkers and Occupational Health describes the state of biomarker development including the implications of the Human Genome program and presents a range of viewpoints on the future of biomarkers from the leaders in the field This book explores the three basic types of biomarkers markers of exposure markers of health effects and markers of susceptibility to disease from a variety of perspectives It examines what can be learned from well known exposure sites Hiroshima and Nagasaki Chernobyl and the Hanford nuclear site in the United States for example and a wide range of human cases and animal studies The book also explores the costs and ramifications of developing a large scale program to monitor potentially exposed workers e g at a cleanup site A framework is offered for the use of biomarkers based on the mandate to change the environment before you change the worker The book explores how to identify ethical issues how to set development priorities and how to integrate biomarkers into an occupational health and safety program The authors present the latest technical findings about markers for chronic beryllium disease as well as markers for exposure to carcinogens radiation and chromium including prospects for detecting long past exposures Biomarkers and Occupational Health offers an update on biomarker development and explores a wide scope of issues This book will be important to occupational health professionals biomedical researchers toxicologists epidemiologists and labor and management officials involved in worker health issues Moritmer L Mendelsohn M D Ph D is Vice Chairman of the Radiation Effects Research Foundation RERF in Japan which studies the long term health effects of the atomic blasts in Hiroshima and Nagasaki and he is former Associate Director of the Lawrence Livermore National Laboratory in California John P Peeters Ph D is a geneticist who is currently directing a division of the Office of Occupational Medicine for the United States Department of Energy Mary Janet Normandy Ph D is a toxicologist who specializes in the metabolism of xenobiotics in mammalian systems She is currently a member of the Department of Energy s Office of Occupational Medicine  
*Biomarkers and Occupational Health; Progress and Perspectives* ML Mendelsohn (Ed), 1995  
**Toxicologic Biomarkers** Anthony P. DeCaprio, 2006-04-18 Responding to the explosion of advances in the use of biomarkers to efficiently rapidly and economically evaluate the health effects of chemical entities this authoritative reference provides a detailed overview of the theory development and practical application of biomarkers in the toxicological environmental forensic and pharmaceutical s  
*Toxicology Principles for the Industrial Hygienist* William E. Luttrell, Warren W. Jederberg, Kenneth R. Still, 2008 Focuses on the applications of toxicology principles to the practice of industrial hygiene

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Maxey-Rosenau-Last Public Health and Preventive Medicine: Fifteenth Edition Robert B. Wallace, 2007-10-12 An extensive in depth look at public health and preventive medicine topics from experts in the field This trusted one stop resource is a completely up to date all in one public health and preventive medicine guide Sponsored by the Association of Teachers of Preventive Medicine and edited and written by well respected authorities in the range of topics covered Maxcy Rosenau Last Public Health and Preventive Medicine is also an outstanding guide to additional resources of information in preparing for the board exam in preventative medicine and public health The new edition of Maxcy Rosenau Last Public Health and Preventive Medicine has been completely updated to encompass many new diseases conditions and policy issues that continue to dramatically shape and expand the influence of public health and preventive medicine New to this Edition Important coverage of new diseases conditions and policy issues including critical lessons learned from the SARS epidemic the most recent perspectives on monkey pox plus an increased emphasis on West Nile Virus Restructured infectious and communicable disease section that reflects the emergence of many emerging and recrudescing conditions Greater focus on existing web based resources for further reading New information on community based participatory research Timely new chapter on bioterrorism and preparedness Additional insights on the amelioration of disease producing lifestyles Research enhancing lists and catalogs based on federal and other public access databases that are relevant to public health and prevention More streamlined coverage of chemical exposures and diseases overall Essentials of the public health service delivery infrastructure *Choice*, 1996 **Toxicological Profile for Mineral-based Crankcase Oil**, 1997

## Reviewing **Biomarkers And Occupational Health**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is actually astonishing. Within the pages of "**Biomarkers And Occupational Health**," an enthralling opus penned by a highly acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve in to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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