World Health Organization
REGIONAL OFFICE FOR Europe

UN environment
United Nations Environment Programme

Assessment of prenatal exposure to mercury: standard operating procedures

Abstract

Mercury is toxic for humans, and the toxic effects of different forms of mercury have been extensively studied. Human biomonitoring is recognized as the most effective tool for evaluation of cumulative human exposure to mercury. In-utero development is the most vulnerable stage for the long-term adverse neurodevelopmental effects of mercury. Characterizing prenatal exposure is critical for evaluating public health impacts of mercury and assessing public health benefits of exposure reduction measures. Approaches to estimating exposure to mercury include measuring mercury levels in different biological matrices. The level of mercury in tissues can be an indicator of exposure to various types of mercury. The validity, usefulness and meaning of such measurements depend on the form of mercury exposure, type of tissue measurement and other factors. This document consists of standard operating procedures describing the assessment of mercury in hair, cord blood and urine. Quality control is essential to get reliable results. The document also provides information on alternative methods that can be used for analysis of mercury.

Keywords

Biomarkers – analysis
Mercury – analysis
Prenatal Exposure Delayed Effects – analysis
Maternal Exposure – adverse effects
Environmental Exposure

Address requests about publications of the WHO Regional Office for Europe to:

Publications
WHO Regional Office for Europe
UN City, Marmorvej 51
DK-2100 Copenhagen Ø, Denmark

Alternatively, complete an online request form for documentation, health information, or for permission to quote or translate, on the Regional Office website (http://www.euro.who.int/pubrequest).

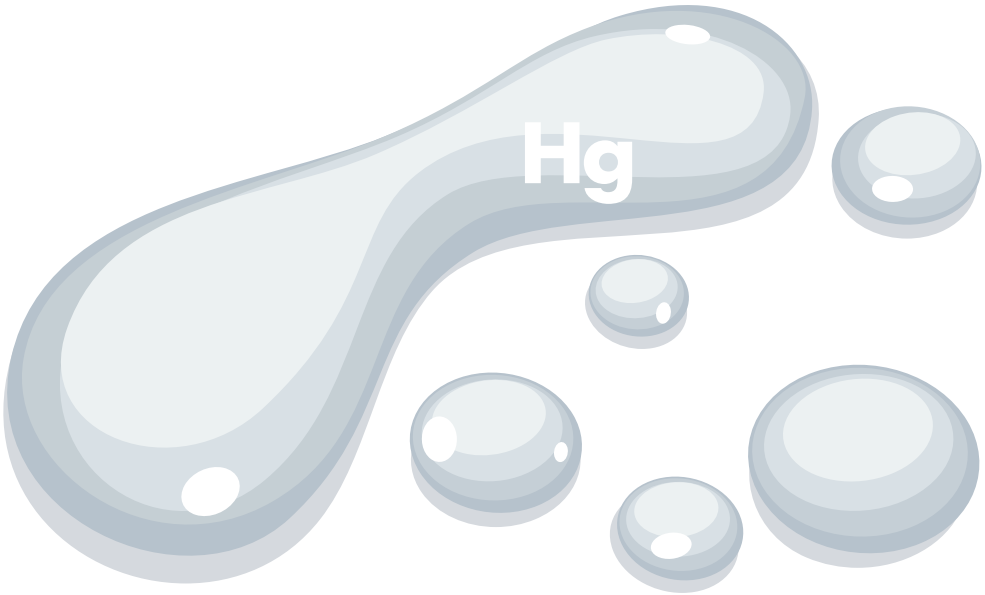
Document number: WHO/EURO:2020-430-40165-53693

Contents

Acknowledgments

The Standard Operating Procedures for assessment of prenatal exposure to mercury were developed in the framework of the project “Development of a Plan for Global Monitoring of Human Exposure and Environmental Concentrations of Mercury” funded by the Global Environment Facility.

The WHO Regional Office for Europe gratefully acknowledges technical support provided by the UN Environment at all stages of the project, from the project planning, through coordination among the project components at the implementation stage, to the organization of the final discussions on the documents developed in the frame of the project.



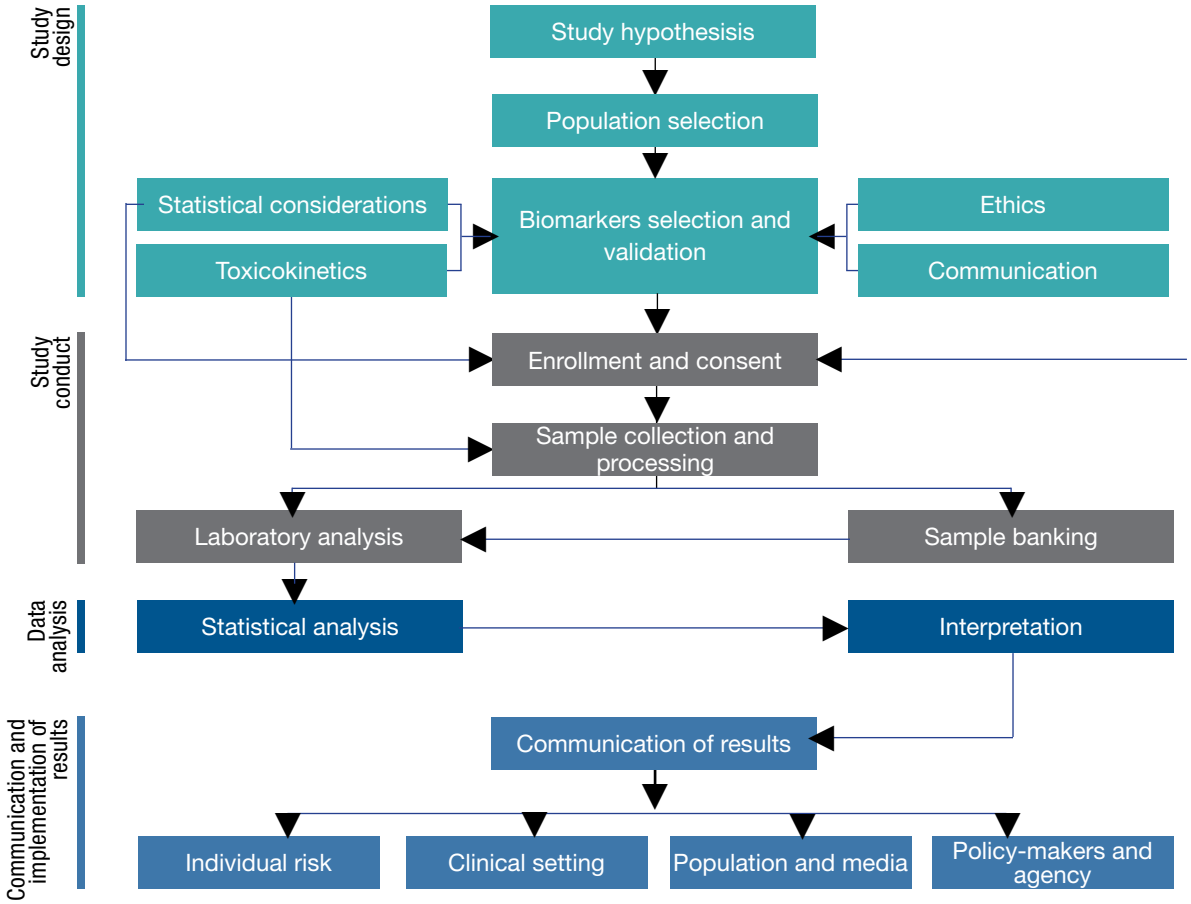
Introduction

Although human biomonitoring (HBM) has been widely employed in the framework of occupational exposure, it has only recently been used to assess the exposure of the general population to environmental pollutants. The extension of HBM to this field of application over the past few years has been boosted by, among others, different initiatives focused on increasing our understanding of the relationship between the environment and health.

The potential of HBM in the field of public health is an accepted fact, although the lack of harmonization between the different HBM studies/programmes can considerably limit the comparison of results, their global interpretation and subsequent translation into policy. It is, therefore, fundamentally important to develop a harmonized framework that allows the most efficient use of data obtained in HBM studies, such as in the European Union-supported projects Development of a coherent approach to human biomonitoring in Europe (ESBIO), Consortium to Perform Human Biomonitoring on a European Scale (COPHES) and its twin feasibility study DEMOCOPHES.

The organization of an HBM survey is a complex process involving professionals with different technical skills (epidemiologists, analytical chemists, toxicologists, statisticians, physicians and communications specialists), all of whom contribute to specific stages of the study. They work together to deal with the interactions between the various disciplines concerned (Fig. 1).

Fig 1. Stages of a biomonitoring study



Source: National Research Council of the National Academies *(1)*.

Quality control programme for mercury human biomonitoring

Abstract

The objective of the document is to define an effective system for performing quality-control activities to ensure the reliability of mercury human biomonitoring (HBM) results. These activities are focused on the pre-analytical and analytical stages of the mercury HBM. The measures described should be seen as a general recommendation for use when planning and implementing HBM surveys at national, regional and international level. The document should be considered for use together with relevant standard operating procedures for sampling and analysis of mercury in human scalp hair, cord blood and urine.

Keywords

Mercury – analysis
Methylmercury compounds – analysis
Biomarkers - analysis
Maternal exposure
Maternal-fetal exchange
Infant, newborn
Environmental exposure
Quality control
Public health

Contributors

Argelia Castaño
National Centre for Environmental Health, Carlos III Institute of Health, Spain

Marta Esteban
National Centre for Environmental Health, Carlos III Institute of Health, Spain

Miguel Ángel Lucena
National Centre for Environmental Health, Carlos III Institute of Health, Spain

Contents

Abbreviations

HBM	human biomonitoring
ID	identification