

Submission by the World Health Organization of information relevant to the effectiveness evaluation of the Minamata Convention.

15 February 2019

WHO's submission comprises the following:

1. Protocol for assessment of prenatal exposure to mercury
2. Standard Operating Procedures for the assessment of prenatal exposure to mercury
3. Information about the forthcoming publication of results of 6 pilot surveys, conducted through a UNEP/WHO GEF Project.
4. State-of-the science review of mercury biomarkers in human populations worldwide between 2000 and 2018

1. Protocol for assessment of prenatal exposure to mercury

Assessment of prenatal exposure to mercury: human biomonitoring survey. The first survey protocol: a tool for developing national protocols. Copenhagen: World Health Organization, Regional Office for Europe; 2018

http://www.euro.who.int/_data/assets/pdf_file/0010/386893/survey-mercury-eng.pdf?ua=1

Abstract: This publication describes the design of a survey for assessment of prenatal exposure to mercury using human biomonitoring. The selection of target populations and biological matrix, planning of the survey, recruitment and fieldwork, data management and communication, community involvement strategy and ethical considerations are addressed in the protocol. An informed consent form, eligibility screening form and a questionnaire for collecting epidemiological information are also included in the protocol. The protocol was used to guide pilot surveys for assessment of prenatal exposure to mercury in China, Ghana, India, Kyrgyzstan, Mongolia and the Russian Federation, and can be applied for mercury human biomonitoring surveys globally. The protocol has been approved by the WHO Ethics Research Committee.

2. Standard Operating Procedures for the assessment of prenatal exposure to mercury

Assessment of prenatal exposure to mercury: standard operating procedures, Copenhagen: World Health Organization, Regional Office for Europe, UN Environment; 2018.

http://www.euro.who.int/_data/assets/pdf_file/0009/384174/prenat-exp-mercury-sop-eng.pdf?ua=1

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.

3. Information about the forthcoming publication of results of 6 pilot surveys, conducted through a UNEP/WHO GEF Project.

Applicability of the WHO Survey protocol and the Standard Operating Procedures has been checked through the implementation of pilot surveys in six countries: China, India, Ghana, Kyrgyzstan, Mongolia, and the Russian Federation. The pilot surveys were conducted in the general population, i.e., populations with a high level of consumption of marine fish (Ghana) and fresh water fish (the Russian Karelia), in the vicinity of primary mercury mining (Kyrgyzstan) and ASGM (Mongolia), in an agricultural area located at the contaminated territories of former mercury mining (China), and populations exposed to emissions of coal power plants (India).

WHO site-specific protocols and protocols approved by national ethics committees guided the surveys in countries. In all countries, except the Russian Federation, three biological matrixes were investigated: maternal scalp hair and urine and cord blood. The number of samples varied from 106 in Kyrgyzstan (small sample size due to small population size) to 265 in Mongolia (two different ASGM locations). Investigators in Ghana faced cultural and ethical barriers to collecting hair samples; only 54 samples were collected representing one-fifth of the number of cord blood samples. However, reliable results on pre-natal exposure to mercury were obtained in all pilot surveys. There were large variations in the level of exposure, with the highest level of exposure in populations with high-level consumption of fish and rice produced in contaminated areas. The surveys confirmed the applicability of the WHO Protocol and SOPs for assessment of exposure in the most vulnerable population group – the fetus – to mercury.

The results of the pilot surveys are being prepared for publication in the peer reviewed scientific literature.

4. State-of-the science review of mercury biomarkers in human populations worldwide between 2000 and 2018

Basu N, Horvat M, Evers DC, Zastenskaya I, Weihe P, Tempowski J. A state-of-the-science review of mercury biomarkers in human populations worldwide between 2000 and 2018. In: Environ Health Perspect. 2018 Oct;126(10):106001. doi: 10.1289/EHP3904 (<https://ehp.niehs.nih.gov/doi/full/10.1289/EHP3904>).

This WHO-commissioned review of mercury biomarkers in human populations established a global benchmark for human exposure to mercury and identified vulnerable populations and geographical regions lacking data.

Abstract

Background: The Minamata Convention on Mercury provided a mandate for action against global mercury pollution. However, our knowledge of mercury exposures is limited because there are many regions and subpopulations with little or no data.

Objective: We aimed to increase worldwide understanding of human exposures to mercury by collecting, collating, and analyzing mercury concentrations in biomarker samples reported in the published scientific literature.

Method: A systematic search of the peer-reviewed scientific literature was performed using three databases. A priori search strategy, eligibility criteria, and data extraction steps were used to identify relevant studies.

Results: We collected 424,858 mercury biomarker measurements from 335,991 individuals represented in 312 articles from 75 countries. General background populations with insignificant exposures have blood, hair, and urine mercury levels that generally fall under 5µg/L, 2 µg/g, and 3 µg/L, respectively. We identified four populations of concern: a) Arctic populations who consume fish and marine mammals; b) tropical riverine communities (especially Amazonian) who consume fish and in some cases may be exposed to mining; c) coastal and/or small-island communities who substantially depend on seafood; and d) individuals who either work or reside among artisanal and small-scale gold mining sites.

Conclusions: This review suggests that all populations worldwide are exposed to some amount of mercury and that there is great variability in exposures within and across countries and regions. There remain many geographic regions and subpopulations with limited data, thus hindering evidence-based decision making. This type of information is critical in helping understand exposures, particularly in light of certain stipulations in the Minamata Convention on Mercury.

<https://doi.org/10.1289/EHP3904>
