**Mercury**

***Who is this guidance for?***

This guidance is primarily aimed at employers or individuals with delegated responsibility for managing workplace exposure to substances. Whilst it is not exhaustive, the information presented is intended to demonstrate how biomonitoring can help with this duty. Some simple advice is presented to help non-specialist users to get the most out of biomonitoring covering (1) when to take a sample to ensure reliable and comparable results over time; (2) putting the result into context with respect to background (environmental) levels or what can reasonably be achieved with good exposure control; and (3) some basic technical data that can help to evaluate an analytical service provider. For further information you should consult your chosen analytical service provider who should be happy to discuss your specific requirements and find solutions.

**Hazardous Substances:**

Mercury and its divalent inorganic compounds

CAS number (elemental Hg): 7439-97-6

**Workplace Exposure Limits:**

For Hg and its divalent inorganic compounds:

8-hour TWA: 0.02 mg/m3

**Mercury (Hg)**

Monitored by analysis of total Hg content in urine

**BMGV**: 20 µmol mercury/mol creatinine

***Biological Monitoring Guidance Value (BMGV)***

20 µmol mercury/mol creatinine

Conversion: 1 µmol/mol – 1.77 µg/g

***Other Guidance Values***

The ACGIH BEI is 20 µg/g (approx. 11 µmol/mol creatinine).

The DFG BAT is 25 µg/g (approx. 14 µmol/mol creatinine).

This BMGV, the United States Biological Exposure Index (BEI) and the German Biological Tolerance Value (BAT) are all health based guidance values, where long term exposure at or below this level will not reasonably create a risk of injury, disease or ill health effects, based on current scientific understanding.

***Sample Collection***

Urine samples can be collected at any time into polystyrene universal containers (30mL).

***Sample Transport to Laboratory***

Send samples to the laboratory by first class post (or equivalent) to arrive within 48 hours of collection. If any delay is anticipated, store frozen at -20OC. Packaging must comply with relevant postal regulations for biological samples (UN3373).

**Suggested Method and Analytical Evaluation**

Analytical technique: Inductively Coupled Plasma Mass Spectrometry (ICPMS)

Limit of Quantitation: 0.5 nmol/L (approx. 0.04 µmol/mol creatinine)

Calibration range: Typically 0 – 500 nmol/L

Precision:

- within day <4% RSD at 180 nmol/L

- day to day <6% RSD at 180 nmol/L

Sample stability: 2 days at ambient temperature, >6 months at -20°C

Analytical Interferences: None known

Quality assurance: GEQAS (www.g-equas.de).

***When to take a sample***

Elimination half-life is a measure of the rate of removal of a substance that has been taken into the body. It helps to identify when it is best to take a sample following potential exposure and indicates the potential ‘exposure window’ that will be reflected by a result.

The elimination half-life for mercury in urine is 40 – 60 days. Therefore the concentration of mercury in urine reflects cumulative exposure over the previous 2 – 4 months. Urinary mercury measurements can be used for workers with constant medium to long term exposure. It is not sensitive to day-to-day variations in exposure and it will take several months for urine levels to reflect reductions in exposure. Hence, a random spot urine sample can be taken at any time.

**Other Information**

***Confounding factors***

None known.

***Unexposed level***

There is potential for very low-level exposure to dietary mercury sources. The background reference range for an occupationally unexposed population in the UK for urinary Hg is < 1.4 µmol/mol creatinine.

Significant consumption of seafood (particularly shellfish or tuna) can increase mercury levels and should be noted.

**Creatinine correction is advised**

***Interpretation***

Urinary mercury results reflect systematic exposure to mercury that may have entered the body by inhalation or through the skin. If biological monitoring results are greater than the guidance value, it does not necessarily mean that ill health will occur, but it does mean that exposure is not being adequately controlled. An elevated result should be re-tested as soon as possible to help establish whether it represents ongoing workplace exposure or a ‘one-off’ event. If necessary, employers will need to look at current work practices to see how they can be improved to reduce exposure.

***Further Information***

EH40 List of Approved Workplace Exposure Limits <http://www.hse.gov.uk/pubns/books/eh40.htm>

Biological Monitoring: A tool for helping to assess workplace exposure (August 2021). Published by British Occupational Hygiene Society (www.bohs.org). [BOHS-Biological-Monitoring-A-tool-for-helping-to-assess-workplace-exposure-rebranded.pdf](https://www.bohs.org/app/uploads/2021/08/BOHS-Biological-Monitoring-A-tool-for-helping-to-assess-workplace-exposure-rebranded.pdf)

For further advice, please contact us:

Sample Registration, HSE, Harpur Hill, Buxton. SK17 9JN.

registration.sample@hse.gov.uk

0203 028 3383

**Biological Monitoring at HSE**

<https://www.hsl.gov.uk/online-ordering/analytical-services-and-assays/biological-monitoring>