

Biological Monitoring Guidance Values

Guidance sheet for:

Mercury in urine

BMGV: 20 μ mol mercury/mol creatinine

Hazardous Substance

Mercury and its divalent inorganic compounds

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

Workplace Exposure Limits:

For mercury and its divalent inorganic compounds: 8-hour TWA: 0.02mg/m³



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Biological Monitoring Guidance Value (BMGV)

Guidance value: 20µmol mercury/mol
creatinine

Conversion: 1µmol/mol = 1.77µg/g

Other Guidance Values

The ACGIH BEI is 20µg/g (approx. 11µmol/mol creatinine). The DFG BAT is 25µg/g (approx. 14µmol/mol creatinine).

Sample Collection

Urine samples should 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 at -20°C. Packaging must comply with Post Office regulations.

Description of Suggested Method

Analysis of urine using direct nebulisation Inductively Coupled Plasma Mass Spectrometry (ICP-MS)¹. Urine samples are diluted 1 in 20 with a 1% nitric acid diluent (containing a suitable internal standard). It is advisable to add gold to the sample and standards to stabilise the analytical performance.

Analytical Evaluation

Detection limit:

1 nmol/L

Calibration range:

Typically 0-500 nmol/L

Precision:

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

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

Sample stability:

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

Analytical Interferences: None known.



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Other Information

Elimination half-time:

For mercury in urine: 40-60 days. At moderate exposures, results reflect cumulative exposure over recent weeks/months.

Confounding factors:

None known

Unexposed level:

<1.4µmol mercury/mol creatinine

Creatinine correction is advised

Alternative Methods

Urinary mercury may also be determined using a cold-vapour mercury detector² or by cold vapour atomic absorption spectrometry³. The method consists of firstly digesting the urine sample, reduction of Hg²⁺ to Hg⁰ using stannous chloride and subsequent measurement of elemental mercury with the detector of choice.

Quality Assurance

Internal QC:

Must be established

External QA:

G-EQUAS (www.g-equas.de).

Email: G-EQUAS@ipasum.med.uni-erlangen.de

Telephone: +49-9131-8522312

UK NEQAS for Trace Elements

(www.surreyeqas.org.uk/trace-elements-teqas)

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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. Under these circumstances employers will need to look at current work practices to see how they can be improved to reduce exposure.



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Links

EH40 List of Approved Workplace Exposure Limits

<http://www.hse.gov.uk/pubns/books/eh40.htm>

Biological Monitoring at HSL

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

References

¹ Morton, J., Mason, H.J., Ritchie, K.A. and White, M., 2004. Comparison of hair, nails and urine for biological monitoring of low level inorganic mercury exposure in dental workers. *Biomarkers*, 9(1), pp.47-55.

² Richardson, R.A., 1976. Automated method for determination of mercury in urine. *Clinical chemistry*, 22(10), pp.1604-1607.

³ Mason, H.J. and Calder, I.M., 1994. The correction of urinary mercury concentrations in untimed, random samples. *Occupational and environmental medicine*, 51(4), p.287.

For further advice, please contact us:

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