

Biological Monitoring Guidance Values

Guidance sheet for:

Chromium in urine

BMGV: 10 μ mol chromium/mol creatinine

Hazardous Substance

Chromium and its water-soluble compounds

Workplace Exposure Limits:

For elemental chromium, Cr(II) or Cr(III) compounds: 8-hour TWA: 0.5 mg/m³

For Cr(VI) compounds: 8-hour TWA: 0.05 mg/m³



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Biological Monitoring Guidance Value (BMGV)

Guidance value: 10µmol chromium/mol creatinine

Conversion: 1µmol/mol = 0.46µg/g

Other Guidance Values

The ACGIH BEI is 25µg/g (approx. 40µmol/mol creatinine) for samples collected at the end of the shift, at the end of the week. The DFG BAR is 0.6µg/L (approx. 1µmol/mol creatinine).

Sample Collection

Urine samples should be collected at the end of shift 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). Collision cell mode is used to remove polyatomic interferences. Urine samples are diluted 1 in 20 with a 1% nitric acid diluent and a suitable internal standard is used.

Analytical Evaluation

Detection limit:

1 nmol/L

Calibration range:

Typically 0-1600 µmol/L

Precision:

- within day 1.1% at 19.9µg/L

- day to day 5.6% at 19.9µg/L

Sample stability:

2 days at ambient temperature, >3 months at -20°C

Analytical Interferences: Chloride interference (for ICP-MS analysis) should be removed by use of collision cell mode.



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Other Information

Elimination half-time:

For chromium in urine, approximately 7 hours, 15-30 days and 3-5 years (triphasic).

Confounding factors:

None known

Unexposed level:

<2.9 μmol chromium/mol creatinine

Creatinine correction is advised

Alternative Methods

Urinary chromium may also be measured using graphite furnace atomic absorption spectroscopy. The sample is injected into the graphite tube, then following drying, ashing and atomisation stages, chromium is determined at 357.9 nm.

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

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Interpretation

Urinary chromium results reflect systematic exposure to total chromium that may have entered the body by inhalation or, more likely, 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

Morton, J., Tan, E., Leese, E. and Cocker, J., 2014. Determination of 61 elements in urine samples collected from a non-occupationally exposed UK adult population. Toxicology letters, 231(2), pp.179-193.

For further advice, please contact us:

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