INTERPRETATION

Health Guidance Values(BGVs) are set at a level at which there is no indication from the scientific evidence available that the substance being monitored is likely to be injuries to health. Values not greatly in excess of a HGV are unlikely to produce serious short or long term effects on health. However, regularly exceeding the HGV does indicate 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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BIOLOGICAL MONITORING METHODS

October 2005

HEALTH & SAFETY LABORATORY

Method for Mercury in Urine

Hazardous Substance:
Mercury & inorganic compounds

Occupational Exposure Standard = 0.025 mg m^{-3}
CAS No. 7439-97-6

Biological Monitoring Guidance value:
HGV= 20 µmol Hg/mol creatinine
Conversion: 1 µmol/mol = 1.77 µg

❑ Sample Collection

Time : Random, untimed urine
Equipment: Polystyrene universal container (30ml)

❑ Description of Suggested Method

Analysis of urine using direct nebulisation Inductively Coupled Plasma Mass Spectrometry (ICP-MS)[1].Samples should be diluted in nitric acid, and it is advisable to add gold to the samples and standards to stabilise the analytical performance. An internal standard must be added to the samples to compensate for matrix effects.

❑ References

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

2. Richardson R A, (1976) Automated method of th determination of mercury in urine. Clin Chem, 22, 1604-1607

3. Mason J H, Calder I. (1994) The correction of urinary mercury concentrations in untimed, random samples. Occup. Env. Med, 51(4),287.

❑ Alternative Method

Mercury in urine may also be determined using a cold-vapour mercury detector[2] or by cold vapour atomic absorption spectrometry[3]. The method consists of firstly digesting the urine sample by reduction of Hg^{2+} to Hg^{0} using stannous chloride and subsequent measurement of elementary mercury with the detector of choice.

❑ Sample Transport to Laboratory

At ambient temperature, samples should arrive within 48h of collection. If delay anticipated store at -20°C. Samples sent through postal system must comply with Post Office regulations.

❑ Analytical Evaluation

Precision
- within day <4% RSD at 180 nmol/l
- day to day <6% RSD at 180 nmol/l
- recommended precision <7.3% RSD3

Detection limit
-5 nmol/l
creatinine)

Calibration range
- typically 0 - 500 nmol/l

Sample Stability
-2 days at RT, > 6 months at -20 °C

Analytical interferences
-None known

❑ Other Information

At moderate exposures result reflect cumulative exposure over recent weeks/ months
Half life-time
-40-60 days

❑ Confounding Factors

None known
Unexposed Levels
< 2 µmol/mol creatinine
Creatinine Correction
Advised, specific gravity correction less suitable

❑ Quality Assurance

Internal QC - must be established
External QA - TEQAS, University of Surrey (Tel: 01483 509217)