Biological Monitoring
Guidance Values

Guidance sheet for:
Cyclohexanone
Monitored by analysis of cyclohexanol in urine
BMGV: 2mmol cyclohexanol/mol creatinine

Hazardous Substance
Cyclohexanone
CAS number: 108-94-1

Workplace Exposure Limits:
8-hour TWA: 10ppm, 41mg/m³
15-minute STEL: 20ppm, 82mg/m³
Skin notation
Biological Monitoring Guidance Values

Cyclohexanone in urine

Biological Monitoring Guidance Value (BMGV)

Guidance value:
2 mmol cyclohexanol/mol creatinine
Conversion: 1 mmol/mol = 0.886 mg/g

Other Guidance Values

The ACGIH BEI is 8 mg/g (approx. 6 mmol/mol creatinine).

Sample Collection

Urine samples should be collected at the end of shift into polystyrene universal containers (30 mL).

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

Cyclohexanol and cyclohexanediols can be measured in urine after acid hydrolysis of glucuronide conjugates and extraction twice into diethyl ether. Analysis is then carried out by gas chromatography with flame ionisation detection or selected ion monitoring mass spectrometry.

Analytical Evaluation

Detection limit:
5 µmol/L (3 x background)

Calibration range:
Typically 0-100 µmol/L

Precision:
- within day <3% RSD at 25 µmol/L
- day to day <16% RSD at 25 µmol/L

Sample stability:
>4 days at ambient temperature

Analytical Interferences: None known

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

Elimination half-time:
For cyclohexanol in urine, approximately 1-2 hours.

Confounding factors:
Cyclohexanol is a metabolite of cyclohexane and so any co-exposure to cyclohexane or cyclohexanol may contribute to the urinary excretion of cyclohexanol and needs to be noted. The metabolism of cyclohexane to cyclohexanol is mediated by alcohol dehydrogenase and so any co-exposure to ethanol (e.g. alcoholic drinks during work time) needs to be noted as it will affect the conversion of cyclohexanone to cyclohexanol.

Unexposed level:
None detected

Creatinine correction is advised

Cyclohexanediols can also be measured but their longer half-life means that with repeated exposure they may accumulate and their concentration in end-of-shift urine samples will increase during the week. As an example, after repeated daily exposure to 10ppm for 8 hours, the concentration of 1,2 and 1,4 cyclohexanediols in end-of-shift urine samples on the 4th day would be around 44 and 23 mmol/mol respectively.

Quality Assurance

Internal QC:
Must be established

External QA:
Available from Health and Safety Laboratory

Interpretation

Urinary cyclohexanol results reflect systematic exposure to cyclohexanone 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


For further advice, please contact us:

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