

Biological Monitoring Guidance Values

Guidance sheet for:

4-Methylpentan-2-one (MIBK) in urine

BMGV: 20µmol 4-methylpentan-2-one/L urine

Hazardous Substance

4-methylpentan-2-one

CAS number: 108-10-1

Alternative names:

Methyl isobutyl ketone (MIBK), Hexone

Workplace Exposure Limits:

8-hour TWA: 50ppm, 208mg/m³

15-minute STEL: 100ppm, 416 mg/m³

Skin notation



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Biological Monitoring Guidance Value (BMGV)

Guidance value: 20µmol/L

Conversion: 1µmol/L = 100.16µg/L

Other Guidance Values

The ACGIH BEI is 1mg/L (10µmol/L) and the DFG BAT is 0.7mg/L (7µmol/L).

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

Urine samples (0.25mL) are diluted with H₂O (0.75mL) in glass headspace vials, capped with PTFE-faced butyl rubber septa and incubated at 65°C for 10 minutes before injection into a gas chromatography column. The oven temperature is held at 60°C for 1 minute, then increased at 8°C/min to 80°C, then at 25°C/min to 200°C where it is held for 1 minute before cooling to reset. Detection is by mass spectrometry in electron impact mode, monitoring ions m/z 85 and 100.

Analytical Evaluation

Detection limit:

1µmol/L (3 x background)

Calibration range:

Typically 0-40 µmol/L

Precision:

- within day <2% RSD at 16µmol/L

- day to day <10% RSD at 16µmol/L

Sample stability:

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

Analytical Interferences: None known



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Other Information

Elimination half-time:

For 4-methylpentan-2-one in blood, approximately 0.2 and 1-1.4 hours (biphasic).

Confounding factors:

None known

Unexposed level:

<2µmol/L

Creatinine correction is not advised

Alternative Methods

Hjelm, E.W., Hagberg, M., Iregren, A. and Löf, A., 1990. Exposure to methyl isobutyl ketone: toxicokinetics and occurrence of irritative and CNS symptoms in man. *International archives of occupational and environmental health*, 62(1), pp.19-26.

Ogata, M., Taguchi, T. and Horike, T., 1995. Evaluation of exposure to solvents from their urinary excretions in workers coexposed to toluene, xylene, and methyl isobutyl ketone. *Applied Occupational and Environmental Hygiene*, 10(11), pp.913-920.

Quality Assurance

Internal QC:

Must be established

External QA:

Available from Health and Safety Laboratory

Interpretation

Urinary 4-methylpentan-2-one results reflect systematic exposure to 4-methylpentan-2-one 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

Akrill P., Sonderkoetter H., Jones K. A biological monitoring method for 4-methylpentan-2-one. HSL Report OT/97/01 (available from HSL).

For further advice, please contact us:

Sample Registration, Health and Safety
Laboratory, Harpur Hill, Buxton. SK17 9JN.

registration.sample@hsl.gsi.gov.uk

01298 218099

