**4-Methylpentan-2-one (MIBK)**

***Who is this guidance for?***

This guidance is primarily aimed at employers or individuals with delegated responsibility for managing workplace exposure to substances. Whilst it is not exhaustive, the information presented is intended to demonstrate how biomonitoring can help with this duty. Some simple advice is presented to help non-specialist users to get the most out of biomonitoring covering (1) when to take a sample to ensure reliable and comparable results over time; (2) putting the result into context with respect to background (environmental) levels or what can reasonably be achieved with good exposure control; and (3) some basic technical data that can help to evaluate an analytical service provider. For further information you should consult your chosen analytical service provider who should be happy to discuss your specific requirements and find solutions.

**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

**4-Methylpentan-2-one**

Monitored by analysis of 4-methylpentan-2-one in urine

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

***Biological Monitoring Guidance Value (BMGV)***

20 μmol 4-methylpentan-2-one/L urine

Conversion: 1 µmol/L = 100.16 μg/L

***Other Guidance Values***

The US (ACGIH) biological exposure index (BEI) is 1 mg/L (~10 µmol/L). The German (DFG) biological tolerance value (BAT) is 0.7 mg/L (~7 µmol/L). Guidance values set by different organisations will vary, based on factors including available data and scientific knowledge at the time and interpretation of the toxicology data.

***Sample Collection***

Urine samples should be collected at the end of shift into polystyrene universal containers (30mL). Sample bottle should be filled to the shoulder line (but not beyond).

***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 samples chilled – ideally frozen if suitable facilities are available. Packaging must comply with relevant postal regulations for biological samples (UN3373).

***Description of Suggested Method***

4-Methylpentan-2-one in urine is determined by headspace-gas chromatography-mass chromatography.

**Analytical Evaluation**

Detection limit: 1 µmol/L (0.1 mg/L) (3 x background)

Calibration range: Typically 0-40 µmol/L

Precision:

- within day <11% RSD

- day to day <14% RSD

Sample stability: 4 days at ambient temperature, >3 months at -20°C

Analytical Interferences: None known

Quality assurance: GEQAS (www.g-equas.de).

***Elimination Half-Life***

Elimination half-life is a measure of the rate of removal of a substance that has been taken into the body. It helps to identify when it is best to take a sample following potential exposure and indicates the potential ‘exposure window’ that will be reflected by a result.

Excretion of 4-methylpentan-2-one in urine has a half-life of approximately 1.5 hours. An end-of-shift urine sample will mostly reflect the past ~4 hours’ exposure. If use is intermittent, consider sampling within an hour of the end of last use.

While inhalation is generally the main route of exposure to 4-methylpentan-2-one, it can also enter the body through contact with exposed skin or contaminated gloves. Significant levels of skin absorption will delay the appearance of 4-methylpentan-2-one in urine.

**Other Information**

***Confounding factors***

None known.

***Unexposed level***

4-Methylpentan-2-one values in people not occupationally exposed are generally less than 1 µmol/L.

**Creatinine correction is not advised**

***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.

***Links***

EH40 List of Approved Workplace Exposure Limits <http://www.hse.gov.uk/pubns/books/eh40.htm>

Biological Monitoring: A tool for helping to assess workplace exposure (August 2021). Published by British Occupational Hygiene Society (www.bohs.org). [BOHS-Biological-Monitoring-A-tool-for-helping-to-assess-workplace-exposure-rebranded.pdf](https://www.bohs.org/app/uploads/2021/08/BOHS-Biological-Monitoring-A-tool-for-helping-to-assess-workplace-exposure-rebranded.pdf)

For further advice, please contact us:

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**Biological Monitoring at HSE**

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