**Xylene**

***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:**

Xylene CAS number: 1330-20-7

**Workplace Exposure Limits:**

8-hour TWA: 50ppm, 220mg/m3

15-minute STEL: 100ppm, 441mg/m3

Skin notation

**Xylene**

Monitored by analysis of methyl hippuric acid in urine

**BMGV**: 650 mmol methyl hippuric acid/mol creatinine

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

650mmol methyl hippuric acid/mol creatinine

Conversion: 1mmol/mol = 1.71mg/g

***Other Guidance Values***

The ACGIH BEI is 1.5 g/g creatinine (approx. 900mmol/mol creatinine). The DFG BAT is 2.0 g/L urine (approx. 900mmol/mol creatinine). 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 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***

Methyl hippuric acid in urine is determined by HPLC with UV detection. It is present as three isomers, which correspond to the three isomers of xylene (o-, m- and p-xylene). Industrial grade xylene comprises of a mixture of these isomers. Methyl hippuric acid results are reported as the sum of all isomers.

***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.

**Analytical Evaluation**

Detection limit: 100 µmol/L (20mg/L) (3 x background)

Calibration range: Typically 0-5000 µmol/L

Precision:

- within day <5% RSD

- day to day <10% RSD

Sample stability: 7 days at ambient temperature, >3 months at 20°C

Analytical Interferences: None known

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

Excretion of methyl hippuric acid in urine is biphasic, with half-lives of approximately 1.5 hours and 20 hours. An end-of-shift urine sample will mostly reflect that shift’s exposure to xylene, but there may be some additional influence from exposures over the previous 48 hours.

While inhalation is generally the main route of exposure to xylene, it can also enter the body through contact with exposed skin or contaminated gloves. Significant levels of skin absorption will delay the appearance of methyl hippuric acid in urine. Higher levels can be found pre-shift the following day if exposure is predominantly via skin absorption.

**Other Information**

***Confounding factors***

Alcohol and aspirin can interfere with the metabolism of xylene to methyl hippuric acid. They reduce the rate of elimination via urine metabolites, leading to lower levels in urine samples, while potentially extending the overall elimination time. Aspirin, at therapeutic doses, can reduce the methyl hippuric acid in end of exposure urine samples by 50%. Any co-administration of alcohol, aspirin or similar substances should be noted when collecting samples.

***Unexposed level***

Methyl hippuric acid values in people not occupationally exposed are generally less than 1 mmol/mol (< 2 mg/g). **Creatinine correction is advised**

***Interpretation***

Urinary methyl hippuric acid results reflect systematic exposure to xylene 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***

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

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

For further advice, please contact us:

Sample Registration, HSE, Harpur Hill, Buxton. SK17 9JN.

registration.sample@hse.gov.uk

0203 028 3383

**Biological Monitoring at HSE**

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