**2-Butoxyethanol (BAA)**

***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 Substances:**

2-Butoxyethanol

CAS number: 111-76-2

Alternative names:

Ethylene glycol monobutyl ether (EGBE), Butyl glycol

**Workplace Exposure Limits:**

8-hour TWA: 25 ppm; 15-minute STEL: 50 ppm

Skin notation

**2-Butoxyethanol**

Monitored by analysis of 2-butoxyacetic acid in urine

**BMGV**: 240 mmol 2-butoxyacetic acid /mol creatinine

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

240 mmol 2-butoxyacetic acid /mol creatinine

This is a health-based guidance value, set at a level at which there was no indication from the scientific evidence available that the substance being monitored was likely to be injurious to health.

Conversion: 1mmol/mol = 1.167mg/g

***Other Guidance Values***

The ACGIH BEI is 200 mg/g (approx. 170 mmol/ mol creatinine) and the DFG BAT is 150 mg/g creatinine (approx. 125 mmol/mol creatinine).

Guidance values from other sources may reflect different derivations and/or equivalence to different exposure limits. They will also have been set and/or reviewed at different times.

***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***

The metabolite 2-butoxyacetic acid is analysed as an indicator of exposure to 2-butoxyethanol. Urine samples are spiked with isotope-labelled internal standard, acid hydrolysed, derivatised with dry acetone and pentafluorobenzyl bromide and analysed by capillary GCMS. The GCMS is operated in the negative ion chemical ionisation mode with selected ion monitoring. Other methods have been reported by different laboratories and they can be found in the published scientific literature.

**Analytical Evaluation**

Limit of Quantitation: 10 µmol/L (approx. 0.8 µmol/mol creatinine)

Calibration range: Typically 0-1000 µmol/L

Precision:

- within day <12% RSD at 600 µmol/L

- day to day <17% RSD at 600 µmol/L

Sample stability: 2 days at ambient temperature, >3 months at -20°C

Analytical Interferences: None known

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

***When to take a sample?***

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.

The half-life of butoxyacetic acid (the metabolite of 2-butoxyethanol) is approximately 6-7 hours. Samples should be taken at the end of the shift, preferably after several days’ work if there is the potential for skin uptake.

**Other Information**

***Confounding factors***

Consumption of ethanol will delay excretion as the same enzyme pathway is used to metabolise both chemicals. Co-exposure to 2-butoxyethyl acetate will increase urinary levels as it is also metabolised to 2-butoxyacetic acid.

***Unexposed level***

Below the quantitation limit.

**Creatinine correction is advised**

***Interpretation***

Urinary 2-butoxyacetic acid results reflect systematic exposure to 2-butoxyethanol 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. An elevated result should be re-tested as soon as possible to help establish whether it represents ongoing workplace exposure or a ‘one-off’ event. If necessary, employers will need to look at current work practices to see how they can be improved to reduce exposure.

***Further information***

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)

Jones, K. and Cocker, J., 2003. A human exposure study to investigate biological monitoring methods for 2-butoxyethanol. Biomarkers, 8(5), pp.360-370.

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>