

Biological Monitoring Guidance Values

Guidance sheet for:

Polycyclic aromatic hydrocarbons (PAHs)

Monitored by analysis of 1-hydroxypyrene in urine

BMGV: 4 μ mol 1-hydroxypyrene/mol creatinine

Hazardous Substance

Polycyclic aromatic hydrocarbons



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Biological Monitoring Guidance Value (BMGV)

Guidance value: 4µmol 1-hydroxypyrene/mol creatinine

Conversion: 1µmol/mol = 1.93µg/g

Other Guidance Values

None.

Sample Collection

Urine samples should be collected at the end of shift at the end of the working week, 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 for up to 7 days in the refrigerator; for longer-term store at -20°C. Packaging must comply with Post Office regulations.

Description of Suggested Method

Urine (200µL) is incubated at 37°C for 4 hours with glucuronidase before injection onto a C18 HPLC column. Detection is by fluorescence, with an excitation wavelength of 242nm and an emission wavelength of 398 nm.

Analytical Evaluation

Detection limit:

5nmol/L (3 x background)

Calibration range:

Typically 5-100nmol/L

Precision:

- within day <8% RSD at 40nmol/L

- day to day <7% RSD at 250µmol/L

Sample stability:

2 days at ambient temperature, >3 months at 20°C

Analytical Interferences: None known



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Other Information

Elimination half-time:

For 1-hydroxypyrene in urine, approximately 5.5, 23 and over 300 hours (triphasic).

Confounding factors:

Use of coal tar products (e.g. shampoos) can increase 1-hydroxypyrene levels significantly and any use should be noted. Smokers will have higher levels than non-smokers.

Unexposed level:

$<2\mu\text{mol}$ 1-hydroxypyrene/mol creatinine

Creatinine correction is advised

Biological monitoring for PAHs is based on the analysis of a marker PAH metabolite, 1-hydroxypyrene (MW 218), which is excreted in urine as a mixture of glucuronide and sulphate conjugates. 1-Hydroxypyrene has been shown to have a good correlation with total PAH exposure and also with exposure to benzo[a]pyrene¹.

Quality Assurance

Internal QC:

Must be established

External QA:

G-EQUAS (www.g-equas.de).

Email: G-EQUAS@ipasum.med.uni-erlangen.de.

Telephone: +49-9131-8522312.

Interpretation

Urinary 1-hydroxypyrene results reflect systematic exposure to polycyclic aromatic hydrocarbons 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

¹ Unwin, J., Cocker, J., Scobbie, E. and Chambers, H., 2006. An assessment of occupational exposure to polycyclic aromatic hydrocarbons in the UK. *Annals of Occupational Hygiene*, 50(4), pp.395-403.

For further advice, please contact us:

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