

Biological Monitoring Guidance Values

Guidance sheet for:

4, 4' Methyleneedianiline (MDA) in urine

BMGV: 50µmol 4, 4' methylenedianiline/mol creatinine

Hazardous Substance

4, 4' Methyleneedianiline (MDA)

CAS number: 101-77-9

Alternative name:

Diaminodiphenylmethane

Workplace Exposure Limit:

8-hour TWA: 0.01ppm, 0.08mg/m³

Skin notation



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Biological Monitoring Guidance Value (BMGV)

Guidance value: 50µmol/mol creatinine

Conversion: 1µmol/mol = 1.751 µg/g

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

The major urinary metabolites of MDA (the N-acetyl conjugates) are hydrolysed in concentrated sulphuric acid (200µL), at 100°C for 90 minutes. After cooling, sodium hydroxide (2mL, 10M) and diethyl ether (4mL) are added and mixed for 20 minutes. After extraction, the tubes are centrifuged and 3mL of the ether layer is transferred to a clean tube and the

solvent removed under nitrogen. The residue is derivatised with heptafluorobutyric anhydride (20µL) in toluene (200µL) in closed tubes at 60°C for 1 hour. The tubes are cooled, the derivatising agent is removed under nitrogen and the residue reconstituted in toluene (100µL). Splitless injection is carried out (2µL, 350°C) into a capillary column (30m x 0.3mm, ZB-5, 1µm) at 150°C, increasing at 5°C/min to 200°C, then 25°C/min to 300°C. Detection is by mass spectrometry with negative ion chemical ionization (methane), monitoring ions at m/z 571 and 574; with d8-4, 4-methylene dianiline used as the internal standard.

Analytical Evaluation

Detection limit:

1nmol/L (approximately 0.1µmol/mol creatinine)

Limit of quantitation:

5nmol/L (approximately 0.5µmol/mol creatinine)

Calibration range:

Typically 0-160 nmol/L

Precision:

- within day <3% RSD at 375µmol/L

- day to day 8% RSD at 375µmol/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:

Approximately 6-7 hours

Confounding factors:

Co-exposure to methylenedianiline diphenyl isocyanate

Unexposed level:

None detected

Creatinine correction is advised

Toxicity of MDA:

MDA is a suspected human carcinogen¹.

Alternative Method

Peterson, J.C., Estiva, E.C., Lyttle, D.S. and Harris, R.M., 1991. High-performance liquid chromatographic determination of 4, 4'-methylenedianiline in human urine. *Journal of Chromatography B: Biomedical Sciences and Applications*, 564(1), pp.205-212.).

Quality Assurance

Internal QC:

Must be established

External QA:

Available from Health and Safety Laboratory

Interpretation

Urinary MDA results reflect systematic exposure to MDA that may have entered the body by inhalation or more likely, 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 The National Institute for Occupational Safety and Health (NIOSH), (2004). 4,4'-Methylenedianiline(MDA) (Revised). [online] Available at: <http://www.cdc.gov/niosh/docs/86-115/> [Accessed 05/05/2016].

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

