



24.14 Biological Monitoring: A Guide to Sampling & Guidance Values

Introduction

Biological monitoring is the measurement and assessment of chemicals or their metabolites (substances the body converts the chemical into) present in exposed workers bodies. These measurements are made using samples of breath, urine, blood, or any combination of the above. Measurements reflect the total uptake of a chemical by an individual by all routes (inhalation, ingestion, through the skin or by a combination of these routes).



The Purpose of Sampling

Sampling may be undertaken for several reasons, but in most cases, it is used for:

- **Health Surveillance** – Some chemicals, such as lead, are very toxic and people who work with them must be closely monitored.
- **Exposure control** – For less harmful chemicals, it is often useful to measure a worker's uptake to ensure that controls such as extraction and PPE are adequate and that they are being used correctly.

Sampling Considerations

Factors that affect sampling choice include:

- **Half-life** – A measure of how quickly a substance is excreted from the body.
- **Sample type** – Usually urine, blood, or breath.
- **Target Chemical** – Some substances can be measured directly; others may require the measurement of a metabolite (a substance that is produced by the body as it breaks down a chemical).

Biological Monitoring Guidance Values (BMGV)

Substance	Biological monitoring guidance values	Sampling time
Butan-2-one	70 µmol butan-2-one/L in urine	Post shift
2-Butoxyethanol	240 mmol butoxyacetic acid/mol creatinine in urine	Post shift
Carbon monoxide	30 ppm carbon monoxide in end-tidal breath	Post shift
Chromium VI	10 µmol chromium/mol creatinine in urine	Post shift
Chlorobenzene	5 mmol 4-chlorocatechol/mol creatinine in urine	Post shift
Cyclohexanone	2 mmol cyclohexanol/mol creatinine in urine	Post shift



Substance	Biological monitoring guidance values	Sampling time
Dichloromethane	30 ppm carbon monoxide in end-tidal breath	Post shift
N,N-Dimethylacetamide	100 mmol N-methylacetamide/mol creatinine in urine	Post shift
Glycerol trinitrate (Nitroglycerin)	15 µmol total nitroglycols/mol creatinine in urine	At the end of the period of exposure
Isocyanates (applies to HDI, IPDI, TDI and MDI)	1 µmol isocyanate-derived diamine/mol creatinine in urine	At the end of the period of exposure
Lindane (gBHC(ISO))	35 nmol/L (10 µg/L) of lindane in whole blood (equivalent to 70 nmol/L of lindane in plasma)	Random
MbOCA (2,2' dichloro-4,4' methylene dianiline)	15 µmol total MbOCA/mol creatinine in urine	Post shift
Mercury	20 µmol mercury/mol creatinine in urine	Random
4-methylpentan-2-one	20 µmol 4-methylpentan-2-one/L in urine	Post shift
4,4'-Methylenedianiline (MDA)	50 µmol total MDA/mol creatinine in urine	Post shift for inhalation and pre-shift next day for dermal exposure
Polycyclic aromatic hydrocarbons (PAHs)	4 µmol 1-hydroxypyrene/mol creatinine in urine	Post shift
Xylene, o-, m-, p- or mixed isomers	650 mmol methyl hippuric acid/mol creatinine in urine	Post shift

How to interpret your results

You should compare your results to the values in the table overleaf. In most cases, you should expect your results to be below the guidance values. Where they are not, you may wish to discuss your results with your Occupational Health Professional, Health & Safety Officer, or manager.

Further Information

A free information sheet briefly describing a suggested analytical method, appropriate sampling strategy, the availability of quality assurance schemes and interpretation of results is available for each of the substances referenced in the table.

This information can be obtained from the Health & Safety Laboratory: <https://www.hsl.gov.uk/online-ordering/analytical-services-and-assays/biological-monitoring/bm-guidance-values>

The HSE's document, *Biological Monitoring in the Workplace. A guide to its Practical Application to Chemical Exposure* can be found here: <https://www.hse.gov.uk/pubns/priced/hsg167.pdf>

Most of the information in this guide has been supplied by the Health & Safety Executive (HSE). Their website is a useful source of information regarding Health & Safety: <https://www.hse.gov.uk/index.htm>

A copy of this & other documentation can be found from <https://mohs.co.uk/resources> or using the QR code at the top of this page.