Provision of efficient and verified biomonitoring methods by the MAK Commission

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Introduction

- **Biomonitoring** represents the most powerful approach to **assess individual exposure and health risk** of workers from chemical compounds.
- **Challenges** of biomonitoring analysis are availability and implementation of high-quality biomonitoring methods.
- **Regular published biomonitoring methods** are often
  - lacking sufficient data on reliability criteria
  - difficult to reproduce due to missing detailed information
- **MAK Commission** (Permanent Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area)
  - founded in 1955 by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation)
  - responsible for the assessment of toxicological data and analytical capacity for exposure monitoring
  - includes a working group “Analyses of Hazardous Substances in Biological Materials” (*AibM*), which develops, verifies, and publishes high-quality human biomonitoring methods

Methodology

- **Submitted/requested biomonitoring methods** are assessed in a specified multi-stage process including
  - practical replication and verification in at least one independent lab
  - checking of practical reproducibility and
  - reliability criteria (precision, recovery, LOD, LOQ, matrix effects)

Results

- The *AibM* group has developed, verified and published nearly 200 biomonitoring methods in English since 1985
- **AibM methods** include
  - Inorganic parameters (Cr, Hg, Pb, Sb, …)
  - Organic parameters (solvents, plasticisers, pesticides, …)
  - Element species (As, Sb, Se, …)
  - Multimethods (e.g. chlorophenols, alkylating substances, …)
- **AibM methods** are comprehensively validated, and reliability data are confirmed by replication and verification of the procedure in independent laboratories (by examiners).
- Outdated *AibM methods* are continuously replaced by new methods with more up-to-date equipment.
- **AibM cooperates** closely with the MAK working group on **assessment values in biological material (BAT group)**, which develops concepts and assessment values for the use of biomonitoring in occupational settings.
- “The MAK Collection for Occupational Health and Safety” has been submitted for recording in PubMed Central®.

Take-home messages

- The quality of *AibM* methods is ensured by applying a multi-stage process with fixed specifications from development to publication.
- Detailed, ready-to-use protocols are published and enable
  - the monitoring of occupational exposure
  - but often of the background exposure in the general population as well.
- All documents of the MAK Commission are **available by open access**.

References

- *AibM methods* until 2019: Onlinelibrary Wiley
- *AibM methods* from 2020: PUBLISIO ZB MED

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Figure: Process of development, examination, and publication by the *AibM* group