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Short communication

# Ensuring coherence in occupational biomonitoring: a call for alignment and collaboration

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ABSTRACT

This commentary addresses a critical and timely issue, namely the continued exclusion of certified occupational hygienists from conducting exposure assessments using the biomonitoring approach, as reflected in the recent EU-OSHA 2025 guidance. Current EU regulations frame biomonitoring within medical surveillance. This regulatory structure limits the use of biomonitoring as a preventive tool and sidelines professionals who are essential to exposure assessment and workplace safety. We are a multidisciplinary team comprising certified occupational hygienists and occupational medical doctors. We believe that the EU OSHA guidance represents a missed opportunity for collaboration. We hope this commentary will reach members of the EU regulatory bodies encouraging them to reconsider the current framing and promote a more integrated approach. By clarifying roles and fostering cooperation between occupational hygienists and physicians, we can ensure that biomonitoring fulfills its full potential in protecting worker health.

Human biomonitoring is a key method for assessing chemical exposures, especially in occupational settings where regular handling of substances increases the likelihood of exposure. HBM provides reliable data on chemical exposures with quantitative measures of the presence and concentration of chemicals in our bodies. Although a chemical may be detected in the human body, its interpretation in occupational settings depends on biomonitoring assessment values such as Biological Limit Values (BLVs), Occupational Biomonitoring Levels (OBLs) or Human Biomonitoring Guidance Values (HBM GV), which function as benchmarks for workplace decision-making. Several projects, networks and organizations like the Partnership for the Assessment of Risks from Chemicals (PARC), the Risk Assessment Committee (RAC) of ECHA, the Organisation for Economic Co-operation and Development (OECD), the International Society of Exposure Science (ISES) are actively working toward the international harmonization, the development of standardized biomonitoring methods, and the derivation of assessment values. Monitoring chemical exposures over time can provide valuable insights for regulators, helping them to evaluate the effectiveness of existing regulations and identify any unintended exposures (trend monitoring). While the health risk of certain chemicals, such as lead, are well quantified through established dose–response curves, the health effects of many other chemicals at varying exposure levels remain uncertain due

*Abbreviations:* BLV, Biomonitoring Limit Value; OBL, Occupational Biomonitoring Level; OECD, Organisation for Economic Co-operation and Development; HBM-GV, Human Biomonitoring Guidance Values; PARC, Partnership for the Assessment of Risks from Chemicals; RAC, Risk Assessment Committee.

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to insufficient toxicological data. This knowledge gap highlights the importance of biomonitoring studies that can connect real-world exposure measurements with observed health effects.

From 2019 to 2024, scientists worldwide, specializing in exposure science and occupational health, collaborated within the OECD framework to develop a comprehensive occupational human biomonitoring guide (OECD 2022, Hopf et al. 2024, Hopf et al. 2025). The guidance represents a globally harmonized effort and outlines methodologies for conducting occupational biomonitoring studies and applying OBLs, ensuring worker health protection, and implementing preventive measures against chemical hazards. The OECD's guidance promotes an integrated, multidisciplinary collaboration and reflects scientific consensus on the practical, ethical, and technical dimensions of occupational HBM. It provides clarity on exposure assessment strategies, professional responsibilities, data protection, and the need for cross-disciplinary roles, including certified occupational hygienists (global framework IOHA or equivalent to European Qualification Framework – EQF7 https://europass.europa.eu/en/description-eight-eqf-levels) and health professionals. This guidance also aimed to promote the use of HBM as an exposure assessment method, addressing its traditionally limited application in health surveillance programs, as already discussed extensively in Viegas et al (2020).

In 2025, the European Agency for Safety and Health at Work (EU-OSHA) published a separate guidance document on biological monitoring at work (EU-OSHA 2025), without aligning with the ongoing harmonization efforts led by the OECD. EU-OSHA's 2025 guidance focuses on assisting occupational health professionals and managers in setting up and managing workplace biomonitoring programs for chemical exposures. While it provides practical information and recognizes biomonitoring in the workplace as a method for exposure assessment, the guidance is primarily oriented towards medical surveillance, categorizing biomonitoring under workers' health surveillance programs. This classification potentially limits its use as an exposure assessment method and diminishes the role of the certified occupational hygienists and exposure scientists, who are among the most qualified professionals to evaluate chemical exposures in the workplace. The essential role of the certified occupational hygienists is to identify priority pollutants, define similar exposure groups (SEGs), propose biomonitoring sampling strategies based on workers' exposure profiles, provide contextual data useful for their interpretation, participate in the interpretation of the data and implement prevention and protection measures. This was either forgotten or implicitly denied in EU-OSHA guidance, even though biomonitoring campaigns cannot be correctly implemented in practice without the support from certified occupational hygienists.

Under current EU regulations, including Directive 98/24/EC and Directive 2004/37/EC, biomonitoring is considered part of health surveillance and must be conducted under the supervision of a competent medical authority. An overview of the use of exposure biomonitoring for medical and exposure assessments in many countries has been provided in supplementary material. While this ensures ethical oversight and clinical follow-up, it restricts the certified occupational hygienists from accessing and interpreting individual biomarker results or communicating them to workers, even when the exposure biomarker is used solely to quantify internal exposure. This limitation is problematic, as certified occupational hygienists are best positioned to implement exposure reduction strategies based on biomonitoring data. Exposure biomarkers are particularly valuable for assessing total chemical uptake via inhalation and skin, evaluating the effectiveness of personal protective equipment (PPE), and identifying high-risk scenarios such as heavy manual work that increases inhalation volume. The ICOH Code of Ethics supports a multidisciplinary approach and explicitly includes certified occupational hygienists among occupational health professionals entitled to conduct biomonitoring. Therefore, regulatory reform is needed to distinguish between exposure assessment and clinical diagnosis, allowing certified occupational hygienists to use biomonitoring to improve workplace safety, while maintaining collaboration with medical professionals for health-related follow-up. This would enable biomonitoring to function as an effective preventive strategy that generates substantial societal benefits, rather than being confined to clinical oversight. Such an approach not only protects individual workers but also reduces the broader economic burden of occupational diseases on healthcare systems and society.

## 1. Main concerns

### 1.1. Restrictive classification

EU-OSHA's guidance categorizes all biomonitoring with exposure biomarkers mainly under medical surveillance, which may limit its use as an exposure assessment method. Across the EU and EEA countries, occupational biomonitoring is generally embedded within occupational health surveillance. In some countries (such as Belgium, France, Germany, Italy, and Sweden) it is explicitly defined in law as a medical act. In others, even without formal legal classification, biomonitoring is still conducted under the authority of qualified occupational health professionals, ensuring medical oversight, confidentiality, and integration into occupational medical surveillance systems. However, in certain EU countries, such as the Netherlands and Finland, occupational hygienists may be allowed to implement biomonitoring campaigns for exposure assessment purposes without a formal medical prescription as long as it is conducted for exposure assessment purposes rather than health surveillance and complies with ethical and data protection standards. This distinction is important, as the OECD guidance categorizes biomonitoring for exposure biomarkers under exposure monitoring, aligning more closely with certified occupational hygiene practices. Use of exposure biomarkers should be clearly recognized as part of exposure assessment strategies.

### 1.2. Missed opportunity for collaboration

Divergent interpretations of roles, responsibilities, and implementation strategies can lead to inconsistencies across Member States and reduce the use and effectiveness of biomonitoring in preventing work-related disease. The General Data Protection Regulation (GDPR) adds another layer of complexity, as it classifies exposure biomarkers as sensitive health-related personal data. Even when used solely to quantify chemical exposure, such data must be handled under strict conditions (GDPR Article 4(15) and Recital 35), often restricting access for the certified occupational hygienists. This regulatory framing merges exposure assessment with clinical oversight, limiting the use of biomonitoring for preventive workplace interventions.

## 2. Benefits of collaborative approach

Certified occupational hygienists and occupational physicians possess complementary skill sets that are essential for comprehensive workplace health management. Certified occupational hygienists specialize in identifying, evaluating, and controlling workplace hazards, as well as assessing the resulting risks for workers. Besides, occupational physicians focus on preventing, diagnosing and treating work-related injuries and illnesses among their workers. Integrating these complementary skills and expertise results in a more comprehensive and efficient approach to worker health and safety.

In terms of data protection compliance, biomonitoring data for exposure biomarkers can and should be used for collective assessments, such as Similar Exposure Groups (as described in the OECD report) as well as on individual level by occupational exposure assessors. Appropriate pseudonymization enables the use of biomonitoring data while maintaining confidentiality. This involves coding all biological samples (such as urine and blood) with numerical identifiers instead of names and securely storing the key that links codes to worker identities.

Exposure assessors can then identify elevated biomarker concentrations without compromising privacy. In this setup, only certified occupational hygienists and occupational physicians have access to the key, making the data effectively anonymous to anyone else. This access is justified because exposure biomarkers typically reflect workplace-related exposures and are not inherently medical in nature.

Certified occupational hygienists should be able to conduct biomonitoring programs using exposure biomarkers independently or in collaboration with occupational physicians. Certification occupational hygienists should have access to pseudonymized data, allowing them to assess individual exposure and relevant biomarker information. Occupational physicians should also receive these reports and have access to the individual-level data shared by the occupational hygienists. This information is important for understanding the actual working conditions and for the occupational physician, it supports clinical evaluations and discussions with workers. In cases where an individual's exposure biomarker concentration is exceptionally high and cannot be explained by known occupational exposures, this may indicate other underlying causes that require medical attention. In such situations, the occupational physician should take the lead in evaluating the case under medical confidentiality. This collaborative approach ensures full GDPR compliance while enabling both effective workplace interventions and appropriate medical follow-up, through a coordinated effort between the certified occupational hygienists and occupational health professionals. While both the OECD and EU-OSHA guidance documents aim to enhance the implementation of occupational HBM, these parallel initiatives present a risk of fragmentation. Their divergent interpretations of the scope of occupational biomonitoring may hinder knowledge translation and reduce the use of biomonitoring in preventing work-related disease. This also undermines the collaborative efforts needed between exposure scientists, certified occupational hygienists, and clinicians to comprehensively manage workplace risks. Interdisciplinary collaboration ensures that protection strategies are comprehensive and effective. By working together, certified occupational hygienists and physicians can develop and implement strategies that address both the immediate and long-term health risks associated with chemical exposures in the workplace. This collaborative effort ultimately enhances worker protection and promotes a safer working environment.

## 3. Recommendation

We welcome EU-OSHA's initiative to promote biomonitoring in occupational health. Its current guidance places occupational biomonitoring primarily within the scope of medical surveillance. This reflects the structure of existing EU legislation rather than a deliberate omission. In practice, EU-OSHA adopts many elements of the internationally harmonized approach developed under the OECD. The OECD guidance emphasizes the role of exposure assessors, scientists, and certified occupational hygienists in implementing occupational biomonitoring programs and interpreting exposure biomarkers as part of exposure assessment strategies. However, we recommend that future regulatory frameworks explicitly recognize exposure biomonitoring as an approach for exposure assessment and formally include the expertise of certified occupational hygienists and exposure scientists in its implementation.

## 4. Author agreement statement

We the undersigned declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We understand that the Corresponding Author is the sole contact for the Editorial process. He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

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## CRediT authorship contribution statement

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.envint.2025.110006.

## Data availability

No data was used for the research described in the article.

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