Results and experiences on effect biomarkers in HBM4EU and PARC occupational studies – what recommendations can be given?

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Background The HBM4EU project conducted extensive research to assess the utility of effect biomarkers in occupational settings and the work is continued within the EU Partnership on the Assessment of Risks from Chemicals (PARC). The inclusion of effect biomarkers in occupational biomonitoring studies is paramount to understand the relationship between exposure to hazardous substances and resulting health effects and to prioritise intervention strategies. The data generated helps establishing dose-response relationships for determining safe exposure levels.

Materials and methods The referred studies included effect biomarkers such as inflammatory proteins, production of reactive oxygen species, metabolomics, and various genotoxicity endpoints. HBM4EU included workers exposed to hexavalent chromium, di-isocyanates and various compounds in E-waste recycling. In PARC, studies including workers from waste management and healthcare sectors are ongoing. Both projects include control groups from within and outside the participating industries.

Results Examples will be shown to illustrate how the data from effect biomarkers can be used to reveal connections between exposure and early effects and to identify worker groups that are at a higher risk. The use of effect biomarkers also presents challenges, such as the need for standardized methods, understanding the influence of confounding factors and ethical issues related to results communication.

Conclusions These studies highlight the importance of multi-biomarker approaches to enhance the early detection of potential long-term adverse health outcomes. The use of a standardized study design and consistent implementation of effect biomarkers across studies will improve comparability and robustness of the results increasing their utility in regulatory risk assessment.