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2nd International Conference on Human Biomonitoring, Berlin 2016

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Which pollutants are people exposed to nowadays and which exposures have diminished as a result of environmental legislation? This was one of the topics experts from 33 countries discussed at the 2nd International Conference on Human Biomonitoring from the 17th to the 19th of April 2016 in Berlin.

At the conference entitled “Science and policy for a healthy future”, international experts convened and discussed a broad variety of human biomonitoring (HBM) activities worldwide. Building upon the success of the first conference in Berlin in 2010, the German Environment Agency (UBA) and the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) jointly organized this second international forum to exchange information on all aspects related to HBM.

HBM provides key information for health-related environmental protection. HBM studies deliver scientific data useful to inform environmental policy decisions, for example to identify chemicals with widespread human exposure, to identify population groups with particularly high levels of exposure and to monitor effectiveness of interventions.

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International experts from the scientific sector, politics, authorities, industry and other associations were invited to critically look at research on chemicals with the potential to harm human health, to evaluate research priorities, and to discuss the incorporation of HBM into national and international initiatives on the environment and health.

The scientific program included sessions with presentations and discussions on the following topics:

HBM programs – new developments

The latest results from important HBM programs around the world were reported, including the National Health and Nutrition Examination Survey (NHANES) from the USA, Health Canada's Human Biomonitoring Initiatives, the German Environmental Survey (GerES) and those from France, Israel, and Korea. Long-standing national HBM survey programs have made significant strides to improve the use of HBM in policy making. On the other hand, new programs have been set up and legal frameworks for surveillance have now been established in a number of countries. Although sample size, study design and selection of chemicals vary by survey and country, HBM programs now cover overall more than 200 substances based on systematic substance prioritization schemes. Time series reveal that some exposures change as new chemicals and products enter the consumers' market. Over time, concern has shifted to chemicals used in consumer products and non-persistent chemicals or alternatives to banned or restricted substances and to exposures among specific segments of the population, such as children and adolescents.

HBM in large scale birth cohorts

Examples of the use of HBM to evaluate potential impacts on health later in life from exposures that may have happened during pregnancy or early childhood were illustrated with the experiences from the large scale birth cohorts in Japan, China, Canada and France. These birth cohorts cover several thousand to a hundred thousand participants and work towards determination of relationships between exposures, in particular to endocrine disruptors (EDCs), and health outcomes. The Environment and Child Health International Birth Cohort Group is working towards harmonization to allow for comparison and combined analyses of results. The large number of samples included in large-scale birth cohorts require new analytical methods to process data in limited time and at low cost.

Broadening the HBM toolbox

The conference showed that good progress has been made in identifying and using biomarkers of exposure to non-persistent chemicals, and analytical methods for substances of emerging health relevance. Innovative methods in HBM range from sensitive analytical methods for chemicals of emerging health relevance to the "omics" techniques. Innovative approaches such as the collaboration between the BMUB and the German Chemical Industry Association (VCI) have proven to be useful. The exposome concept, currently being further developed in a number of EU and other international funded research projects,

may offer a conceptual leap in studying the interaction between genetics and the environment and the role of exposures over lifetime on human health.

HBM in health risk assessment

The experts also covered HBM data use for risk assessment, with cumulative risk assessment and with the practical use of health-related HBM guidance values. Considerable developments in toxicological interpretation of exposures and pharmacokinetic modeling and the establishment of health-related HBM guidance values (HBM values) or biomonitoring equivalents (BEs) have facilitated the use of HBM in health risk assessment. At the same time, considerable efforts have been made to increase the understanding of toxicity of chemical mixtures. One example in this area relates to characterizing the joint action of chemicals such as phthalates. Further, the increasing use of HBM data in the assessment of health and ecological risks associated with approximately 4300 substances under the Canadian Environmental Protection Act also shows the impact that HBM can have in regulatory decision-making.

Harmonizing HBM approaches and data – progress in the international and European landscape

Harmonization needs and efforts in the United States and from the first Europe-wide HBM study COPHES/DEMOCOPHES (2009–2012) were reported. The conference clearly showed the need for further harmonization of HBM approaches and international collaboration to overcome remaining challenges, and showed potential of harmonized approaches to estimate the burden of disease. To address these challenges, new initiatives have been established recently both in Europe and in the USA. Some examples are the European Human Biomonitoring Initiative HBM4EU in the EU Framework Program for Research and Innovation, Horizon, 2020 of the European Union, and the US Association of Public Health Laboratories National Biomonitoring Plan. These initiatives will work towards establishing a Europe-wide or US state-based sustainable HBM program.

The conference’s scientific program was set out in two panel discussions. HBM provides scientific data to support decision making by regulators and policy makers, and to inform the general public. On the regulatory and policy side, HBM provides a mechanism for identifying areas for priority action and for monitoring the success of policies in reducing exposure to environmental chemicals. Important future goals were identified to include the improvement of fast data access and data exchange as well as the enhancement of harmonization of HBM and the expansion of collaboration and cooperation among all stakeholders.

The HBM conference illustrated how HBM can provide early warning data to identify human exposure to potentially harmful pollutants. However, HBM methods constantly have to evolve to be able to critically prioritize investigations to today’s chemicals with the potential to harm human health. Because many chemicals are used worldwide and do not know of geographical borders, increased cooperation, networking, data-sharing and HBM

initiatives would benefit populations' health not only within Europe, but also at a global level.

The UBA and BMUB, the organizers of the HBM conference and this special issue, sincerely thank all the authors and conference participants for their invaluable contributions. We would also like to thank the conference chairs and the panelists for productive discussions and engaging dialog. We also gratefully acknowledge the work of the scientific committee for ensuring the high quality of the program. Special thanks are due to the following additional members of the scientific committee:

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This special issue brings together the conference proceedings as well as additional HBM-related publications. It reflects the current state of the art in HBM – a tool to detect human's exposure to potentially harmful chemicals, to confirm the success of chemical policy and interventions, and to identify areas for priority action and research. The work presented in this issue clearly shows that knowledge exchange and cooperation between all stakeholders in HBM programs can be used to shape a healthy future.