



science and policy  
for a healthy future

# HBM4EU project

Concepts and principles of HBM

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### 1. Concepts and principles

*Definition*

*Types of biomarkers*

*Applications of HBM data*

### 2. HBM in practice - merits

### 3. HBM in practice - limitations



# Definition of human biomonitoring (HBM)

Measurement of concentrations of chemicals or their metabolites in human body fluids and tissues, mainly in blood, urine, and serum, but also in saliva, breast milk, sweat, faeces, hair, teeth, and nails

Source: HBM4EU project proposal



# Biomarkers of exposure

Biomarkers of exposure identify and measure chemical residues in tissues or body fluids, metabolites of xenobiotic compounds, or physiological outcomes that occur as a result of exposure

Source: HBM4EU project proposal



# Biomarkers of susceptibility

Biomarkers of susceptibility reflect the intrinsic characteristics of an organism that make it more susceptible to the adverse effects of an exposure to a specific chemical substance

Source: HBM4EU project proposal



# Biomarkers for research and discovery

During the last decade a combination of advanced techniques clustered under the name “omics” has offered new opportunities for enhanced understanding of the exposure-response continuum and deregulations in physiological networks, rather than single biomarkers in health risk assessment.

Omics are high throughput techniques that permit the observation and measurement of response modulation at different biological scales (e.g. [epi]genome, transcriptome, proteome, metabolome) in humans

Source: HBM4EU project proposal

# Applications of HBM data

[...] reflect **internal exposure** to the chemical of interest

[...] important tool in **epidemiology** and **health sciences**

[...] HBM data can improve **chemical risk assessment**, through a methodology based on robust and realistic human internal exposure data

Source: HBM4EU project proposal



Biomarkers integrate of exposure over

time

Hours, days, months, years, depending on the biomarker

routes

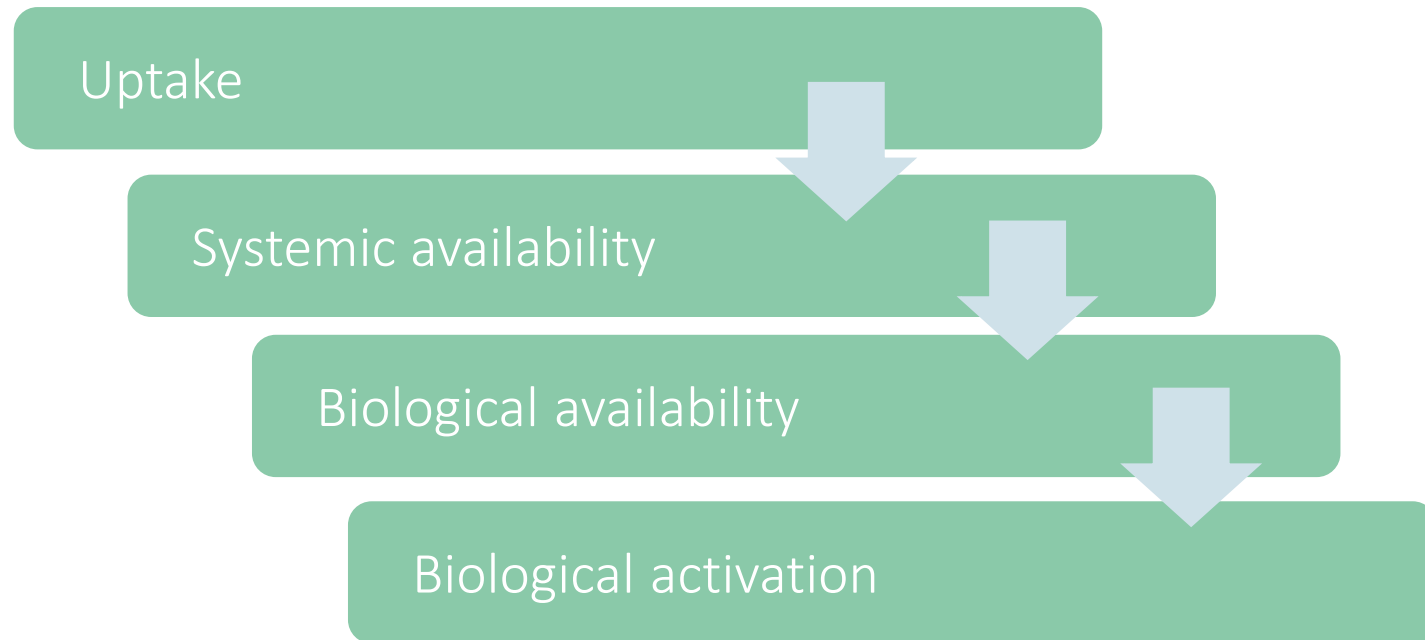
Oral, skin or inhalation

sources

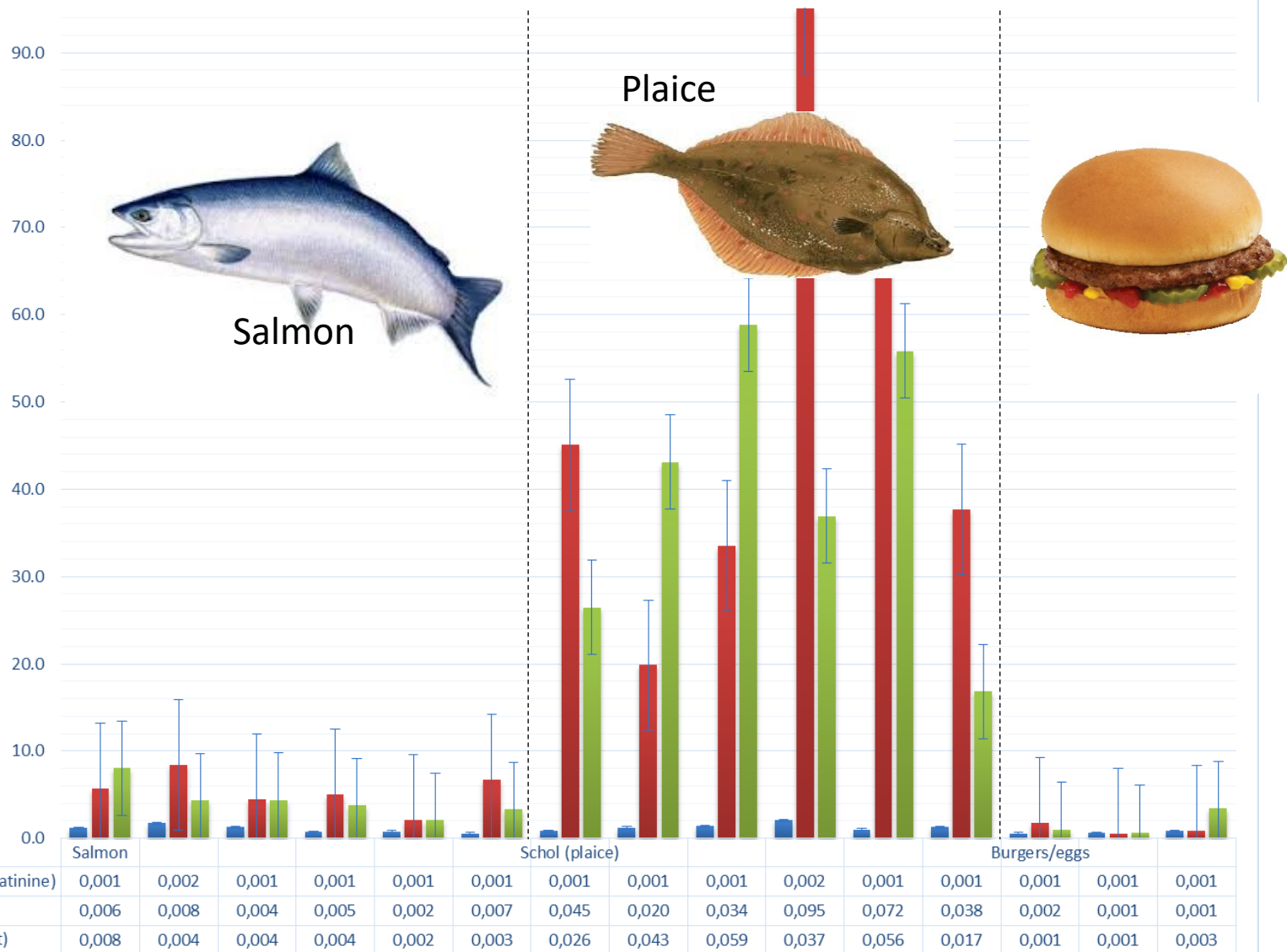
Diet, home, work environment, outdoor air pollution



Compared to environmental monitoring



µg As/mMol creatinine

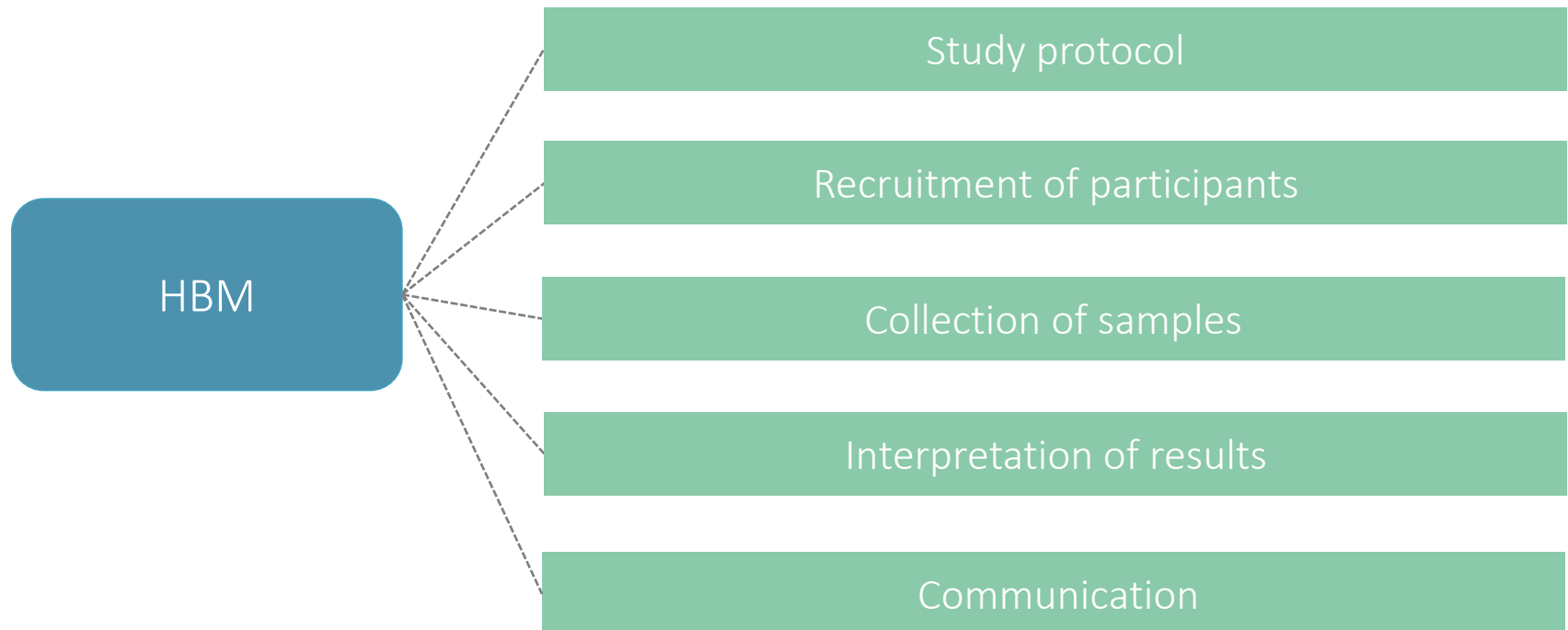


HBM data by themselves do not contain information on

- Exact time or duration of exposure
- Source of exposure
- Route of uptake

For interpretation you often need contextual data  
(e.g. retrieved by questionnaire) and/or additional modelling  
(e.g. PBPK modelling)

HBM is more than the analysis of biomarkers ...



# Take home

Biomarkers can be classified for exposure, susceptibility and for research and discovery.

Depending on the choice of a biomarker, HBM often integrates information on bioavailability and bioactivation over time and are suitable to study aggregate exposure.

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## Speaker's information

Paul T.J. Scheepers PhD works as associate professor at the Radboudumc, Nijmegen, The Netherlands. He received training in toxicology and occupational hygiene. In HBM4EU he is responsible for training activities as task leader in WP2. He is a member of the ethics board in WP1.



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