Biomarker monitoring for food contaminants

Hermann M. Bolt¹

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In this issue of the Archives of Toxicology, Ivonne Rietjens and colleagues contribute a comprehensive review about exposure assessment of food contaminants (Rietjens et al. 2018). The authors focus on five process-related compounds: acrylamide, monochloropropane-1,2-diols (MCPDs), glycidyl ethers, furan and acrolein. For each compound or compound group, occurrence, urinary, blood as well as tissue biomarkers, PBPK studies and possible endogenous formation of the respective biomarkers are summarized and discussed (Rietjens et al. 2018).

Accurate exposure estimation is a critical and particularly a challenging step in risk assessment. As soon as the relationship between blood, urine or tissue biomarkers and internal concentrations of the compound of interest has been understood, extrapolation to external exposure is possible. For this purpose, typically PBPK models (or reverse PBPK models) are used (Strikwold et al. 2017; Wang et al. 2017; Poon et al. 2017; Schenk et al. 2017; Al-Malahmeh et al. 2017). Besides their classical application, PBPK models can also be used for extrapolation between species (Ghallab 2015; Thiel et al. 2015) and for in vitro to in vivo extrapolation, if adequate in vitro systems are available (Frey et al. 2014; Stöber 2016; Leist et al. 2017).

One further step that can be built on the knowledge of compound concentrations in tissues are pharmacodynamic spatio-temporal models (Schliess et al. 2014; Bartl et al. 2015). With the help of such models, predictions of organ toxicity have been made for specific internal exposures (Ghallab et al. 2016). Although this modeling approach still represents a field of basic research, it nevertheless demonstrates the basic importance of internal biomarkers of exposure.

In conclusion, biomarker-based assessment of exposure is an important tool to evaluate exposure of consumers.

The present review of Rietjens and colleagues is a must read for anyone interested in applied aspects of biomarker monitoring.

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✉ Hermann M. Bolt
bolt@ifado.de

¹ IfADo-Leibniz Research Centre for Working Environment and Human Factors at TU Dortmund, Ardeystr. 67, 44139 Dortmund, Germany

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