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"Omics" in consumer health protection

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Abstract

Humans come into contact with a multitude of environmental chemicals every day in life. These chemicals may either be inhaled as dust or smoke or may be taken up from the environment via skin penetration or orally. Various chemicals may leak from sources like textiles, fabrics, shoes, sportswear, cups, kitchenware, packaging materials of foodstuff or other consumer goods. But everybody is due to lifestyle differences exposed in her or his own way. Everybody also exposes himself for varying time-spans to specific environmental chemicals either at work or in leisure time. All these various aspects make a valid risk assessment arising from uptake of cocktails of environmental chemicals next-to-impossible. So far threshold levels for daily exposure to environmental toxicants are only based on a single compound approach, meaning only threshold concentrations are calculated for each single compound taking into account only general risk factors for the calculation of a maximal daily intake dose. Modern toxicology needs a more sophisticated risk assessment strategy especially for multi-compound mixtures. New emerging technologies, like "omics" approaches, systems biology, and high throughput testing are needed to elicit differentially regulated signaling pathways and biomarker sets after exposure. The identification of different modes of action may then help to pave the way toward mode of action-guided risk predictions not only for single compounds, but also for compound mixtures in various exposure scenarios. Especially the interaction of low dose effects needs to be clarified. The repeated low-dose exposure to CMR (carcinogenic/mutagenic/reprotoxic) chemicals with other toxicants like endocrine disruptors or heavy metals needs special attention especially for time resolved effects, thereby not only focusing on various co-exposure scenarios, but also on different time spans of exposure. A major topic herewith will be the assessment of additive or synergistic effects of compound mixtures. Taking into account all the emerging new technologies, risk assessment and health impact prediction may become sounder and get added value especially from "omics" platforms and early regulated biomarker identification for different modes of action.