Grouping of nanomaterials for risk assessment

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In this issue of the archives of toxicology, Gebel and colleagues introduce a practical guide how to group nanomaterials for risk assessment (Gebel et al. 2014). To establish categories, the authors analyzed exposure scenarios where nanoparticles have been shown to cause adverse health effects. Particularly, critical is exposure by inhalation, when nanoparticles belong to one of the following two groups: (1) Rigid biopersistent respirable fibrous nanoparticles with a high aspect ratio, the so-called WHO fibers. This type of nanoparticles may cause lung cancer and mesotheliomas upon inhalation by similar mechanisms as reported for asbestos. (2) Respirable granular biodurable particles. Also, this type of nanomaterial may cause inflammation and secondary mutagenicity after inhalation in the lung. (3) Nanoparticles for which toxicity is mediated by the specific chemical properties of its components. Examples are functional groups on the particle surface or released ions. Particles belonging to this group have to be evaluated case-by-case. In contrast to the first two categories, this applies to all routes of exposure.

Currently, nanotoxicology is one of the most popular fields in toxicology (Clift et al. 2014; Zhao et al. 2014; Lucafò et al. 2013; Silva et al. 2014; Couto et al. 2014; Setyawati et al. 2013; Fadeel et al. 2013), and also, a relatively high number of manuscripts on this topic have recently published in our journal (Bolt et al. 2012; Schäfer et al. 2013; Bondarenko et al. 2013; Horie et al. 2013; Xu et al. 2013). Ongoing studies analyze the impact of size and shape (Park et al. 2013; Xiong et al. 2013; Zhao et al.

2013; Schluesener and Schluesener 2013), study the biokinetics (Landsiedel et al. 2012; Klein et al. 2012) or establish in vitro systems for testing of nanomaterials (Hoelting et al. 2013; Haase et al. 2012; Kroll et al. 2012). However, because of the high number of different materials and the difficulty to interpret many of the in vitro studies with respect to their in vivo relevance, the present categorization concept proposed by Gebel et al. (2014) will contribute to a better overview and a more straightforward hazard identification. When novel nanomaterials have to be evaluated, it seems reasonable to check initially whether they fulfill one of the three “Gebel-criteria.” Besides introducing the novel categorization concept, the review addresses the question whether nanomaterials act by novel mechanisms. The authors conclude that despite the intensive research in this field, not a single “nanospecific” mechanism of action has been identified so far. All molecular mechanisms described for nanomaterials have already been identified for chemicals or described in conventional particle toxicology. The present article (Gebel et al. 2014) is of high interest to anyone working in the field of nanotoxicity, because it introduces a straightforward concept and gives the risk evaluator a better overview.

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