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EDITORIAL

Toxicology of magnetic nanoparticles: disturbed body iron homeostasis?

R. Marchan · R. Reif · J. G. Hengstler

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Nanotoxicology is one of the cutting-edge topics of our journal (Gehrke et al. 2011; Xie et al. 2010; Jeong et al. 2010; Marano et al. 2011). As the use of nanoparticles in commercially available products is rapidly growing, toxicological research has to address the risk of unintended nanomaterial exposure (Foldbjerg et al. 2011; van Berlo et al. 2010; Kim et al. 2011a, b; Truong et al. 2011; Leppänen et al. 2011). On the other hand, the use of nanomaterials in diagnostics and cancer therapy is also growing (Weiss and Diabaté 2011; Gibson et al. 2011; Hoshino et al. 2011). Here, nanotoxicology has to identify possible toxic mechanisms to avoid side effects of pharmaceutical nanoproducts.

One of the widely used pharmaceutical nanomaterials is magnetic nanoparticle. Therefore, the editors are pleased that Dr. Cho from Seoul National University has accepted our invitation and contributed a comprehensive state of the art review about application and possible toxicity of magnetic nanoparticles (Kim et al. 2011a, b; this issue). Magnetic nanoparticles are used in magnetic resonance imaging. Moreover, they allow binding of biomolecules, such as antibodies, proteins, ligand or therapeutic gens, and can therefore improve delivery of biomolecules and drugs. When we consider possible toxic effects of magnetic nanoparticles, iron toxicity is one of the first possible mechanisms that comes to ones mind. However, small amounts of iron released from magnetic nanoparticles do not necessarily have to induce adverse health effects, since iron is efficiently metabolized by the reticuloendothelial system, used for biosynthesis of hemoglobin or excreted via the kidney. In rats even relatively high doses of 100 mg/kg of iron did not induce toxic effects (discussed in Kim et al. 2011a, b). Therefore, the question is relevant whether magnetic nanoparticles can cause a systemic or local iron overload that is high enough to induce toxic effects. The current article of Cho gives a comprehensive summary of animal studies addressing organ toxicity, particularly placenta and testis, the nervous, cardiovascular, respiratory and immune system as well as liver and kidney. The review is highly recommended to anyone interested in application and possible toxicity of magnetic nanoparticles.

R. Marchan (✉) · R. Reif · J. G. Hengstler
Leibniz Institut für Arbeitsforschung an der TU Dortmund, Leibniz Research Centre for Working Environment and Human Factors (IfADo), Ardeystrasse 67, 44139 Dortmund, Germany
e-mail: marchan@ifado.de

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