Inflammatory and Genotoxic Effects of Carbon Based Nanoparticles

Roel Schins

Particle Research
Institut für Umweltmedizinische Forschung (IUF)
an der Heinrich Heine Universität Düsseldorf gGmbH
Auf'm Hennekamp 50
D-40225 Düsseldorf, GERMANY
E-mail: roel.schins@uni-duesseldorf.de

Nanoparticles (NP) as well as related materials such as nanotubes and fibers have gained a tremendous interest in various fields of research and industry. A major research focus within our institute (IUF, Düsseldorf) has been on the investigation of the potential adverse health effects of inhaled carbonaceous NP. We have previously investigated the inflammatory and mutagenic effects of different carbon black model nanoparticles in rat lung after intratracheal instillation. More recently, we have also studied oxidative stress, inflammation and DNA damage responses in mice lungs after short-term nose-only exposure to elemental carbon particles generated by spark discharge. When taken together, our investigations provide further support for the key role of inflammation in driving pulmonary toxicity and mutagenesis of carbonaceous NP after high exposures. Complementary *in vitro* investigations are carried out within our institute to unravel the underlying biological mechanisms of toxicity as well as to develop and improve research protocols for the evaluation of cellular responses to NP. The strategy of this integrated research approach, known as the *NanoCellResponses* program, is to simultaneously determine the effects of NP on multiple subcellular targets, signalling pathways and mechanisms (Unfried et al., 2007). Within this program, we have for instance shown that the ability of carbon nanoparticles and nanotubes to induce apoptosis in macrophages depends on the dimensions of the material. Our investigations have also revealed that care should be taken to taken to avoid artefacts in specific *in vitro* assays. For an appropriate risk assessment of nanomaterials it is important to unravel the biological mechanisms whereby *in vitro* as well as *in vivo* effects have occurred in relation to the tested dose.

Reference

Unfried K, Albrecht C, Klotz LO, von Mikecz A, Grether-Beck S, Schins RPF. Cellular responses to nanoparticles: target structures and mechanisms. Nanotoxicol 2007;1:52-71