

## Pulmonary effects of carbon nanotubes: influence of particle characteristics

**Dominique Lison**

Louvain Centre for Toxicology and Applied Pharmacology  
Catholic University of Louvain, Brussels  
dominique.lison@uclouvain.be

Several experimental studies have indicated that carbon nanotubes (CNT) have the capacity to induce adverse lung reactions after instillation or inhalation. A major difficulty to investigate the biological effects of CNT is the propensity of these materials to form large aggregates which may cause irrelevant tissue reactions such as the formation of foreign body granulomas in the large airways. Several approaches have been used to circumvent these difficulties, such as the addition of detergents or proteins to improve the dispersion of CNT. The addition of these dispersants may, however, modify the surface properties of CNT and possibly alter their toxicological properties. In our laboratory, we used ground multiwall CNT which can be better dispersed and readily reach the lung parenchyma after instillation. We found that, in the rat, ground MWCNT induced an inflammatory lung reaction, followed by the formation of granulomas as well as a fibrotic reaction. The MWCNT also induced genotoxic damages in lung epithelial cells both *in vivo* and *in vitro*.

We then examined whether the characteristics of the MWCNT influenced their toxic potential and found that chemical defects in the surface structure of MWCNT were responsible for their inflammatory and genotoxic activity, but did not affect the fibrotic reaction. In view of the strong link between genotoxicity, inflammation and cancer, we then explored whether MWCNT with or without surface defects would elicit a carcinogenic response, using in the rat peritoneal cavity bioassay to detect the induction of mesothelioma. We did not find any induction of mesothelioma in rats treated with MWCNT irrespective of the presence of surface defects. This negative finding will be discussed and confronted with other recent results in the literature.