

Pulmonary Response to Pharyngeal Aspiration of Multi-Walled Carbon Nanotubes in Mice

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Carbon nanotubes come in a variety of types, but one of the most common forms is multi-walled carbon nanotubes (MWCNT). MWCNT have potential applications in many diverse commercial processes; thus, human exposures are possible. In order to investigate the pulmonary toxicity of MWCNT, in vivo dose-response and time course studies of MWCNT in mice were conducted to assess their ability to induce pulmonary inflammation, damage, and fibrosis using doses that were relevant to measured peak occupational exposures. MWCNT were suspended in dispersion medium (DM), and male C57BL/6J mice (7 weeks old) received either DM (vehicle control) or 10, 20, 40 or 80 μg MWCNT by pharyngeal aspiration exposure. At 1, 7, 28 and 56 days post-exposure, MWCNT-induced pulmonary toxicity was investigated. Bronchoalveolar lavage (BAL) studies determined pulmonary inflammation and damage was dose-dependent and peaked at 7 days post-exposure. By 56 days post-exposure, pulmonary inflammation and damage markers were returning to control levels, except for the 40 μg MWCNT dose, which was still significantly higher than vehicle control.

Histopathological studies determined that MWCNT-exposure caused rapid development of pulmonary fibrosis by 7 days post-exposure, which persisted through 56 days post-exposure. In summary, the data reported here indicate that MWCNT-exposure rapidly produced significant pulmonary responses in a mouse model at doses relevant to peak exposures measured in occupational settings.