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TITLE: INHALATION TOXICITY OF MULTI-WALL CARBON NANOTUBES IN RATS EXPOSED FOR 3 MONTHS

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ABSTRACT: Carbon nanotubes (CNT) are of great commercial interest. Theoretically, during processing and handling of CNT and in abrasion processes on composites containing CNT, inhalable CNT particles might be set free. For hazard assessment, we performed a 90-day inhalation toxicity study with a multi-wall CNT (MWCNT) material (Nanocyl NC 7000) according to OECD test guideline 413. Wistar rats were head-nose exposed for 6 hours/day, 5 days/week, 13 weeks, total 65 exposures, to MWCNT concentrations of 0 (control), 0.1, 0.5 or 2.5 mg/m³. Highly respirable dust aerosols were produced with a proprietary brush generator which neither damaged the tube structure nor increased reactive oxygen species on the surface. Inhalation exposure to MWCNT produced no systemic toxicity. However, increased lung weights, pronounced multifocal granulomatous inflammation, diffuse histiocytic and neutrophilic inflammation, and intra-alveolar lipoproteinosis were observed in lung and lung-associated lymph nodes at 0.5 and 2.5 mg/m³. These effects were accompanied by slight blood neutrophilia at 2.5 mg/m³. Incidence and severity of the effects were concentration-related. At 0.1 mg/m³, there was still minimal granulomatous inflammation in the lung and in lung-associated lymph nodes; a no observed effect concentration was therefore not established in this study. The test substance has low dust-forming potential, as demonstrated by dustiness measurements, but nonetheless strict industrial hygiene measures must be taken during handling and processing. Toxicity and dustiness data such as these can be used to compare different MWCNT materials and to select the material with the lowest risk potential for a given application.