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TITLE: GENE EXPRESSION PROFILES IN RAT LUNG AFTER INHALATION EXPOSURE TO C60 FULLERENE PARTICLES

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ABSTRACT: Concern over the influence of nanoparticles on human health has risen due to advances in the development of nanotechnology. We are interested in the influence of nanoparticles on the pulmonary system at a molecular level. In this study, gene expression profiling of the rat lung after whole-body inhalation exposure to C60 fullerene (0.12 mg/m³; 4.1 × 10⁴ particles/cm³, 96 nm diameter) and ultrafine nickel oxide (Uf-NiO) particles (0.2 mg/m³; 9.2 × 10⁴ particles/cm³, 59 nm diameter) as a positive control were employed to gain insights into these molecular events. In response to C60 fullerene exposure for 6 h a day, for 4 weeks (5 days a week), C60 fullerene particles were located in alveolar epithelial cells at 3 days post-exposure and engulfed by macrophages at both 3 days and 1 month post-exposures. Gene expression profiles revealed that few genes involved in the inflammatory response, oxidative stress, apoptosis, and metalloendopeptidase activity were up-regulated at both 3 days and 1 month post-exposure. Only some genes associated with the immune system process, including major histocompatibility complex (MHC)-mediated immunity were up-regulated. These results were significantly different from those of Uf-NiO particles which induced high expression of genes associated with chemokines, oxidative stress, and matrix metalloproteinase 12 (Mmp12), suggesting that Uf-NiO particles lead to acute inflammation for the inhalation exposure period, and the damaged tissues were repaired in the post-exposure period. We suggest that C60 fullerene might not have a severe pulmonary toxicity under the inhalation exposure condition.