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Study of the genotoxic effects induced by two kinds of silica nanoparticles on human bronchial (BEAS-2B) epithelial cells

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The widespread use of silica nanoparticles (NPs) in consumer products with consequent increase of occupational and general exposure to such NM, raises concerns about their possible adverse effects. Potential genotoxicity is among the most critical health risks. We applied the cytokinesis block micronucleus (CBMN) and Fpg comet assays on BEAS-2B cells, a human lung cell model to test genotoxicity of two synthetic amorphous silica (JRC) synthesized by two different processes (precipitated NM200 and pyrogenic NM203) and with different surface properties. NM characterization has been performed by TEM analysis and DLS. The cells were treated with NP concentrations from 0.1 to 100 µg/ml for 24 h (Fpg comet assay) and for 48 h (CBMN) to detect direct/oxidative DNA damage and MN induction respectively. NM203 was better dispersed in water/BSA but showed higher aggregate/agglomerate sizes than NM200 in culture medium. Slight direct DNA damage at 10 and 100 µg/ml and oxidative DNA damage at the lowest concentration were induced by NM200. Otherwise dose-dependent direct DNA damage reaching 5.3 fold of control at 100 µg/ml and significant oxidative DNA damage up to 10 µg/ml were found for NM203. In the CBMN assay, a slight induction of MN and a reduced replication index were found only for NM203 indicating greater toxicity of NM203 in comparison with NM200 possibly due to surface differences. The findings show higher genotoxic effects for the pyrogenic NM203 in agreement with its higher capability to induce toxic and pro-inflammatory/ oxidative effects already demonstrated particularly on macrophages.

Biography

Delia Cavallo graduated in Biological Science from Sapienza University of Rome and worked as Researcher at ENEA (National Agency for New Technologies, Energy, Environment), Rome and at IRG (Institute of Genetic Researches), Naples. She is currently Head of Laboratory "Risk of Carcinogenic and Mutagenic Agents" at INAIL, Department of Occupational and Environmental Medicine, Epidemiology and Hygiene in Monte Porzio Catone, Rome, Italy. She has published more than 50 papers in reputed journals in the field of occupational toxicology, carcinogenesis, reproductive effects, genetic disease, safety and health.

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