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Potential toxicity of alkaline earth silicate wools (AESW) for thermal insulation: Evaluation of cyto-genotoxic and inflammatory effects on human lung cells

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A lkaline earth silicate wool (AESW) represents a new generation of high-temperature insulation material characterized by low bio-persistence and high bio-solubility and therefore considered not hazardous. However, at present, a few reliable toxicity studies are available. We evaluated cytotoxic, genotoxic-oxidative and inflammatory effects induced in human alveolar (A549) cells by 24 h exposure to 2-200 µg/ml of an AESW designed for high temperature (1260°C) usage and characterized by high magnesium oxide percentage. SEM analysis was performed to characterize fiber dimensions and to evaluate, on fibers treated with Gamble's solution at pH neutral, fiber dissolution. Cytotoxic effects were studied evaluating cell viability by MTT assay and membrane damage by LDH release assay. The genotoxicity was evaluated by Fpg comet assay and inflammatory potential detecting IL-6 and IL-8 release by ELISA. SEM analysis found a length-weighted geometric mean fiber diameter (D_{LG}) of 2.5 µm, 62% of respirable fibers (d≤3 µm and $l \ge 5$ µm) and a dissolution constant (K_{dis}) 70 ng/cm²/h. No viability reduction was found. Membrane damage was induced by the highest concentration. A dose-dependent moderate DNA damage and oxidative DNA damage associated to induction of IL-6 and IL-8 release were found at the highest concentrations. The findings show moderate membrane damage and genotoxic/oxidative effects associated to pro-inflammatory response at the highest concentrations of AESW. The effects could be related to the specific chemical composition and lower biosolubility of this AESW in comparison with other highly soluble AESWs (having Kdis>100 ng/cm²/h). These results suggest further investigations on this fibre which does not seem so harmless.

Biography

Cinzia Lucia Ursini has completed her PhD from University of L'Aquila. She worked as Research Contractor at the Department of Biochemistry of University of L'Aquila. She was awarded a Fellowship at CNR (National Research Council) Institute of Atmospheric Pollution, Rome. Currently, she is researcher of the 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 40 papers in reputed journals and 9 book chapters and has been Reviewer of several international journals.

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