

Title \*

Investigating the *in vitro* toxicity of after-service man-made vitreous fibres

Abstract \*

Certain man-made vitreous fibres (MMVF), such as aluminosilicate wools (ASW; sometimes known as refractory ceramic fibres) and alkaline earth silicates (AES), are used in high-temperature industries as insulation materials. When manufactured, these amorphous materials contain silica. During use, the exposure to high temperatures can cause devitrification resulting in the formation of crystalline silica, notably cristobalite. The formation of this potentially carcinogenic material raises safety concerns regarding the after-use handling and disposal of MMVF. This study aims to determine whether the formation of cristobalite in ASW and several different types of AES can influence *in vitro* cellular responses.

Macrophage (J774A.1) and alveolar epithelial (A549) cell lines were exposed to four different pristine MMVF, as well as corresponding samples which had been either milled, heat-treated or heat-treated/milled. Heat treatment generated cristobalite, while milling generated low aspect ratio particles.

Treated cells were assessed for cell death, immunomodulatory effects, and formation of reactive oxygen species (ROS). DQ12 quartz was used as positive control, which induced cytotoxicity, a high release of pro-inflammatory mediators, and formation of ROS. In contrast, MMVF did not induce cell death under these same conditions, and their ability to induce pro-inflammatory responses was far lower than that of DQ12. Where statistically significant increases did occur, they were relatively low and appeared to be related to a combination of causes, including cristobalite content, fibre dimensions and material solubility. Pilot data using antioxidants suggests that oxidant-induced cell signalling was responsible for many of these immune responses.

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