

Cytotoxicity and TNF α expression evaluations for silica containing dusts

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The International Agency for Research on Cancer published a review on crystalline silica in 1997 that classified it as a human carcinogen (Group 1). However at workplaces there is still controversy regarding on its fibrogenic and genotoxic potential in lung. This is due to a lack of mechanistic data of lung toxicity of silica. Further mechanistic studies should allow better risk assessment in ceramic factory. Thus, an European Collective Research Project, called Siliceram, has been launched. As a part of this project, in-vitro test were performed that should be predictive and valuable paradigms of human silica-induced diseases.

Therefore we evaluated on NR8383 rat alveolar macrophages, the cytotoxicity scale of various silica-containing particles, namely mid-size DQ12 quartz (positive control), contrived sample that is representative of mineral mixtures employed in ceramic production and TiO₂ or (Bayertitan T, a negative control). All particles, provided by ITEM, were tested after a 2h- or a 24h-incubation period, at a 200 $\mu\text{g}/\text{cm}^2$ concentration. The viability percentages are presented in the following table.

<i>Particles</i>	<i>2 h</i>	<i>24 h</i>
Unexposed cells	100 \pm 0.05	100 \pm 0.07
Titanium dioxide	104 \pm 0.06*	101 \pm 0.1
Quartz DQ12	29 \pm 0.05*	30 \pm 0.01*
Contrived sample	75 \pm 0.07*	28 \pm 0.01*

Titanium dioxide displayed no effect whatever the incubation time. Contrived sample was less toxic than mid-size DQ12 quartz at 2h, but both showed similar toxicity after 24h of incubation.

Another endpoint, pro-inflammatory TNF α expression was also analyzed by quantitative RT-PCR. A non-cytotoxic dose of DQ12 induced a two time TNF α expression increase in NR8383 cells. In contrast, same doses of contrived sample and titanium dioxide induced respectively a moderate (10 %) and no increase of TNF α expression in rat alveolar macrophage. Both endpoints seem to reflect differential macrophage reactions to various particles and be valuable candidates for toxicity evaluation of factory ceramic dusts.