Title *

Comparing nanomaterial toxicity with lung cells cultured under air-liquid interface and submerged conditions

Abstract *

In traditional *in-vitro* cell exposure studies, interaction of ENMs with the cell culture medium can inadvertently modify nanoparticle properties, reducing its representativeness for realistic lung-nanoparticle interactions. Consequently, ENM-cell exposure under more physiological air-liquid-interface (ALI) culture conditions have been increasingly adopted as an alternative method (Lenz et al. 2014). Quantitative comparison of ENM toxicity obtained under different culture conditions is typically hampered by the lack of reliable information on cell-delivered ENM dose.

The current study aims to perform dose-controlled ENM-cell exposures and compare cellular responses under submerged and ALI exposure conditions using the VITROCELL-CLOUD® system. ZnO and TiO_2 nanoparticles are used to expose human and murine lung epithelial cells (A549 and LA4). Cell viability (WST-1), membrane damage (LDH) and cytokine release (IL-8) are characterized as toxicological endpoints. Cell delivered ENM dose was determined with a quartz crystal microbalance and a particokinetics model for ALI and submerged culture conditions, respectively.

Preliminary results document that ALI and submerged A549 cells display very similar sigmoidal dose response curves for ZnO ENMs. Cell viability decreased and cell membrane damage increased with increasing ENM doses. The dose response curves for WST-1 were very steep with IC_{50} values near 0.25-0.5 cm^2/cm^2. This is consistent with data published in the literature.

The current results show that the cellular response of A549 cells to ENMS is relatively independent of submerged or ALI culture conditions. These findings will be put into perspective by comparison with literature data using cell-delivered ENM surface area as dose metric.

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