

## No cytotoxicity or genotoxicity of graphene and graphene oxide in murine lung epithelial FE1 cells in vitro - DTU Orbit (09/11/2017)

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Graphene and graphene oxide receive much attention these years, because they add attractive properties to a wide range of applications and products. Several studies have shown toxicological effects of other carbon-based nanomaterials such as carbon black nanoparticles and carbon nanotubes in vitro and in vivo. Here, we report in-depth physicochemical characterization of three commercial graphene materials, one graphene oxide (GO) and two reduced graphene oxides (rGO) and assess cytotoxicity and genotoxicity in the murine lung epithelial cell line FE1. The studied GO and rGO mainly consisted of 2–3 graphene layers with lateral sizes of 1–2  $\mu\text{m}$ . GO had almost equimolar content of C, O, and H while the two rGO materials had lower contents of oxygen with C/O and C/H ratios of 8 and 12.8, respectively. All materials had low levels of endotoxin and low levels of inorganic impurities, which were mainly sulphur, manganese, and silicon. GO generated more ROS than the two rGO materials, but none of the graphene materials influenced cytotoxicity in terms of cell viability and cell proliferation after 24 hr. Furthermore, no genotoxicity was observed using the alkaline comet assay following 3 or 24 hr of exposure. We demonstrate that chemically pure, few-layered GO and rGO with comparable lateral size ( $> 1 \mu\text{m}$ ) do not induce significant cytotoxicity or genotoxicity in FE1 cells at relatively high doses (5–200  $\mu\text{g/ml}$ ). *Environ. Mol. Mutagen.* 57:469–482, 2016.

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