Poster: nanotoxicology / nanobiotechnology

In vitro study of the toxicity induced by Nickel and Cobalt particles on human lung cells

Efrat Forti[0], Susan Salovaara[0], Yuksel Cetin[0], Anna Bulgheroni[0], Pilar Prieto[0], Walter Pfaller[1]

[0] European Commission Joint Research Centre (Ispra) (I); [1] Innsbruck Medical University (Innsbruck) (AT)
e-mail: efrat.forti@jrc.it

Epidemiological studies show that human population in the industrialised world is more exposed to particulate air pollution which contributes to respiratory morbidity and mortality. As more particles are released to the environment, research in the area of particles (micro and nano sized) toxicity is highly important. The respiratory system is a primary interface between the organism and its environment and serves as a portal of entry and therefore as a potential site to particles toxic effect. In this study we used Calu-3, a human bronchial cell line, to investigate the effect of Nickel (Ni) and Cobalt (Co) particles (µm and nm size) *in vitro*. Calu-3 cells are known to form a polarized monolayer and retain the characteristics of the native epithelium with the formation of tight junctions, and production of mucous under air-interfaced culture (AIC). Calu-3 cells were grown on transwells for 14 days under AIC condition. Exposure was performed by addition of the particles in solutions to the apical compartment for 72 hours. In parallel the toxicity of the soluble forms ($NiCl_2$, $CoCl_2$) was also investigated. The trans-epithelial electrical resistance (TEER) was recorded after 24, 48 and 72 hours of exposure. Two viability assays, neutral red uptake (NRU) and lactate dehydrogenase (LDH) were performed at the end of the exposure (72h). Results showed a concentration-response effect on cell viability and TEER after treatment with the soluble forms. However, with the particles (µm and nm size) no significant effect was found on the cell viability but a concentration dependent increase of TEER was observed at non cytotoxic concentrations. This effect on barrier integrity was higher with particles of µm size than nm size. The effect of Ni and Co particles on oxidative stress and gene expression is still under investigation.

[The study is supported by the Marie Curie Research Training Network: PULMO-NET]

Keywords: particles toxicity, viability assays, in vitro, Calu-3, human bronchial cell line, trans epithelial electrical resistance, air-interfaced culture