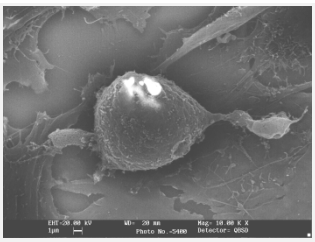
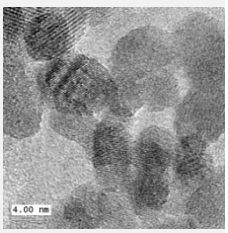
Publishable executive summary

CellNanoTox aims at the development of innovative multidisciplinary sets of tests and indicators for toxicological profiling of nanoparticles (NPs) as well as unraveling the correlation between the physicochemical characteristics of NPs and their toxic potential on various organs of the human body.

For a comprehensive understanding of the complex data to be obtained on toxicology of NPs, based on in-vitro and ex-vivo studies, we will employ conventional toxicology combined with the methodologies of toxicogenomics, metabonomics, Knowledge Discovery from Data (KDD) and Data Mining (DM).



Cobalt aggregates in immortalised mouse fibroblast (Balb/3T3 cell) by Scanning Electron Microscope (SEM-EDX). (copyright JRC)



Cobalt Ferrite Nanoparticles by TEM (copyright WWU)

This project is focused towards understanding the relation of size and surface chemistry on the deposition, uptake, translocation, and toxicity of a few selected industrially important NPs as well as novel synthesized NPs, whose size and surface chemistry will be methodically modified. Since it was shown that the penetration of NPs into the human body proceeds principally through inhalation or orally, whereas penetration through healthy skin is restricted, we have chosen lung and intestine as the primary interacting tissues/organs with NPs, while liver, kidney and the immunological system have been selected to be the secondary major sites of interaction, following the penetration of NPs into the blood circulation. The interaction of the NPs with these different target organs will be studied by making use of alternative

methods to animal experimentation by employing in-vitro cell systems as well as ex-vivo studies based on precision-cut slices of lung, liver and kidney.

During the first year of activity we have performed toxicological screening of some commercial and non-commercial nanoparticles. This has been done using different cellular models of lung, intestine, liver, kidney and cells of the immunologic system. The various cellular systems showed somewhat different susceptibility towards the exposure to the nanoparticles, though the overall trend of the toxicological response was similar. Under the concentration range used, gold nanoparticles have shown almost no toxicity whereas cobalt aggregates of nanoparticles were shown to be toxic. The toxicological response also depended on the duration of exposure to the nanoparticles. Longer exposure time has resulted higher toxicity than a short one.

The studies carried out within the CellNanoTox project address the needs of the European society for assessing the risk of occupational and general population exposure to industrially manufactured NPs. It is expected generate new knowledge on potential health risk or the absence of it, providing objective arguments for recommendations and regulations.

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