PROJECT FACTSHEET

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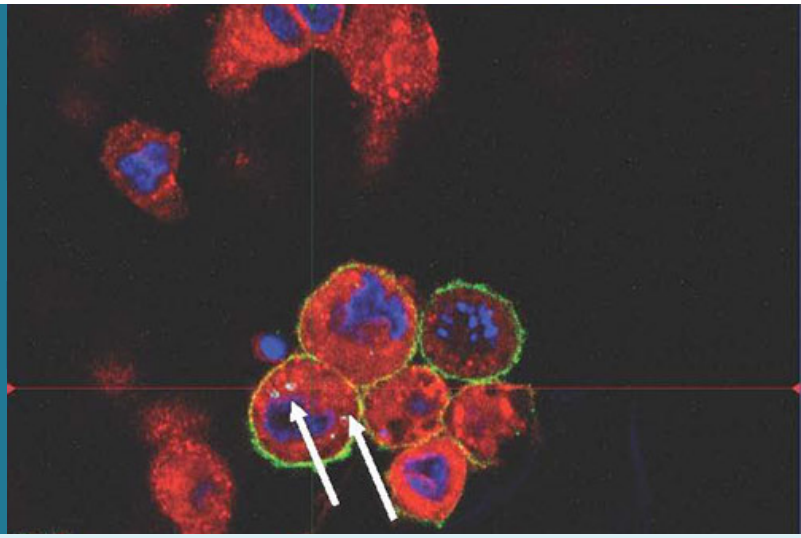
NANION

Nanomaterial toxicity - The role of surface properties and released ions for uptake and effects



CONTEXT

The main objective of NANION is to acquire basic knowledge in order to understand certain processes and factors involved in the absorption and toxicity of NP (nanoparticles). This acquisition of knowledge is a prerequisite for the future development of nanomaterials corresponding to the philosophy of “safety as of the design”, as anticipated in the long-term strategy by the two involved departments from the LIST. The specific objectives of NANION fall into two types:

- to study whether the effects of NP come from the nanoparticles themselves or the ions released from the nanoparticles. With this aim, batches of NPs (commercial NPs of different sizes made of gold, silver or copper) will be acquired and coated with various compounds. Prior to the tests, these NPs will be carefully characterized in relevant exposure environments and at various protein concentrations. The release of ions from these bare or coated NPs will be analysed on the basis of the exposure environment;
- to study the variations of the absorption kinematics and the toxic effects on the basis of the biomolecules attached to the surface of the NPs. Consequently, the proteins and fats attached to the surface of the NPs and that influence the absorption will be determined according to the incubation performed in a culture environment or in the pulmonary surfactant that comprises relevant fluids for the proposed exposure models that namely consist of submerged intestinal cells and pulmonary cells cultivated at the air-liquid interface. The absorption kinematics, the intracellular distribution of these NPs and their toxicity for a range of relevant points will be studied within a co-culture system consisting of intestinal cells (Caco-2) and of mucus secreting cells (HT29-MTX) that mimic the human intestine, and within a co-culture system of 4 cellular types that mimic the human pulmonary system.

INNOVATION & IMPACT

As part of the project, the MRT department manufactured and partially modified the commercially available nanomaterials. Within the ERIN department, studies were then undertaken in order to characterize the toxicity and to differentiate the toxicity due to the nanomaterials themselves from the toxicity due to potentially released ions. The first batch of spherical nanoparticles was produced and the first analyses of the purity, release of ions and in vitro toxicity on organisms relevant for environmental toxicology are in progress.

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Contact

5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | LIST.lu

Dr Arno GUTLEB (arno.gutleb@list.lu)
Dr Naoufal BAHLAWANE
(naoufal.bahlawane@list.lu)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST