

## NANOSOLUTIONS SET TO REVOLUTIONISE THE USE OF NANOTECHNOLOGY

**More engineered nano materials (ENM) are being used in commercial products than ever before, but assessing how safe these materials are when released into the environment or on to people is both time-consuming and expensive. It has to be done, of course, but having to assess each material individually is a major barrier to the development of innovative new products. Now, ground-breaking research by the Finnish-led research project Nanosolutions will deliver the means to classify the safety potential of a variety of ENM, making new and innovative products cheaper and safer to produce.**

Engineered nanomaterials (ENM) - defined as having at least one dimension  $\leq 100\text{nm}$  - have attracted a great deal of interest during recent years, due to their many technologically interesting properties. The unique properties of ENM and their applications have given birth to immense technological and economic expectations for industries using them – and more and more products are being developed using this nano material.

However, some of these properties have given rise to concern that they may be harmful to humans. Currently, creating commercial products using ENM requires vigorous testing and there are many barriers to overcome. Streamlining that process would have huge commercial benefits.

Scientists, regulators, and the industrial representatives have now begun to investigate the features of ENM in order to be sure of their safe use in nanotechnologies (NT), i.e. technologies utilising ENM. The European Commission has also explored in-depth the characteristics of ENM and issued a document on ways to assure the safety of their use. An effective test is required for these properties in order to ensure ENM are safe to use. While this testing of individual applications of ENM is possible, it is expensive and time-consuming and it acts as a barrier to innovation. This is the context in which the Nanosolutions project, which is being led by the Finnish Institute of Occupational Health was established.

Nanosolutions, which began work in April 2013, was created to develop a safety classification for ENM based on an understanding of their interactions with living organisms at molecular, cellular and organism levels. Many important functions of living organisms take place at the nanoscale. The human body uses natural nanomaterials, such as proteins and other molecules, to control the body's many systems and processes. A typical protein such as haemoglobin, which carries oxygen through the bloodstream, is 5nm in diameter. We need to know what impact ENM may have on these natural materials.

So, the main objective of the project is to identify and elaborate those characteristics of ENM that determine their biological hazard potential. This potential includes the ability of ENM to induce damage at the cellular, tissue, or organism levels by interacting with cellular structures leading to impairment of key cellular functions. These adverse effects may be mediated by ENM-induced alterations in gene expression and translation, but may involve also epigenetic transformation of genetic functions.

The long-term goal is to create a set of biomarkers of ENM toxicity that are relevant in assessing and predicting the safety and toxicity of ENM across species. ENM-organism interaction is complex and depends not simply on the composition of the ENM core, but particularly on its physicochemical properties, which are largely governed by their surface properties.

The overarching objective of this research is, therefore, to provide a means to develop an "ENM safety classifier" based on their material characteristics, using the understanding of ENM interactions with living organisms at the molecular, cellular and organism level. This will give scientists the ability to predict these harmful effects rather than simply describe them once they have occurred.

The Nanosolutions ENM safety classification model will be of great benefit not only to industry, but also in enabling and speeding up innovation. By making the innovation cycle quicker and making it easier to develop commercially viable products that use ENM, Nanosolutions will deliver results critical for maintaining Europe's position in the nanotechnology field. As a result of the project, testing procedures will be shorter and more cost effective. Meanwhile, the public will have greater confidence in the products produced using ENM, thus making them more commercially viable and industry will be more inclined to use innovative technology in their product development if they can assure its safety and they know consumer concerns are abated. The work Nanosolutions does will be vital in bringing new materials and technologies to market.

### Notes

Nanosolutions is a pan-European project funded by the EC. The 27 partners come from academia and industry and also the project also involves a world-renowned international advisory board. The implications of this work have global implications and the project is keen to involve all countries developing products using nano materials.

*You can find out more about the Nanosolutions project at [www.nanosolutionsfp7.eu](http://www.nanosolutionsfp7.eu). Interviews with leading nano scientists involved in the project are available. Interviews are also available with the Finnish project coordinator, Kai Savoleinen at the FIOH. Contact William Davis at Insight Publishers to make the arrangements, +44 (0)117 2033 120 or email [wdavis@ipl.eu.com](mailto:wdavis@ipl.eu.com)*

