A new project seeks to identify and elaborate the characteristics of engineered nanomaterials (ENM) that determine their biological hazard potential. Nanosolutions will help develop a safety classification model for ENM based on an understanding of their interactions with living organisms, benefiting industry and enabling innovation

Safety Innovation

Engineered nanomaterials (ENM) - defined as having at least one dimension ≤100nm - 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 ENM. However, some of these properties have given rise to concern that they may be harmful to humans. Currently, creating commercial products using ENM requires rigorous testing and there are many barriers to overcome.

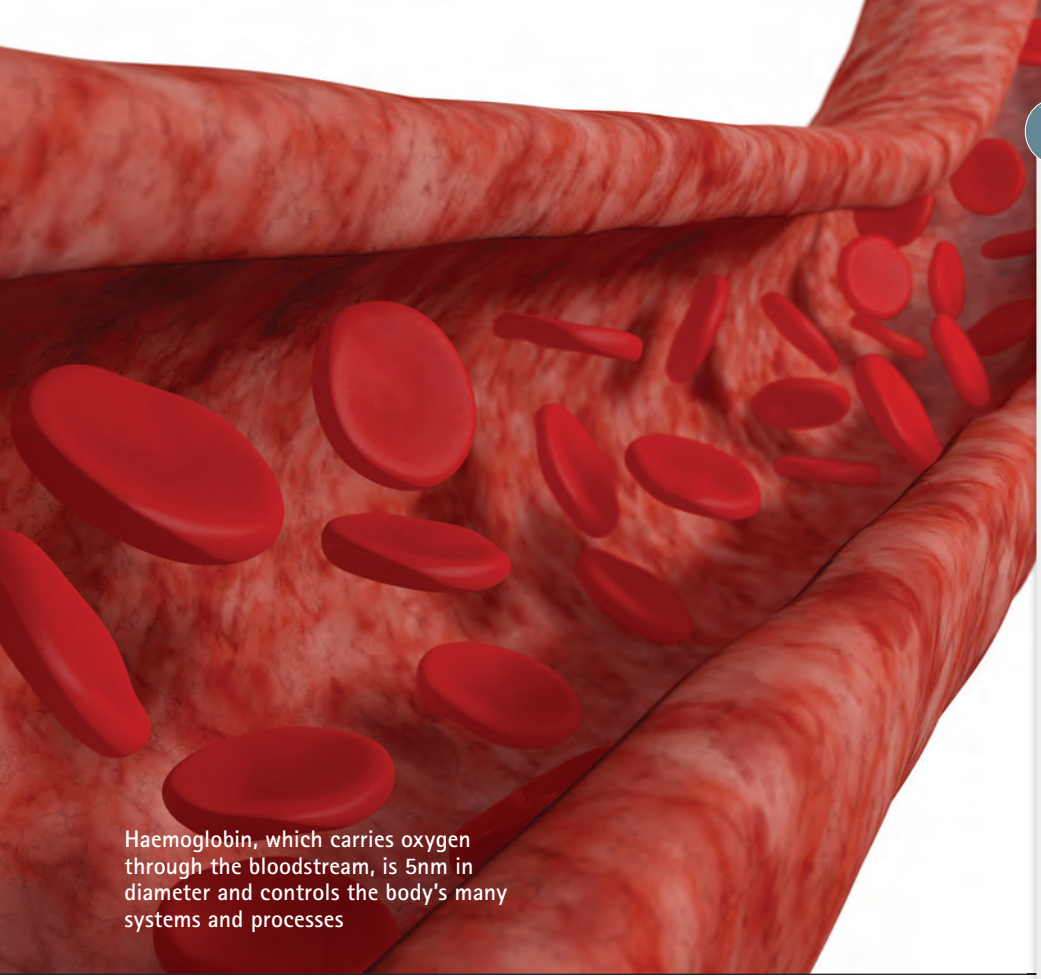
Scientists, regulators, and the industrial representatives have now begun to investigate the features of ENM in order to be sure of their safe use in nanotechnologies (NT), i.e. technologies utilising ENM. The European Commission has also explored in-depth the characteristics of ENM and issued a document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

The Nanosolutions consortium, which began in April 2013, was created to develop a safety classification for engineered nanomaterials (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.

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 Nanosolutions ENM safety classification model will be of great benefit not only to industry, but also in enabling and speeding up innovation"

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



Haemoglobin, which carries oxygen through the bloodstream, is 5nm in diameter and controls the body's many systems and processes

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 acquired in this consortium. 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 procedure will be shorter and more cost effective. The public will have greater confidence in the products produced using ENM, thus making them more commercially viable. 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.★

AT A GLANCE

Project Information

Project Title:
Nanosolutions: Biological Foundation for the Safety Classification of Engineered Nanomaterials (ENM): Systems Biology Approaches to Understand Interactions of ENM with Living Organisms and the Environment

Project Objective:
By identifying and elaborating those characteristics of engineered nanomaterials (ENM) that determine their biological hazard potential, NANOSOLUTIONS FP7 will provide a means to develop a safety classification model for ENM based on an understanding of their interactions with living organisms at the molecular, cellular, and organism levels based on their material characteristics.

Project Duration and Timing:
4 years, April 2013 to April 2017

Project Funding:
European Commission

Project Partners:
FIOH, Karolinska Institutet, NUID UCD, TNO, Universite Bordeaux, University of Manchester, University of Plymouth, Heriot-Watt University, CIC biomaGUNE, Walter Brendel Centre of Experimental Medicine, IOM, Turku Centre for Biotechnology, VTT, LEITAT, DTU Food, TIGEM, ULEI, Empa, Biobyte Solutions GmbH, Insight Publishers, PlasmaChem GmbH, Inkoa, BioTeSys GmbH, Zhejiang University, FUB, NHLS/NIOH, North West University, NCL / SAIC Frederick Inc., Nanocyl SA, Nanologica AB, NeuRoNe lab, University of Salerno, SOLVAY, Polymer Factory Sweden AB, Polysistec

AT A GLANCE

MAIN CONTACT

Kai Savolainen
Kai Savolainen, MD, is currently Professor and Director of Nanosafety Research Centre at the Finnish Institute of Occupational Health. His research interests cover inflammatory and genetic effects and risk assessment of engineered nanomaterials. He has served in numerous scientific expert committees, and has led several international and national research consortia with a focus on the safety of engineered nanoparticles.

Contact:
Tel: +358 40 742 0574
Email: kai.savolainen@ttl.fi
Web: www.nanosolutionsfp7.com

NANOSOLUTIONS