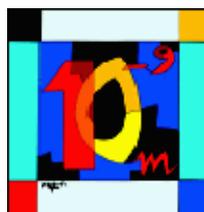


# EU nanotechnology R&D in the field of health and environmental impact of nanoparticles



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<http://cordis.europa.eu/nanotechnology>

The present publication is based on the information that was available at the time  
and cannot be guaranteed to be complete.

The views expressed in this document are entirely those of the Authors  
and do not engage or commit the European Commission in any way.

## Introduction

I am glad to present this publication on nanotechnology research funding addressing in particular the health and environmental impact of nanoparticles.

Nanotechnology presents itself as a scientific and technology approach of paramount importance. Recently winner of the Nobel Prize on physical sciences, nanotechnology shows already a huge potential of applications. At the same time, some concerns have been raised regarding the potential of some nanoparticles to have a negative impact of the human health and the environment. Europe's strategy has been and is to support the safe, responsible development of nanotechnology while providing favourable conditions for industrial innovation to ensure that research and technological development is translated into affordable and safe wealth-generating products and processes<sup>1</sup>.

Following this commitment of addressing upfront the potential risks, the European Commission has boosted support for specific collaborative research into the potential impact of nanoparticles on human health and the environment since the Framework Programme 5 (FP5). These activities have been continued and reinforced in FP6 and in FP7 where several topics were launched specifically addressing the safety of nanomaterials. At the same time, the EU Members States have also been funding research in that field, but a consolidated overview of these ongoing or finished projects was not yet available so the magnitude of these national efforts was difficult to evaluate.

The present compilation aims at gathering the most complete overview of past and ongoing research projects funded by the FPs, EU Member States, Candidate Countries and Countries associated to FP6 or FP7 in the area of possible impacts in health, environment and safety of nanoparticles. Being the first of its kind, this compilation has information of 106 projects, 14 of them are from the FPs which give around 32 million € in grants. The others 92 projects are from the EU Members States which spend around 47 million € in grants. This makes a total of some 79 million €. This information may well be incomplete. All interested parties are kindly requested to send additional information on research projects funded through national funding schemes to the email address [pilar.aguar@ec.europa.eu](mailto:pilar.aguar@ec.europa.eu). Several projects are currently in negotiation for funding under FP7; information will be added as soon as possible. It is the intention to regularly update this information and make it available through the European Commission dedicated websites<sup>2</sup>.

Renzo Tomellini  
Head of the Unit "Nano and Converging Sciences and Technologies"

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<sup>1</sup> <http://cordis.europa.eu/nanotechnology/actionplan.htm>

<sup>2</sup> [http://ec.europa.eu/nanotechnology/index\\_en.html](http://ec.europa.eu/nanotechnology/index_en.html) and <http://cordis.europa.eu/nanotechnology/>

## INDEX:

1. Background:.....	Page 4 to 8
2. Annexe I: FP5 EU research projects: .....	Page 9 to 12
3. Annexe II: FP6 EU research projects:.....	Page 13 to 24
4. Annexe III: National Research Projects: .....	Page 25 to 124
Belgium: .....	Page 32
Czech Republic: .....	Page 33
Denmark: .....	Page 34 to 45
Germany: .....	Page 46 to 48
Greece: .....	Page 49
Italy: .....	Page 50
Finland: .....	Page 51 to 53
Sweden: .....	Page 54
United Kingdom: .....	Page 55 to 100
Switzerland: .....	Page 101 to 124

# Research efforts in the area of health, environmental and safety impact of nanoparticles

## **Background information**

Products based on Nanosciences and Nanotechnologies (N&N) are already in use and analysts expect markets to grow by billions of euros during this decade. The potential risks to the health and environment of these engineered nanomaterials has become the focus of increasing international attention. Although a number of institutions have published reports discussing these potential environmental and health risks associated with the manufacture, use, distribution and disposal of nanomaterials, to date the widely accepted view is that there are still a number of unanswered questions.

The European Commission (EC) has adopted the Communication "*Towards a European Strategy for Nanotechnology*"<sup>3</sup> and the "*Nanosciences and nanotechnologies: An action plan for Europe 2005-2009*"<sup>4</sup>. In them a safe, integrated and responsible strategy was proposed and it was stated that "*risk assessment related to human health, the environment, consumer and workers should be responsibly integrated at all stages of the life cycle of the technology, starting at the point of conception and including Research and Development (R&D), manufacturing, distribution, use and disposal or recycling*" and "*R&D needs to take into account the impacts of nanotechnologies throughout the whole of their life-cycle, for example, by using Life Cycle Assessment (LCA) Tools*". The purpose of this strategy is to reinforce the Union's leading position in N&N research, development and innovation, while addressing any environmental, health, safety and societal concerns upfront.

The EC has also highlighted international cooperation as a key asset to advance R&D. International co-operation can accelerate R&D by overcoming knowledge gaps more rapidly and helps to pave the way for a levelled playing field in the global market. In particular, the EC believes there is an urgent need to share knowledge in the health, safety and environmental aspects of nanotechnology for the benefit of all citizens.

Since 2003, The EC has started funding research projects and taking initiatives to address the potential risks of nanoparticles. EU Member States and associated countries to the FP5 are also funding research on this area. The present documents aims at collecting the most accurate overview of the activities being carried out in Europe, specifically, at national level in order to provide a real picture of the European research efforts in the field of health and environmental impacts of nanoparticles.

## ***European Commission activities***

The research initiatives funded within the previous Framework Programs (FP5 and FP6) have been until last year primarily related to implications to human health. In some of the projects the study on the environmental implications of nanoparticles has been included. A complete list of the projects is available below and more details are given in the annexes.

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<sup>3</sup> COM(2004) 338 <http://cordis.europa.eu.int/nanotechnology/actionplan.htm>

<sup>4</sup> COM (2005) 243 <http://cordis.europa.eu.int/nanotechnology/actionplan.htm>

Additional activities have included the organization of dedicated workshops and other activities such as:

- Research Needs on Nanoparticles (Workshop held in Brussels on 25-26 January 2005<sup>5</sup>)
- Nanotechnologies and Life Cycle Assessment (Workshop held in Washington on 2-3 October 2006) in cooperation with US EPA and the Woodrow Wilson Center<sup>6</sup>.
- Informal collection of inputs for nanotechnology R&D in the field of (eco)toxicology (published in our website in June 2006)<sup>7</sup>.
- Safety keeping pace with innovation, European Commission leaflet with a project showcase on safety issues in nanotechnology, July 2005.

Other Directorates in the EC have organised activities related to the risk assessment of nanoparticles in the context of their competences. The Scientific Committees, which provide the EC with scientific advice and are managed by the Directorate General for Health and Consumers' Protection, have issued several scientific opinions<sup>8</sup> on:

- *'The appropriateness of existing methodologies to assess the potential risks associated with engineered and adventitious products of nanotechnologies'*.
- *"Safety of Nanomaterials in Cosmetic Products"*.
- *'The Appropriateness of the Risk Assessment methodology in accordance with the technical guidance documents for new and existing substances for assessing the risks of nanomaterials.'*

#### Research projects addressing environmental, health and safety (EHS) issues

The portfolio of current and past research projects addressing risk assessment and in particular nano (eco) toxicology issues includes EU funding for more than 28 millions € in grants. Although studies addressing health impact of non-engineered nanomaterials (i.e. in exhaustion fumes) are of undeniable interest, in this compilation, only research projects dealing with engineered nanoparticles are included. The list presented below does not include many other EU funded projects where risk assessment and safety issues in relation to nanoparticles may be addressed but are not the main objective of the project, such as projects developing new nanostructured materials for health and environmental applications.

*Completed research projects addressing environmental, health and safety (EHS) issues in FP5 (total grants of ~2.5 million €):*

- **Nano-Pathology** (The role of nano-particles in material-induced pathologies).
- **Nanoderm** (Quality of skin as a barrier to ultra-fine particles).
- **Nanosafe** (Risk assessment in production and use of nanoparticles with development of preventive measures and practice codes).

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<sup>5</sup> <http://cordis.europa.eu/nanotechnology/src/safety.htm>

<sup>6</sup> [ftp://ftp.cordis.europa.eu/pub/nanotechnology/docs/lca\\_nanotechnology\\_workshopoct2006\\_proceedings\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/nanotechnology/docs/lca_nanotechnology_workshopoct2006_proceedings_en.pdf)

<sup>7</sup> [ftp://ftp.cordis.europa.eu/pub/nanotechnology/docs/inputs\\_nanoecotox.pdf](ftp://ftp.cordis.europa.eu/pub/nanotechnology/docs/inputs_nanoecotox.pdf)

<sup>8</sup> [These documents are available at http://ec.europa.eu/health/ph\\_risk/committees/committees\\_en.htm](http://ec.europa.eu/health/ph_risk/committees/committees_en.htm)

*Ongoing financed research projects addressing EHS issues in FP6 (total grants around 28 million €):*

- **Cellnanotox** (Cellular Interaction and Toxicology with Engineered Nanoparticles).
- **Dipna** (Development of an Integrated Platform for Nanoparticle Analysis to verify their possible toxicity and the eco-toxicity).
- **Impart** (Improving the understanding of the impact of nanoparticles on human health and the environment).
- **Nanointeract** (Development of a platform and toolkit for understanding interactions between nanoparticles and the living world).
- **Nanosh** (Inflammatory and genotoxic effects of engineered nanomaterials).
- **Particle-Risk** (Risk Assessment of Exposure to Particles).
- **Nanosafe2** (Safe production and use of nanomaterials).
- **Nanotransport** (The Behaviour of Aerosols Released to Ambient Air from Nanoparticle Manufacturing - A Pre-normative Study).
- **Saphir** (Safe, integrated & controlled production of high-tech multifunctional materials and their recycling).
- **Nanocap** (Nanotechnology capacity building NGOs).
- **Nanotox** (Nano-Particle Characterization and Toxicity).

### ***Looking towards the future: The FP7, current perspectives in the field of safety of nanoparticles***

N&N will have an important role in FP7. The advances enabled through research and development in N&N are intended to address the needs of citizens and contribute to the European Union's competitiveness and sustainable development objectives and many of its policies including public health, employment and occupational safety and health, information society, energy, transport, security and space.

It is foreseen that past research activities in the area of impact assessment of nanoparticles will continue and be reinforced within the Seventh Framework Programme for Research (2007-2013), with the first call already containing topics in the area of the health, safety and environmental impact of nanoparticles. FP7 will be the main initiative for implementing the Action Plan on Nanosciences and Nanotechnologies.

These are the directly related topics in the first call for research proposals (launched on 22 December 2006):

- **NMP-2007-1.3-1 Specific, easy-to-use portable devices for measurement and analysis**
- **NMP-2007-1.3-2 Risk assessment of engineered nanoparticles on health and the environment**
- **NMP-2007-1.3-3 Scientific review of the data and studies on the potential impact of engineered nanoparticles on health, safety and the environment.**
- **NMP-2007-1.3-4 Creation of a critical and commented database on the health, safety and environmental impact of nanoparticles.**

- **NMP-2007-1.3-5 Coordination in studying the environmental, safety and health impact of engineered nanoparticles and nanotechnology based materials and products**
- **HEALTH-2007-1.3-4: Alternative testing strategies for the assessment of the toxicological profile of nanoparticles used in medical diagnostics. – Call coordinated with NMP-2007-4.1.3-2/4.4-4.**

Of particular relevance is the topic **NMP-2007-1.3-2 Risk assessment of engineered nanoparticles on health and the environment**, which strives to reinforce the international cooperation, in particular with USA research teams. This call is the result of particular efforts to address point 7 of the Action plan (on International Cooperation). As results of all these calls, the first project has been already launched and 7 more have been recommended for funding. It is foreseen that the work-programme 2008 will again contain some topics related to health and environmental implication.

All documents cited as well as additional information on EU funded research projects (completed and ongoing) are available at the European Commission Nanotechnology Homepage: <http://cordis.europa.eu.int/nanotechnology/>

## **Annex I: FP5 EU research projects**

**Project: NANO-PATHOLOGY**

**Project: NANODERM**

**Project: NANOSAFE**

# Project: NANO-PATHOLOGY

**TITLE: THE ROLE OF MICRO AND NANOPARTICLES IN BIOMATERIAL-INDUCING PATHOLOGIES**

- **Acronym** : NANO-PATHOLOGY.
- **Project leader / Coordinator** : Dr. Antonietta M. Gatti.  
UNIVERSITY OF MODENA AND REGGIO EMILIA, Italy.
- **Partners** :
  - UNIVERSITY OF MAINZ, Germany.
  - UNIVERSITY OF CAMBRIDGE, UK.
  - BIOMATECH SPA, FRANCE .
  - FEI ITALIA, Italy.
- **Duration of project** : 42 months.
- **Start date** : 01/01/2002.
- **Funding body/bodies** : FP5.
- **Total amount of funding** : 999,937 Euro.
- **Objectives** :
  - To develop an innovative methods of diagnosis micro- and nano- particles.
  - To investigate patho-mechanisms of possible particle-included disease.
  - To determine the pathological significance of the nanoparticles.
- **Expected results ( i.e. Published reports, patents, etc.)** :
  - New diagnostic tools to detect micro- and nano- particles in pathological tissues.
  - To develop experimental models in vitro and in vivo.
  - To investigate the possible pathogenic role of nano-particles in human cryptogenic diseases.
- **Website** : <http://www.nanopathology.it/paginei/menu.htm>

# Project: NANODERM

**TITLE: QUALITY OF SKIN AS A BARRIER TO ULTRA-FINE PARTICLES**

• **Acronym :** NANODERM.

• **Project leader / Coordinator :**  
Tilman Butz.  
UNIVERSITÄT LEIPZIG, Germany.

• **Partners :**

- HENRYK NIEWODNICZANSKI INST. OF NUC. PHY., Poland.
- UNIVERSITY OF DEBRECEN, Hungary.
- UNIVERSITE DE BORDEAUX I, France.
- UNI. DE BORDEAUX I/CNRS, France.
- INST. TEC. E NUCLEAR, Portugal.
- JAGIELLONIAN UNIVERSITY, Poland.

• **Duration of project : 42 months.**

• **Start date : 01/01/2003.**

• **Funding body/bodies : FP5.**

• **Total amount of funding : 1,097,994 Euro/M.**

• **Objectives :**

- To apply and develop different methods for analysing the quality of skin as a barrier against nanoparticles.
- To investigate the nanoparticles activity and the skin response.

• **Expected results ( i.e. Published reports, patents, etc.) :**

- New information about nanoparticles penetration pathways and impacts on human health.
- Development of molecular and cell-biological methods to assess the risk of nanoparticles that could be use as input on consumer's protection policies.

• **Website :** [www.uni-leipzig.de/~nanoderm/](http://www.uni-leipzig.de/~nanoderm/)

# Project: NANOSAFE

**TITLE: RISK ASSESSMENT IN PRODUCTION AND USE OF NANOPARTICLES WITH DEVELOPMENT OF PREVENTIVE MEASURES AND PRACTICE CODES**

- **Acronym :** NANOSAFE.
- **Project leader / Coordinator :**  
Ruediger Nass.  
NANOGATE TECHNOLOGIES GMBH, Germany.
- **Partners :**
  - COMMISSARIAT A L'ENERGIE ATOMIQUE, France.
  - VTT TECHNICAL RESEARCH CENTRE, Finland.
  - UNIVERSITY OF OXFORD, UK.
  - INSTITUT "JOZEF STEFAN", Slovenia.
  - KATHOLIEKE UNIVERSITEIT LEUVEN, Belgium.
  - FORSCHUNGSZENTRUM FÜR UMWELT UND GESUNDHEIT GMBH, Germany.
  - OXONICA LIMITED, UK.
  - VEREIN DEUTSCHER INGENIEURE E.V, Germany.
- **Duration of project :** 15 months.
- **Start date :** 01/04/2003.
- **Funding body/bodies :** FP5.
- **Total amount of funding :** 322,787 Euro.
- **Objectives :**
  - Assemble available information on the possible hazards.
  - Evaluate risks to workers, consumers and the environment.
  - Assess mechanisms of risks to human health.
  - Formulate codes of good practice to obviate danger.
- **Expected results ( i.e. Published reports, patents, etc.) :**
  - Develop techniques to measure nanoparticles.
  - New tool for risk assessment in production and use of nanomaterials.
  - New information to improve guidelines for regulatory measures.
- **Website :** <http://www.nanosafe.org>

## **Annex II: FP6 EU research projects**

**Project: CELLNANOTOX**

**Project: DIPNA**

**Project: IMPART**

**Project: NANOINTERACT**

**Project: NANOSH**

**Project: PARTICLE-RISK**

**Project: NANOSAFE2**

**Project: NANOTRANSPORT**

**Project: NANOCAP**

**Project: SAPHIR**

**Project: NANOTOX**

# Project: CELLNANOTOX

## TITLE: CELLULAR INTERACTION AND TOXICOLOGY WITH ENGINEERED NANOPARTICLES

- **Acronym** : CELLNANOToX.
- **Project leader / Coordinator** :  
Prof. Rafi Korenstein.  
TEL-AVIV UNIVERSITY – Israel.
- **Partners** :
  - INSERM.
  - JRC- INSTITUTE FOR HEALTH AND CONSUMER PROTECTION.
  - UNIVERSITY OF MUNSTER.
  - J. GUTENBERG UNIVERSITY OF MAISZ.
  - BASF AG.
  - COLOROBIA- ITALIA.
  - TP21 GMBH.
- **Duration of project** : 36 months.
- **Start date** : 01/11/2006.
- **Funding body/bodies** : FP6.
- **Total amount of funding** : 2,600,000 Euro/M.
- **Objectives** :
  - Unraveling the correlation between the physicochemical characteristics of NPs and their toxic potential on various organs of the human body.
- **Expected results ( i.e. Published reports, patents, etc.)** :
  - Address the risk of occupational and general population exposure to industrially manufactured NPs.
  - Generate new knowledge on potential health risk of industrially manufactured NPs.
  - Provide objective arguments for recommendations and regulation.
- **Website** : <http://www.fp6-cellnanotox.net/index.html>

# Project: DIPNA

**TITLE: DEVELOPMENT OF AN INTEGRATED PLATFORM FOR NANOPARTICLE ANALYSIS TO VERIFY THEIR POSSIBLE TOXICITY AND THE ECO-TOXICITY**

- **Acronym : DIPNA.**
- **Project leader / Coordinator :**  
Dr. Antonietta M. Gatti.  
CONSORZIO NAZIONALE INTERUNIVERSITARIO SVILUPPO MATERIALI - UNIVERSITY OF MODENA AND REGGIO EMILIA - Italy.
- **Partners :**
  - UNIVERSITY OF SALZBURG, (A).
  - FRAUNHOFER INSTITUTE OF BIOMEDICAL ENGINEERING, ( DE).
  - CONSIGLIO NAZIONALE DELLE RICERCHE, (I).
  - UNIVERSITÀ DELLA MAGNA GRAECIA, (I).
  - GRIMM AEROSOL, (DE).
  - VITO n.v. (NL).
  - CSEM SA, (CH).
  - INSTITUT CATALÀ DE NANOTECNOLOGIA, (ES).
  - EC JOINT RESEARCH CENTRE ISPRA – EUROPEAN CENTER VALIDATION ALTERNATIVE METHODS, (I).
- **Duration of project : 36 months.**
- **Start date : 01/11/2006.**
- **Funding body/bodies : FP6.**
- **Total amount of funding : 2,793,235 Euro/M.**
- **Objectives :**
  - In-vitro tests of interaction of engineered nanoparticles (NP) with cells.
  - Identification of the modes of NP-cell interaction.
  - Application of the laboratory-developed cellular models on the field investigations.
- **Expected results ( i.e. Published reports, patents, etc.) :**
  - Basic knowledge on the interaction between nanoparticles and cells.
  - Better understanding of the possible risks related to nanoparticles and criteria to assess the risk case by case.
  - Assessment of the health risk for nanotechnological operators, citizens and end-users and identification of safety procedure.
  - Criteria for prevention and contribution to Standards for policy makers.
- **Website : <http://www.dipna.eu>**

# Project: IMPART

**TITLE: IMPROVING THE UNDERSTANDING OF THE IMPACT OF NANOPARTICLES ON HUMAN HEALTH AND THE ENVIRONMENT.**

- **Acronym :** IMPART.
- **Project leader / Coordinator :**  
Karl Hoehener.  
TEMAS AG, Switzerland.
- **Partners :**
  - NANO FUNCTIONAL MATERIALS CONSORTIUM, Israel.
  - INST OF PHYSICAL CHEMISTRY, Romania.
  - JOSEF STEFAN INSTITUTE, Slovenia.
  - KAUNO TECHN. UNIVERSITETAS, Lithuania.
  - UNIVERSITATEA DIN CRAIOVA, Romania.
  - VDI GMBH, Germany.
  - KATHOLIEKE UNIVERSITEIT LEUVEN, Belgium.
  - UNIVERSITY OF SURREY, UK.
  - TEMAS AG, Switzerland.
  - NAT. INST. RES & DEV FOR TECH. PHYSICS, Romania.
  - STICHTING BIOMADE TECH., NETHERLANDS.
  - LATVIJAS TOKSIKOLOGU BIEDRIBA, LATVIA.
  - UNIVERSITY OF CRETE, GREECE.
  - UNIVERSITY OF MANCHESTER, UK.
  - BULGARIAN ACADEMY OF SCIENCES, BULGARIA.
  - NOFER INSTITUTE OF OCCUPATIONAL MEDICINE, POLAND.
  - HELSINKI UNIVERSITY OF TECHNOLOGY, FINLAND.
  - EMPA, SWITZERLAND.
- **Duration of project :** 42 months.
- **Start date :** 01/02/2005.
- **Funding body/bodies :** FP6.
- **Total amount of funding :** 699,913 Euro.
- **Objectives :**
  - To prevent knowledge of the health and environmental implications of nanoparticles from lagging behind the technological advances.
- **Expected results ( i.e. Published reports, patents, etc.) :**
  - Improvements in the understanding of the potential impact of nanoparticles on human health and the environment.
  - Dissemination to, and recommendations for the respective stakeholder groups.
- **Website:** <http://www.temas.ch/Impart/ImpartProj.nsf/fmPubsByType?ReadForm&count=12&lang=en>

# Project: NANOINTERACT

## TITLE: DEVELOPMENT OF A PLATFORM AND TOOLKIT FOR UNDERSTANDING INTERACTIONS BETWEEN NANOPARTICLES AND THE LIVING WORLD

- **Acronym :** NANOINTERACT.
- **Project leader / Coordinator :**  
Prof. Kenneth Dawson.  
UNIVERSITY COLLEGE DUBLIN (Ireland).
- **Partners :**
  - UNIVERSITY COLLEGE DUBLIN, Ireland.
  - LUDWIG-MAXIMILIANS UNIVERSITÄT, Germany.
  - OXFORD UNIVERSITY, United Kingdom.
  - TRINITY COLLEGE DUBLIN, Ireland.
  - UNIVERSITY OF ULSTER, United Kingdom.
  - UNIVERSITE PARIS SUD IX, France.
  - LUND UNIVERSITY, Sweden.
  - RIVM, The Netherlands.
  - NOFER INSTITUTE, Poland.
  - GHENT UNIVERSITY, Belgium.
  - RICE UNIVERSITY, United States
  - GLANTREO, Ireland.
  - MEDTRONIC, The Netherlands.
  - L'OREAL, France.
  - INTEL, Ireland.
  - UMICORE, Belgium.
  - DSM, The Netherlands.
- **Duration of project :** 36 months.
- **Start date :** 01/01/2007.
- **Funding body/bodies :** FP6.
- **Total amount of funding :** 3,300,000 Euro/M.
- **Objectives :**
  - To connect nanoparticle properties in physiological solution to mechanism of uptake into and transport in cells.
  - To connect final cellular location of nanoparticles with the intra- and inter-cellular processes disrupted.
  - To establish experimental protocols for every aspect to ensure complete reproducibility.
- **Expected results ( i.e. Published reports, patents, etc.)**
  - A fundamental view of how engineered nanoparticles interact with living cells.
  - A knowledge-based and rational approach that underpins the development of nanotoxicology.
- **Website :** <http://www.nanointeract.net/>

# Project: NANOSH

## TITLE: INFLAMMATORY AND GENOTOXIC EFFECTS OF ENGINEERED NANOMATERIALS

- **Acronym** : NANOSH.
- **Project leader / Coordinator** :  
Kai Savolainen .  
FINNISH INSTITUTE OF OCCUPATIONAL HEALTH, HELSINKI, Finland.
- **Partners** :
  - INSTITUTE FOR SURGICAL RESEARCH, UNIVERSITY OF MUNICH, Germany.
  - CENTRAL INSTITUTE FOR LABOUR PROTECTION – NATIONAL RESEARCH INSTITUTE, WARSAW, Poland.
  - TNO, ZEIST, Netherlands.
  - HEALTH AND SAFETY LABORATORY, BUXTON, UK.
  - BG INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, Sankt Augustin, Germany.
  - CANCER BIOMARKERS AND PREVENTION GROUP, UNIVERSITY OF LEICESTER, UK.
- **Duration of project** : 36 months.
- **Start date** : 01/11/2006.
- **Funding body/bodies** : FP6.
- **Total amount of funding** : 2,400,000 Euro/M.
- **Objectives** :
  - Characterization of nanoparticles and definition of exposure levels in laboratory conditions and workplaces.
  - Assessment of the genotoxic, inflammatory and microcirculatory effects of nanoparticles.
- **Expected results ( i.e. Published reports, patents, etc.)** :
  - Better understanding of the characteristics, behaviour, and toxicity of nanoparticles.
  - Useful methods to assess exposure to and health effects of nanoparticles.
- **Website** : [www.ttl.fi/nanosh](http://www.ttl.fi/nanosh)

# Project: PARTICLE-RISK

## TITLE: RISK ASSESSMENT FOR PARTICLE EXPOSURE

- **Acronym :** PARTICLE-RISK.
- **Project leader / Coordinator :**  
Dr Tran Lang.  
INSTITUTE OF OCCUPATIONAL MEDICINE, UK.
- **Partners :**
  - UNIVERSITY OF EDINBURGH, UK.
  - NAPIER UNIVERSITY, UK.
  - CONS. VENEZIA RICERCHE, Italy.
  - UNIV. CA' FOSCARI DI VENEZIA, Italy.
  - FORSCHUNGSZ. FUER UMWELT UND GESUNDHEIT GMBH, Germany.
  - NAT. INST. OF OCCUPATIONAL HEALTH, Denmark.
- **Duration of project :** 36 months.
- **Start date :** 01/06/2005.
- **Funding body/bodies :** FP6.
- **Total amount of funding :** 799,575.9 Euro.
- **Objectives :**
  - To investigate the possible adverse health effects from exposure to NP.
  - Developing novel methods for NP risk assessment.
- **Expected results ( i.e. Published reports, patents, etc.) :**
  - new toxicological methods for emerging NP evaluation.
  - new information to help regulate environmental exposure to NP.
  - a tool for hazard ranking of novel particle producing technologies.
- **Website :** <http://www.iom-world.com/particlerisk/>

# Project: NANOSAFE2

## TITLE: SAFE PRODUCTION AND USE OF NANOMATERIALS

- **Acronym** : NANOSAFE2.
- **Project leader / Coordinator** :  
Frédéric Schuster.  
CEA-Grenoble, France.
- **Partners** :
  - ARKEMA, France
  - BASF, Germany
  - CENTRE ADV EUROP. STUD. & RES., Germany
  - COMMISSARIAT A L'ENERGIE ATOMIQUE, France
  - CENT. SUISSE D'ELECTRON ET MICROTECHN, Switzerland
  - DGTEC, France
  - ECHANGE ET COLLABOR RECH. INDUST, France
  - UNIVERSITY OF GLASGOW, UK
  - NAT. RES. CENTRE FOR ENV. & HEALTH, UK
  - HEALTH AND SAFETY LABORATORY, UK
  - HAUPT. GEWERBLICHEN BERUFSG., Germany
  - INST. NAT. L'ENVIRON. IND. ET RISQUES, France
  - INST. NAT. SANTE ET RECH. MED., FRANCE
  - JOZEF STEFAN INSTITUTE, SLOVENIA
  - KATHOLIEKE UNIVERSITEIT LEUVEN, BELGIUM
  - NANOGATE, GERMANY
  - UNIVERSITY OF OXFORD, UK
  - OXONICA, UK
  - PROCTER & GAMBLE, BELGIUM
  - QINETIQ, UK
  - INSTITUTE OF SAFETY AND SECUR., SWITZERLAND
  - UNIVERSITY COLLEGE LONDON, UK
  - TECHNICAL RESEARCH CENTRE, FINLAND
- **Duration of project** : 48 months.
- **Start date** : 01/04/2005.
- **Funding body/bodies** : FP6.
- **Total amount of funding** : 6,999,837 Euro/M.
- **Objectives** :
  - Developing an integrated system addressing potential hazards related to nanoparticle, in particular for health and environmental protection.
  - Developing detection and characterisation techniques, hazard assessment, safe production processes and applications.
- **Expected results ( i.e. Published reports, patents, etc.)** :
  - Equipment for new detection techniques in air and liquid, nanotracers and markers and miniaturised translocation test system.
  - Management of toxicology data globally.
  - Safe production methods demonstrated.
  - Establish a total safety system in cooperation with other projects.
- **Website** : [www.nanosafe.org](http://www.nanosafe.org)

# Project: NANOTRANSPORT

## TITLE: THE BEHAVIOUR OF AEROSOLS RELEASED TO AMBIENT AIR FROM NANOPARTICLE MANUFACTURING - A PRE-NORMATIVE STUDY

- **Acronym** : NANOTRANSPORT.
- **Project leader / Coordinator** :  
Dr. Qinglan Wu.  
Det Norske Veritas AS (DNV) Høvik, Norway.
- **Partners** :
  - GRIMM AEROSOL TECHNIK GMBH, AINRING, Germany.
  - UNIVERSITY OF KARLSRUHE, INSTITUT FÜR MECHANISCHE VERFAHRENSTECHNIK UND MECHANIK, KARLSRUHE, Germany.
- **Duration of project** : 18 months.
- **Start date** : 01/09/2006.
- **Funding body/bodies** : FP6.
- **Total amount of funding** : 450,000 Euro.
- **Objectives** :
  - Definition of realistic test conditions in terms of test aerosols characteristics for use within nanotoxicology investigations.
  - Testing and certification of the efficiency of existing engineering control systems of manufacturing equipment.
  - Provision of experimental results that will be used to develop recommendations and guidelines for the European Commission.
- **Expected results ( i.e. Published reports, patents, etc.)** :
  - Based on results the Commission will have the necessary background information to prioritise and initiate research to develop standard test aerosols depending on the scope of the pursued studies/tests/validations/investigations.
- **Website** :

# Project: NANOCAP

## TITLE: NANOTECHNOLOGY CAPACITY BUILDING NGOS

- **Acronym:** Nanocap.
- **Project leader / Coordinator:**  
Jacques Cornelis Pieter VAN BROEKHUIZEN (Drs.)  
IVAM UVA BV, Netherland
- **Partners (other participating institutions):**
  - TECHNISCHE UNIVERSITÄT DARMSTADT, Germany.
  - STICHTING NATUUR EN MILIEU, Netherlands.
  - LEGAMBIENTE LOMBARDIA ONLUS, Italy.
  - PUBLIC INSTITUTION BALTIC ENVIRONMENTAL FORUM (LITH. VIESOJI ISTAIGA BALTIJOS APLINKOS FORUMAS), Lithuania.
  - EUROPEAN ENVIRONMENTAL BUREAU / BUREAU EUROPÉEN DE L'ENVIRONNEMENT
  - MEDITERRANEAN INFORMATION OFFICE FOR ENVIRONMENT, CULTURE AND SUSTAINABLE DEVELOPMENT, Greece.
  - FEDERATIE NEDERLANDSE VAKBEWEGING
  - AMICUS, Ireland.
  - EUROPEAN TRADE UNION INSTITUTE FOR RESEARCH, EDUCATION, HEALTH AND SAFETY
  - FREIE UND HANSESTADT HAMBURG, BEHÖRDE FÜR WISSENSCHAFT UND FORSCHUNG, KOOPERATIONSSTELLE HAMBURG, Germany.
  - PPM FORSCHUNG UND BERATUNG ARBEIT GESUNDHEIT UMWELT, Austria.
  - AARHUS UNIVERSITET, Denmark.
  - KATHOLIEKE UNIVERSITEIT LEUVEN, Belgium.
  - UNIVERSITY OF ESSEX, UK.
  - UNIVERSITEIT VAN AMSTERDAM
- **Duration of project:** 36 months.
- **Start date:** 2006-09-01.
- **Funding body/bodies:** FP6.
- **Total amount of funding :** 1306180 Euro.
- **Objectives:**
  - To improve the understanding of environmental, occupational health and safety risks and ethical aspects of nanotechnology.
  - To develop recommendations to enable public authorities to address the health, safety and environmental risk issues related to the rapid introduction of nanotechnology into society.
  - To give industry the tools to introduce a "responsible nanotechnology", i.e. to stimulate industrial and academic performers to focus on source reduction regarding nanoparticles and to make risk assessment an important dimension in their work.
- **Expected results ( i.e. Published reports, patents, etc.):**
- **Website:** <http://www.nanocap.eu/Flex/Site/Page.aspx?PageID=&Lang=>

# Project: SAPHIR

## TITLE: SAFE, INTEGRATED & CONTROLLED PRODUCTION OF HIGH-TECH MULTIFUNCTIONAL MATERIALS AND THEIR RECYCLING.

- **Acronym:** Saphir.
- **Project leader / Coordinator:**  
Compagnie Industrielle des Lasers, CILAS, France.
- **Partners (other participating institutions):**

COMMISSARIAT A L'ENERGIE  
ATOMIQUE, CEA, France  
CTECH INNOVATION, CTECH, UK

INSTITUT JOZEF STEFAN, IJS, SI  
QUINETIQ NANOMATERIALS, QNL, UK

IRD FUEL CELL, IRD, DK

AEROSOL & PARTICLE TECHNOLOGY LABORATORY,  
CENTRE FOR RESEARCH AND  
TECHNOLOGY/CHEMICAL PROCESS ENGINEERING  
RESEARCH INSTITUTE, APTL, EL  
STOCKHOLM UNIVERSITY, DPT. OF PHYSICAL,  
INORGANIC AND STRUCTURAL CHEMISTRY, SU, S  
BRITISH CERAMIC RESEARCH Ltd, CERAM, UK  
FRUNHOFER-INSTUTUT FÜR WERKSTOFF- UND  
STRAHLTECHNIK, FRAUNHOFER, Germany  
ARKEMA, France

ZENTRUM FÜR BRENNSTOFFZE  
TECHNIK GmbH, ZBT, Germany  
MECACHROME, MECA, France  
ARCELOR, Belgium

ECOLE POLYTECHNIQUE FEDERALE DE  
LAUSANNE, EPFL, CH  
UNIVERSITY OF SHERBROOKE,  
UNISHER, Ca  
INSTITUT NATIONAL DE  
L'ENVIRONNEMENT INDUSTRIEL ET DES  
RISQUES, INERIS, F  
TEKNA PLASMA SYSTEMS Inc., TEKNA,  
Ca  
NIRO, DK

CENTRO RICERCA PLAST-OPTICA – FIAT, CRP, Italy

ALMA CONSULTING GROUP, ALMA, France

EADS – EUROPEAN AERONAUTIC DEFENCE AND  
SPACE COMPANY, EADS, France  
LABEIN CENTRO TECNOLÓGICO, LABEIN, E

- **Duration of project:** 48 months.
- **Start date:** 2006-10-01.
- **Funding body/bodies:** FP6.
- **Total amount of funding :** 8.1 million Euro.
- **Objectives:**  
The general objective of the project is the safe, integrated and controlled production of high-tech multifunctional nanostructured products including their recycling, ensuring competitiveness.
- **Expected results ( i.e. Published reports, patents, etc.):**
- **Website:**

# Project: NANOTOX

## TITLE: NANO-PARTICLE CHARACTERIZATION AND TOXICITY

- **Acronym:** NANOTOX
- **Project leader / Coordinator:**  
Senior Researcher, Phd., Keld Alstrup Jensen, National Research Centre for the Working Environment – Denmark
- **Partners:**  
- University of Copenhagen (Denmark)
- **Starting date:** 01/12/2006
- **Expected end date:** 30/11/2008
- **Funding body/ies:** EU FP6 (Marie Curie)
- **Total amount of funding:** 180 134 Euro (public)
- **Objectives:**  
Elucidating the relationships between physicochemical properties and reactive oxygen species induced by nanoparticles and their inflammogenicity and toxicity in human epithelial cells.

**Website:**

[http://cordis.europa.eu/fetch?CALLER=FP6\\_PROJ&ACTION=D&DOC=1&CAT=PROJ&QUERY=1194423998403&RCN=83326](http://cordis.europa.eu/fetch?CALLER=FP6_PROJ&ACTION=D&DOC=1&CAT=PROJ&QUERY=1194423998403&RCN=83326)

## Annex III: National Research Projects

### BELGIUM

**Project: NANOTOXICO**

### CZECH REPUBLIC

**Project:** Study of transport of inhaled nano-sized particles (Ag, Pb, Cd) and their allocation in organs

### DENMARK

**Project:** EVALUATION AND CONTROL OF OCCUPATIONAL HEALTH RISKS FROM NANOPARTICLES

**Project: NANOFILM**

**Project: NANO KEM**

**Project: NANOPLAST**

**Project:** Translocation of Nanoparticles and Ultrafine Particles across Tissue Barriers in Mice.

**Project: SUNANO**

**Project: NANOPACK**

**Project:** Risk analysis and governance of nanomaterials

**Project:** Environmental Effects of Engineered Nanoparticles

**Project:** Framework Development for Adaptive Environmental Risk Assessment and Uncertainty Analysis for Nanomaterials

**Project:** Engineered Nanoparticles and Development of Airway Allergy

**Project: CAGEN**

**GERMANY**

**Project: NANOCARE**

**Project: TRACER**

**Project: INOS**

**GREECE**

**Project:** Technology Development for Optimising Air Quality in Industrial Buildings: Characterisation of Air Quality in Industrial Buildings – Mechanisms Controlling the Indoor/Outdoor Particulate Matter Chemical Characteristics and their Effects to Human Exposure and Inhaled Dose (IN-DOOR-HEALTH)

**ITALY**

**Project : ECSIN**

**FINLAND**

**Project : NANOHEALTH**

**Project:** Inflammatory and genotoxic effects on engineered nanoparticles

**Project:** Nanosafety in Finland

**SWEDEN**

**Project: Risk for man and the environment following use of nanotechnology**

**UNITED KINGDOM**

**Project: NOSH**

**Project:** HSL Investment Research Programme - Nanochallenge

**Project:** Assessment of the potential use of nanomaterials as food additives or food ingredients in relation to consumer safety and implications for regulatory control.

**Project:** Assessment of current and projected applications of nanotechnology for food contact materials in relation to consumer safety and regulatory implications.

**Project:** Current and Predicted Environmental Exposure to Engineered Nanomaterials.

**Project:** An Assessment of Regulatory Testing Strategies and Methods for Characterising the Ecotoxicological Hazards of Nanomaterials

**Project: REFNANO**

**Project:** New tools for nanometrology

**Project: Nanonet**

**Project:** Nanometrology for Molecular Science, Medicine and Manufacture

**Project:** Research network on Nanoparticles at the science and engineering/Medicine Interface.

**Project: NANOsafeNET**

**Project:** Examining the host response to polymer conetworks

**Project:** Centre for Inflammation research

**Project:** A proof of concept study for a structure activity model for the toxicity of nanoparticles.

**Project:** An exploratory study investigating the physicochemical characteristics of ambient air particles responsible for the dysregulation of pulmonary genes

**Project:** Assessing human exposure, uptake and toxicity of nanoparticles from contaminated environments

**Project:** Determinants of oxidative potential, a health-based metric to assess particulate matter toxicity.

**Project:** Exploring the link between surface structures and toxicity in mineral particles: case study of induced and intrinsic toxicity in quartz

**Project:** Hazards of nanoparticles to the environment and human health

**Project:** Identification and verification of ultrafine particle affinity zones in Urban neighborhoods: a proof of concept proposal

**Project:** Metal-colloid interactions in freshwaters

**Project:** Toxicology of Nanomaterials to fish: a fact finding pilot study

**Project:** The Big Issue-the ecotoxicology of nanoparticles

**Project:** Trace metal interactions with manufactured and natural nanoparticles

**Project:** Effects of C60 fullerenes and carbon nanotubes on marine mussels.

**Project:** Dietary Exposure to nanoparticles in fish: a pilot study

**Project:** Manufactured nanoparticles migration in groundwaters.

**Project:** Genomic and oxidation-related biological responses in fish exposed to fullerenes of different physicochemical characteristics

**Project:** Model nanoparticles for environmental risk studies

**Project:** Nanoparticle immunotoxicity using an environmental sentinel as a model.

**Project:** Pharmaceutical and cosmetic silica nanoparticles: towards an understanding of their structure in aquatic systems

**Project:** Synthetic polymer nanoparticles: effects of size and composition of uptake, toxicity and interactions with environmental contaminants.

**Project:** Understanding the fate and behavior of manufactured nanoparticles in natural waters

**Project:** Visualisation of nanoparticles in the environment

**Project:** Impact of manufactured nanoparticles on the catabolic capabilities and phenotypic structure of soil microbial communities

**Project:** Biomembrane interactions in the toxicology of nanoparticles to microorganisms.

**Project:** Impact and recovery of groundwater microbial communities exposed to manufactured nanomaterials

**Project:** A study of the effects of silver surface chemistry on bactericidal properties of silver nanoparticles

**Project:** An investigation into the effects of nanoparticles on the bacterial diversity of freshwater and coastal marine sediments

**Project:** Interaction of nanoparticles with microbial populations during particle transport

**Project:** Nanoscale zerovalent iron (nZVI) impact on soil microbial communities.

**Project:** A study to identify physicochemical factors controlling the capacity of nanoparticles to penetrate cells of the respiratory epithelium, especially those of first contact on inhalation of the particles

**Project:** Evaluation of Risk Assessment Approaches for Manufactured Nanomaterials.

**Project:** A study to identify physicochemical factors controlling the capacity of nanoparticles to penetrate cells of the respiratory epithelium, especially those of first contact on inhalation of the particles.

**Project:** An outline scoping study to determine whether high aspect ration nanoparticles (HARN) should raise the same concerns as do asbestos fibres.

## SWITZERLAND

**Project: NanoBioTox**

**Project: NanoHealth**

**Project: NanoHealthNet**

**Project: Nanoinventory**

**Project: Nanorisk**

**Project:** Centre for toxicology and fine dust research. Electron microscope tomography for the study of the distribution of nano-particles in tissue and cells.

**Project:** Interaction of ultrafine particles with the internal surface of the lung

**Project:** Development of a particle exposure system to investigate the inflammation and toxicity potential of nanoparticles in an epithelial airway barrier model

**Project:** Comparison of the effect of asbestos fibres and Carbon-Nanotubes

**Project:** Behaviour of ultrafine particles in tissue and cells of the lung.

**Project:** Characterization of Particulate Matter (incl. Nanoparticles) for the Life Cycle Assessment Methodology according to their Impact on Human Health

**Project: NeuroCNTox**

**Project:** Quantitative risk assessment of nanoparticles in the environment: Exposure modeling and ecotoxicological considerations

**Project:** Protein - carbon nanotubes interaction, uptake and the influence on oxidative stress and inflammation as key factors in nanoparticles - cell interaction

**Project:** Particle-lung interaction: mechanisms and effects on lung cell function

**Project:** Nanosciences - conception and ecopolitical establishment of technology risks with an international comparison.

**Project:** „Solubilization of carbon nanotubes and fullerenes in natural waters under environmental conditions“

**Project:** Ecotoxicology of Nanoparticles: Biota-Nanoparticle-Pollutant Interactions in aqueous systems - Comparison of Black Carbon and Carbon Nanotubes

**Project:** Interplay of lung cells and their cellular responses upon exposure to combustion-generated ultrafine particles and manufactured nanoparticles

**Project:** Fate of hydrophilic nanoparticles in biological environment

**Project:** Analysis of the nanomaterials exposure on humans in Switzerland - Identification of frequent situations for exposure with today's and possible future use of consumer products on the basis of nano-materials

Project: **Chemical Reactivity of NP**

Project: **NanoWorkRisk**

**Project:** How to assess the adequacy of safety measures for manufactured nanoparticles

## BELGIUM

### Project: NANOTOXICO

- **TITLE: RISK ASSESSMENT OF NANOPARTICULES ON HUMAN HEALTH USING IN VITRO AND IN VIVO MODELS**
- **Acronym :** NANOTOXICO.
- **Project leader / Coordinator :**  
Olivier Toussaint.  
UNITE DE RECHERCHE EN BIOLOGIE CELLULAIRE (URBC) University of Namur.
- **Partners :**
  - FACULTES UNIVERSITAIRES NOTRE-DAME DE LA PAIX - NAMUR.
  - Unité de Recherche en Biologie Cellulaire, URBC.
  - Laboratoire d'Analyses par Réactions Nucléaires, LARN.
  - Laboratoire de Chimie et d'Électrochimie des Surfaces, LCES.
  - Département de pharmacie.
  - Atout sciences.
- **Duration of project :** 5 years.
- **Start date :** 01/10/06
- **Funding body/bodies :** FP5 - Belgian Walloon Region.
- **Total amount of funding :** € 10 Millions Euro.
- **Objectives :**  
-Evaluation of the potential toxicity of nanoparticles (carbon nanotubes, nanopowders and argiles exfoliées) of interest to the industry (in vitro, in vivo, physical characterisation, chemical modifications, communication).
- **Expected results ( i.e. Published reports, patents, etc.) :**
- **Website :**  
<http://www.fundp.ac.be/facultes/sciences/esa/as/nanotox/projet-2/>  
[http://www.nano2hybrids.net/post\\_files/Nanotoxico\\_LC\[1\].pdf](http://www.nano2hybrids.net/post_files/Nanotoxico_LC[1].pdf)

## **Project**

- **Title: Study of transport of inhaled nano-sized particles (Ag, Pb, Cd) and their allocation in organs**
  
- **Acronym**
  
- **Project leader / Coordinator**  
Academy of Sciences of the Czech Republic, Institute of Analytical Chemistry,  
Environmental Analytical Chemistry Department – Dr. Večeřa (co-ordinator)
  
- **Partners**
  1. Institute of Animal Physiology and Genetics, Academy of Sciences of the Czech Republic  
Department of Animal Embryology, Cell and Tissue Differentiation – Prof. Míšek
  
  2. Institute of Chemical Process Fundamentals, Academy of Sciences of the Czech Republic,  
Laboratory of Aerosol Chemistry and Physics – Dr. Smolík
  
- **Starting date**
  
- **Expected end date**
  
- **Funding body/ies**
  
- **Total amount of funding ... of which ... public**
  
- **Objectives**

The study will be focused on the only transport of fine particles of elements or oxides. The nonbiogenous elements (Ag, Cd and Pb) have been selected as products of nanotechnological processes. The research will give us more information for a proper understanding of risks of technologies producing Ag, Cd and Pb nano-sized particles as well as their oxides, which can have health impact for animals and humans or the impact on the environment.
  
- **Website**

## DENMARK :

### Project

- **Title:** EVALUATION AND CONTROL OF OCCUPATIONAL HEALTH RISKS FROM NANOPARTICLES
- **Acronym:**
- **Project leader / Coordinator:**  
Senior Researcher Thomas Schneider, National Research Centre for the Working Environment – Denmark.
- **Partners:**
  - NIWL (Sweden)
  - Stockholm University (Sweden)
  - AOSH (Iceland)
  - NIOH (Norway)
  - FIOH (Finland)
- **Starting date:** 01/1/2006
- **Expected end date:** 30/11/2007
- **Funding body/ies:** Nordic Council of Ministers
- **Total amount of funding:** 40 300 Euro (public)
- **Objectives:**

To

  - 1) Gather and structure the existing Nordic knowledge and experience on nanoparticle risk assessment, and enhance the use of existing data, to guide future data collection,
  - 2) Provide a knowledge base on evaluation and control of the occupational health risk of engineered nanoparticles as input to the Nordic Working Environment Authorities for their development of policies and strategies for controlling nanoparticle exposures.
  - 3) Strengthen the Nordic research potential in the field and facilitate Nordic participation in EU sponsored research.
- **Website:**  
<http://www.arbejdsmiljoforskning.dk/Aktuel%20forskning/Evaluation%20and%20control%20of%20occupational%20health%20risks%20from%20nanoparticles.aspx>

## **Project: NANOFILM**

- **Title:** CHARACTERIZATION AND TOXICOLOGICAL EVALUATION OF NANOPARTICLES FROM LIQUID-BASED NANOFILM PRODUCTS
- **Acronym:** NANOFILM
- **Project leader / Coordinator:**  
Senior Researcher, Phd., Keld Alstrup Jensen, National Research Centre for the Working Environment – Denmark
- **Partners:**  
- University of Copenhagen (Denmark)
- **Starting date:** 01/10/2006
- **Expected end date:** 31/12/2010
- **Funding body/ies:** Nanocover Scandinavia A/S
- **Total amount of funding:** 362 659 Euro (private)
- **Objectives:**  
To understand the atmosphere-chemical reactions risk of exposure to chemicals and nanoparticles during use of nanoparticle-base pump and spray products as well as screening their potential cellular and respiratory effects in vitro and in vivo at different user scenarios.
- **Website: (in Danish)**  
<http://www.arbejdsmiljoforskning.dk/Aktuel%20forskning/NANOFILM%20Karakterisering%20og%20toksikologisk%20analyse%20af%20nanopartikler%20i%20v%C3%A6skebaserede%20nanofilmprodukter.aspx>

## **Project: NANOKEM**

- **Title: NanoKem: Nanoparticles in the paint- and lacquer industry. Exposure and toxic properties.**
- **Acronym:** NANOKEM
- **Project leader / Coordinator:**  
Ph.d., Senior Researcher, Ulla Vogel, National Research Centre for the Working Environment - Denmark
- **Partners:**
  - National Research Centre for the Working Environment (Denmark)
  - University of Copenhagen (Denmark)
  - University of Aarhus (Denmark)
  - DHI Group (Denmark)
  - The Danish Paint and Lacquer Industry (Denmark)
- **Starting date:** 01/06/2007
- **Expected end date:** 31/05/2010
- **Funding body/ies:** The Danish Working Environment Research Fund and National Research Centre for the Working Environment (DK)
- **Total amount of funding:** 1,344,086 Euro/M (public)
- **Objectives:**
  1. Evaluation of exposure risks while handling nanoparticles and while sanding paint and lacquer that contain nanoparticles.
  2. Physical and chemical characterization of nanoparticles used in paint and lacquer and characterization of dust created by sanding paint and lacquer that contain nanoparticles.
  3. Identification and evaluation of the toxic effects of nanoparticles used by the paint- and lacquer industry and comparison to the effects created by sanding dust from paint products. Translocation of particles across barriers, carcinogenicity, effects on cardiac system, embryogenic effects and allergenic effects will be part of the study.
  4. Development of model for risk assessment of nanoparticles, for use or expected use in the paint- and lacquer industry.
- **Website:**  
<http://arbejdsmiljoforskning.dk/Aktuel%20forskning/Nanopartikler%20i%20f%20arve-%20og%20lakindustrien%20-%20NANOKEM%20hovedprojekt.aspx>

## Project: NANOPLAST

- **Title: NANOPLAST: Nano-technological materials and products in the plastics industry: Exposure assessment and toxicological properties**
- **Acronym:** NANOPLAST
- **Project leader / Coordinator:**  
Ph.d., Senior Researcher, Per Axel Clausen, National Research Centre for the Working Environment - Denmark
- **Partners**
  - Danish Technological Institute (DTI) (Denmark)
  - Institute of Public Health, University of Copenhagen (Denmark)
- **Starting date:** 01/09/2007
- **Expected end date:** 01/09/2010
- **Funding body/ies:** Danish Working Environment Research Fund
- **Total amount of funding:** 680 000 Euro (public)
- **Objectives:**  
The aim is to investigate physical, chemical, and toxicological properties of nanotechnological materials that will obtain massive use in the future production of plastic products. The project focuses on *polymer nano composites* (PNCs).
- **Website:**  
<http://www.arbejdsmiljoforskning.dk/Aktuel%20forskning/Nanoteknologiske%20materialer%20og%20produkter%20i%20plastindustrien%20NANOPLAST.aspx?lang=en>

## Project

- **Title: Translocation of Nanoparticles and Ultrafine Particles across Tissue Barriers in Mice.**
- **Acronym:**
- **Project leader / Coordinator:**  
Dr., Professor Håkan Wallin, National Research Centre for the Working Environment – Denmark
- **Partners:**  
- Dept. of Anatomy, Aarhus University (Denmark)
- **Starting date:** 01/01/2007
- **Expected end date:** 01/01/2009
- **Funding bodies:** Danish Ministry of Interior and Health, Research Centre for Environmental Health's Fund, and The Danish Medical Research Council.
- **Total amount of funding:** 300 000 Euro (public)
- **Objectives:**  
Understanding fate of nanoparticles in mice and ultimately in humans
- **Website**

## Project: SUNANO

- **Title:** SUNANO - Risk assessment of free nanoparticles
- **Acronym:** SUNANO
- **Project leader / Coordinator:**  
Professor, PhD Herman Autrup, Institute of Public Health and iNANO,  
University of Aarhus, Denmark
- **Partners:**
  - Institute of Public Health, University of Aarhus, Denmark
  - iNANO, University of Aarhus, Denmark
  - National Environmental Research Institute, University of Aarhus, Denmark
  - SCF Technologies, Denmark (SME)
- **Starting date:** 01/10/2007
- **Expected end date:** 01/10/2010
- **Funding body/ies:** The Danish Strategic Research Council, Programme Commission on Nanoscience, Biotechnology and IT (NABIIT)
- **Total amount of funding:** 1 064 000 Euro/M (public)
- **Objectives**

The objective of this project is to establish and validate toxicological test systems in order to perform an integrated hazard characterization of free nanoparticles of silver, ZrO<sub>2</sub>, SiO<sub>2</sub> and TiO<sub>2</sub> using a tiered approach. The toxicity of the particles will be assessed as a function of size, shape and dose (mass and surface area) in relevant human target cells and ecological indicator organisms. The potential toxicological mechanism of the particles will be investigated using a molecular toxicological approach, i.e. identify cellular response pathways, signalling pathway, genetic response and outcome, and the endpoints will in general be the same in human cells and the ecological test organisms. In order to establish dose-response relationships as a function of the particles variable, the particles will be extensively characterized at the different stages of the experimental studies.
- **Website:** [www.inano.dk](http://www.inano.dk)

## **Project: NANOPACK**

- **Title: Biopolymer Nanocomposite Films for use in Food Packaging Applications**
- **Acronym: NANOPACK**
- **Project leader/Coordinator:**  
Dr., Senior Scientist, David Plackett, Risø National Laboratory – Technical University of Denmark
- **Partners:**
  - Risø National Laboratory – Technical University of Denmark (DK)
  - The National Food Institute – Technical University of Denmark (DK)
  - The Faculty of Life Sciences, University of Copenhagen (DK)
  - Faerch Plast A/S (DK)
  - Danish Meat Association (DK)
- **Starting date:** 01/01/2007
- **Expected end date:** 31/12/2010
- **Funding body/ies:** The Danish Strategic Research Council
- **Total amount of funding:** 2 070 635 Euro/M (51% public)
- **Objectives:**  
To investigate and develop advanced polylactide-based nanocomposite films for food packaging while developing a comprehensive understanding of any release, migration and potential toxicological effects of the incorporated nanofillers.
- **Website:** <http://www.nanopack.com>

## Project

- **Title: Risk analysis and governance of nanomaterials**
- **Acronym:**
- **Project leader/Coordinator:**  
Associate Professor, Ph.D., Anders Baun, Institute of Environment and Resources – Technical University of Denmark
- **Partners**
- **Starting date:** 09/01/2005
- **Expected end date:** 09/01/2008
- **Funding body/ies:** Technical University of Denmark
- **Total amount of funding:** 240 000 Euro (public)
- **Objectives:**
  1. To identify and assess the potential risks of nanotechnologies;
  2. Explore and further develop current decision-making tools for dealing with complex and uncertain emerging risks, and;
  3. Provide recommendations on how to govern nanotechnologies within a precautionary framework focused at protecting human health and the environment without hindering innovation.
- **Website:** <http://www.nano.dtu.dk/Forskning/NanoMiljoe.aspx>

## Project

- **Title: Environmental Effects of Engineered Nanoparticles**
- **Acronym:**
- **Project leader/Coordinator:**  
Associate Professor, Ph.D., Anders Baun, Institute of Environment and Resources – Technical University of Denmark
- **Partners:**  
- The National Food Institute – Technical University of Denmark (DK)
- **Starting date:** 15/09/2007
- **Expected end date:** 14/09/2010
- **Funding body/ies:** Technical University of Denmark
- **Total amount of funding:** 240 000 Euro (public)
- **Objectives:**
  1. Develop robust, accurate and reliable methods for evaluation of effects of nanoparticles in aquatic organisms. Acute, chronic and genetic effects will be included in the method development;
  2. Study the links between physical-chemical properties of manufactured nanoparticles and the acute and chronic effects in aquatic organisms;
  3. Study the role of nanoparticles as carriers of contaminants in relation to ecotoxicity and bioaccumulation of xenobiotic organic compounds;
  4. Transfer the knowledge gained into procedures applicable for use in hazard identifications for developers and producers of products based on engineered nanoparticles.
- **Website:** <http://www.nano.dtu.dk/Forskning/NanoMiljoe.aspx>

## Project

- **Title: Framework Development for Adaptive Environmental Risk Assessment and Uncertainty Analysis for Nanomaterials**
- **Acronym:**
- **Project leader/Coordinator:**  
Associate Professor, Ph.D., Anders Baun, Institute of Environment and Resources – Technical University of Denmark
- **Partners:**
- **Starting date:** 01/09/2007
- **Expected end date:** 01/09/2010
- **Funding body/ies:** Technical University of Denmark
- **Total amount of funding:** 240 000 Euro (public)
- **Objectives:**  
The project has the following main study objectives:
  1. Develop and apply uncertainty analysis tools for environmental risk assessment of nanomaterials in order to identify and document critical areas of uncertainty;
  2. Develop a framework for adaptive environmental risk assessment for nanomaterials in various forms;
  3. Evaluate nano-based environmental technologies with respect to environmental risks and the applicability of the developed frameworks on these technologies.
- **Website:** <http://www.nano.dtu.dk/Forskning/NanoMiljoe.aspx>

## Project

- **Title: Engineered Nanoparticles and Development of Airway Allergy**
- **Acronym:**
- **Project leader/Coordinator:**  
Senior Scientist Søren Thor Larsen, The National Research Centre for the Working Environment – Denmark
- **Partners:**  
- University of Copenhagen (DK)
- **Starting date:** 01/06/2006
- **Expected end date:** 31/05/2009
- **Funding body/ies:** The National Research Centre for the Working Environment
- **Total amount of funding:** 250 000 Euro (public)
- **Objectives:**  
To study effects of nanoparticles on the airway with respect to inflammation and allergy-promoting effect. Perform structure-activity studies on the pro-inflammatory effect of nanoparticles.
- **Website:**  
<http://www.arbejdsmiljoforskning.dk/Aktuel%20forskning/Nanopartikler%20i%20farve-%20og%20lakindustrien%20-%20NANOKEM%20hovedprojekt.aspx>

## **Project: CAGEN**

- **Title: Cardiovascular and Genotoxic Effects of Nanoparticles**
- **Acronym: CAGEN**
- **Project leader / Coordinator**  
Steffen Loft and Peter Møller, Dept. of Environment and Health, Institute of Public Health, Health Science Faculty, University of Copenhagen – Denmark
- **Partners**
  - The NanoScience Center, University of Copenhagen (DK)
  - The National Research Centre for the Working Environment (DK)
  - Department of Pharmacology The Pharmaceutical Faculty, University of Copenhagen (DK)
- **Starting date: 01/08/2007**
- **Expected end date: 31/07/2010**
- **Funding body/ies: University of Copenhagen (DK) and the Research Centre for Environment and Health (Ministry for Interior and Health).**
- **Total amount of funding: 336.000 Euro**
- **Objectives:**  
To study the mechanism of cardiovascular effects of nanoparticles related to oxidative stress, inflammation, genotoxicity and liver and vascular functions.
- **Website:**

## GERMANY

### Project: NANOCARE

**TITLE: RESEARCH PROJECT TO STUDY THE SAFE HANDLING OF NANOMATERIALS**

- **Acronym** : NANOCARE
- **Project leader / Coordinator** :  
Prof. Dr. Harald Krug  
Karlsruhe Research Centre – GERMANY
- **Partners** :
  - EVONIIK DEGUSSA GmbH, BASF AG,
  - BAYER MATERIALSCIENCE AG,
  - SOLVAY INFRA BAD HÖNNIGEN GmbH.
  - SUSTECH GmbH & Co.KG.
  - UNIVERSITIES OF MÜNSTER, BIELEFELD AND SAARBRÜCKEN.
  - IUTA e.V.
  - ItN NANOVATION GmbH.
  - Institut für Entwicklung und Anwendung von Verfahren zur biologischen Emissionsbewertung (IBE)
  - Institut für Gefahrstoff-Forschung der Bergbau-Berufsgenossenschaft an der Ruhr-Universität Bochum (IGF)
- **Duration of project** : 3 years.
- **Start date** : March 2006.
- **Funding body/bodies** : The German Federal Ministry of Education and Research (BMBF).
- **Total amount of funding** : € 5.0 million in funding from the German Federal Ministry of Education and Research (BMBF). Industrial partners will contribute an additional € 2.6 million.
- **Objectives** :
  - Ensure that nanoparticles, i.e. atom- or molecule-sized particles, pose no risk to humans and the environment when used in chemical materials.
  - Provide an information platform for all interested societal groups on the opportunities and risks associated with nanomaterials.
- **Expected results ( i.e. Published reports, patents, etc.):**
- **Website** : <http://www.nanopartikel.info/>  
<http://www.nano.org.uk/forum/viewtopic.php?t=715>

# Project: TRACER

**TITLE: TOXICOLOGICAL ASSESSMENT AND FUNCTIONALISATION OF CARBON NANOTUBES**

- **Acronym : TRACER**
- **Project leader / Coordinator :** Dr. Walter Schütz  
FUTURECARBON GMBH.
- **Partners :**
  - FUTURECARBON GMBH.
  - VICTREX PLC.
  - BAYERN MATERIAL SCIENCE.
  - FRENZELIT-WERKE GMBH & Co. KG.
  - DAS FRAUNHOFER-INSTITUT FÜR GRENZFLÄCHEN- UND BIOVERFAHRENSTECHNIK IGB.
- **Duration of project :** 3 years
- **Start date :** March 2006.
- **Funding body/bodies :** German Federal Ministry of Education and Research(BMBF) and industrial project partner.
- **Total amount of funding :** €3 million project (of which 1.5 from the BMBF).
- **Objectives :**

-The project targets on the biocompatibility assessment of the exemplary value chain production – processing – semi-finished products – functional models of Carbon Nanomaterial based PEEK (Polyether-Etherketone) and PUR (Polyurethane) composite materials.
- **Expected results ( i.e. Published reports, patents, etc.):**
- **Website :**  
[www.nano-tracer.de](http://www.nano-tracer.de)

## Project: INOS

**TITLE: IDENTIFICATION AND ASSESSMENT OF THE EFFECTS OF ENGINEERED NANOPARTICLES ON HUMAN AND ENVIRONMENTAL HEALTH**

- **Acronym** : INOS
- **Project leader / Coordinator** : Dr. Volkmar Richter  
FRAUNHOFER INSTITUTE FOR CERAMIC TECHNOLOGIES AND SYSTEMS IN DRESDEN.
- **Partners** :
  - MAX BERGMANN CENTRE FOR BIOMATERIALS – Dresden.
  - NAMOS GMBH. – Dresden.
  - FRAUNHOFER-INSTITUT FÜR KERAMISCHE TECHNOLOGIEN UND SYSTEME.
  - LEIPZIG-HALLE CENTRE FOR ENVIRONMENTAL RESEARCH.
  - TU DRESDEN
- **Duration of project** : 3 years.
- **Start date** : January 2006
- **Funding body/bodies** : Federal German Ministry of Education and Research (BMBF)
- **Total amount of funding** : 1.1 million Euro
- **Objectives** :  
-Developing in-vitro methods to evaluate the hazardous potential of technical (engineered) nano-particles.
- **Expected results ( i.e. Published reports, patents, etc.)**
- **Website** :  
<http://www.nanotox.de>  
  
[http://www.bmbf.de/pub/flyer\\_nanocare-projekte\\_en.pdf](http://www.bmbf.de/pub/flyer_nanocare-projekte_en.pdf)

## **Project:**

**TITLE: TECHNOLOGY DEVELOPMENT FOR OPTIMISING AIR QUALITY IN INDUSTRIAL BUILDINGS: CHARACTERISATION OF AIR QUALITY IN INDUSTRIAL BUILDINGS – MECHANISMS CONTROLLING THE INDOOR/OUTDOOR PARTICULATE MATTER CHEMICAL CHARACTERISTICS AND THEIR EFFECTS TO HUMAN EXPOSURE AND INHALED DOSE (IN-DOOR-HEALTH)**

- **Acronym :**
- **Project leader / Coordinator :**
- **Partners :**  
6 partners: 1 public research organization, 3 universities, 1 industrial company, 1 commercial company
- **Duration of project :** 4 years.
- **Start date :** 1/12/2003.
- **Funding body/bodies :**
- **Total amount of funding** 1162000 € **of which** 732900 € (63%) **public**
- **Objectives :**  
The objective of the project is to characterize the particulate matter (PM) chemical composition/size distribution in selected industrial facilities, their impact on actual human exposure, as well as associated possible biological effects. The participating industrial partner is a leading chemical industry in Greece in the sector of detergent and cosmetics manufacturing. The industrial processes for detergent powder manufacturing lead to high emissions of particles and particles precursors at several areas within the plant (conveyor belts, raw material handling, powder packaging etc.). Improving air quality conditions in industry has a direct positive effect on productivity and, hence, the competitiveness of the company. Cleaner air conditions within an industrial complex motivate strongly the workers and at the same time reduce absenteeism due to sick leaves.
- **Expected results ( i.e. Published reports, patents, etc.):**
- **Website :**

## Project : ECSIN

### TITLE: EUROPEAN CENTER FOR THE SUSTAINABLE DEVELOPMENT OF NANOTECHNOLOGY

- **Acronym:** ECSIN
- **Project leader / Coordinator:**  
Veneto nanotech (Italy).
- **Partners (other participating institutions).**
- **Duration of project**
- **Start date**
- **Funding body/bodies**
- **Total amount of funding ... of which ... public.**
- **Objectives:**

ECSIN will be active in three main nanotech sectors, with a multilevel analysis approach:

- Interaction human health / environment
- Public perception and social/ethical policies
- Education for a responsible use

ECSIN activities are coherent with guidelines of European Commission on "Nanotechnology and Nanosciences Development" (N&N). Within which ECSIN will operate:

#### 1. Security for public health, environment and consumers:

- Risks evaluation about nanoparticles use
- Analysis of potentially nanostructured pollutants and contaminants
- Analysis of risks for workers employed in nanomaterial production

#### 2. N&N Social impact analysis

#### 3. Consistent and acquainted strategy

- **Expected results (i.e. Published reports, patents, etc.) :**
- **Website:**  
[http://www.venetonanotech.it/files/index.cfm?id\\_rst=343](http://www.venetonanotech.it/files/index.cfm?id_rst=343)

## Project : NANOHEALTH

### TITLE

- **Acronym:** Nanohealth
- **Project leader / Coordinator:**  
Pr Kai Savolainen, FIOSH (Finnish Institute of Occupational Health).
- **Partners (other participating institutions).**
- **Duration of project:** 3 years.
- **Start date:** 2007.
- **Funding body/bodies:** Finnish academy of sciences.
- **Total amount of funding** 782.000 € **of which** 782.000 € **public.**
- **Objectives:**  
  
-To produce nanoparticles, define particles that affect working environments and assess exposure to them and their health effects
- **Expected results ( i.e. Published reports, patents, etc.) :**
- **Website**

## Project :

- **Title: Inflammatory and genotoxic effects of engineered nanoparticles**
- **Acronym:**
- **Project leader/coordinator:** Dr. Kai Savolainen, FIOSH (Finnish Institute of Occupational Health)
- **Partners:** -
- **Starting date:** 2005
- **Expected end date:** 2007
- **Funding bodies:** Finnish Work Environment Fund, Finnish Institute of Occupational Health
- **Total amount of funding:** 270 000 €, of which 270 000 € public
- **Objectives:** To assess exposure to selected SNP and to explore genotoxic and pulmonary inflammatory effects of SNP in experimental animals and cells

## **Project :**

- **Title: Nanosafety in Finland**
- **Acronym: -**
- **Project leader/coordinator: Dr. Mari Hjelt, Gaia Consulting Ltd**
- **Partners: -**
- **Starting date: 15.5.2007**
- **Expected end date: 15.12.2007**
- **Funding bodies: Finnish Funding Agency for Technology and Innovation**
- **Total amount of funding: 44 000 €, of which 44 000 € public**
- **Objectives: To clarify the relevant research, administrative and business actors and their roles in the field of nanosafety in Finland, and to map the actors within the nanosafety field, their expertise and international linkages, and the connections of Finnish research to EU level legislation.**

<b>SWEDEN :</b>
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### **Project :**

- **Title: Risks for man and the environment following use of nanotechnology**
- **Acronym: ----**
- **Project-leader:**  
Agneta Falk Filipsson, Swedish Chemicals Agency, (KemI), Sweden
- **Partners: KemI**
- **Start Date:** January 1, 2007
- **End Date:** October 31, 2007
- **Founding Body/bodies:** This project is Government commission given to the Swedish Chemicals Agency and is financed within the agency's budget.
- **Objectives:**
  - 1) Compile available knowledge about risks for man and the environment following use of nanotechnology
  - 2) Identify knowledge-gaps
  - 3) Make proposals for how to fill the identified gaps
- **Expected results:**
  - 1) Proposals for how to continue the work of minimizing the risks for man and the environment following use of nanotechnology
  - 2) Build a knowledge-based platform for competent authorities and the government
  - 3) Coordinate and strengthen Swedish Research and Development, including risks for health and environment
  - 4) Proposals on how to review the need for complementing existing legislation

## UNITED KINGDOM

### Project: NOSH

- **Title: Nanoparticle Occupational Safety and Health Consortium**
- **Acronym: NOSH**
- **Project leader / Coordinator:**  
Du Pont (US)
- **Partners:**  
Health and Safety Executive (HSE) in the UK
- **Starting date**
- **Expected end date:**  
Phase 1 ended August 2007. Phase 2 beginning
- **Funding body/ies:**  
HSE in UK
- **Total amount of funding ... of which ... public** £400k (£35k from HSE)
- **Objectives:**  
Phase 1 – methods for the development of reproducible generation of SiO<sub>2</sub>, citric acid and Ag aerosols with median sizes in the range 10 to 60 nm. Reference method for nanoparticle aerosols
- **Website**

## Project:

- **Title:** HSL Investment Research Programme - Nanochallenge
- **Acronym**
- **Project leader / Coordinator:**  
Health and Safety Laboratory (HSL) UK
- **Partners:**  
Health and Safety Executive (HSE) UK
- **Starting date:**  
Spring 2007
- **Expected end date**
- **Funding body/ies:**  
HSL/HSE
- **Total amount of funding ... of which ... public**  
£900k
- **Objectives:**
  1. Exposure Assessment and Control
  2. Fire and explosion hazard assessment
  3. *in vitro* toxicology assays
- **Website:** [www.hsl.gov.uk/nanotech/index.htm](http://www.hsl.gov.uk/nanotech/index.htm)

## **Project:**

- **Title:** Assessment of the potential use of nanomaterials as food additives or food ingredients in relation to consumer safety and implications for regulatory control.
- **Acronym**
- **Project leader / Coordinator:**  
Food Standards Agency (FSA) (UK)
- **Partners**
- **Starting date:**  
2006
- **Expected end date:**  
By end 2007
- **Funding body/ies:**  
FSA
- **Total amount of funding ... of which ... public:**  
£40k
- **Objectives:**  
See title
- **Website**

## **Project:**

- **Title:** Assessment of current and projected applications of nanotechnology for food contact materials in relation to consumer safety and regulatory implications.
- **Acronym**
- **Project leader / Coordinator:**  
Food Standards Agency (FSA) UK
- **Partners**
- **Starting date:**  
2006
- **Expected end date:**  
Spring 2008
- **Funding body/ies:**  
FSA
- **Total amount of funding ... of which ... public:**  
£68.5k
- **Objectives:**  
See title
- **Website**

## Project:

- **Title: Current and Predicted Environmental Exposure to Engineered Nanomaterials.**
- **Acronym**
- **Project leader / Coordinator:**  
Central Science Laboratory UK – Alastair Boxall
- **Partners:**  
University of York, Institute of Occupational Medicine, Cranfield University
- **Starting date**
- **Expected end date:**  
Project completed
- **Funding body/ies:**  
UK Defra
- **Total amount of funding ... of which ... public**  
£50k
- **Objectives:**
  1. To identify current nanomaterials produced in the UK and their actual and predicted usage volumes
  2. To identify new developments in the field of nanomaterials and to assess the potential for environmental contamination arising from these
  3. To assess the likely fate and behaviour of nanoparticles in the environment
  4. To determine the potential for exposure at all stages of nanomaterial production, use, disposal and recycling
  5. To quantify current and potential concentrations of nanomaterials in the environment and assess the value of current models for predicting exposure
  6. To identify work ongoing elsewhere of relevance to the study
  7. To recommend future research requirement
- **Website:** <http://randd.defra.gov.uk/Document.aspx?DocumentID=2291>

## **Project:**

- **Title: An Assessment of Regulatory Testing Strategies and Methods for Characterising the Ecotoxicological Hazards of Nanomaterials**
- **Acronym**
- **Project leader / Coordinator:**  
Watts and Crane Associates – Mark Crane
- **Partners:**  
Richard Handy, University of Plymouth
- **Starting date:**
- **Expected end date:**  
August 2007; Project completed
- **Funding body/ies:**  
UK Defra
- **Total amount of funding ... of which ... public**  
£25k
- **Objectives:**
  1. To review critically those studies that have characterised the hazard of nanomaterials, summarising and appraising key issues and challenges arising from these
  2. To describe succinctly the current test strategies and associated methods used within current chemicals regulatory ecohazard (toxicity and bioaccumulation) assessment
  3. To propose pragmatic variants on current tests based on the information gathered
  4. To propose an experimental programme to test variants on the standard methodologies
- **Website:** <http://randd.defra.gov.uk/Document.aspx?DocumentID=2270>

## **Project: REFNANO**

- **Title: Reference materials for engineered nanoparticle toxicology and metrology**
- **Acronym: REFNANO**
- **Project leader / Coordinator:**  
Institute of Occupational Medicine – Rob Aitken
- **Partners:**  
Edinburgh University, Napier University, National Physical Laboratory, Central Science Laboratory
- **Starting date**
- **Expected end date:**  
August 2007; Project completed
- **Funding body/ies:**  
UK Defra
- **Total amount of funding ... of which ... public:**  
£80k
- **Objectives:**
  1. Prioritise potential NPs for inclusion in a Reference Library for toxicology studies
  2. Prioritise potential NPs for inclusion in a reference library for
  3. Calibration and testing of physico-chemical
  4. Measurement
  5. Particle characterisation methods
  6. Choose a panel of candidate NP which
  7. Are relevant at the nanoscale
  8. Gives priority to materials produced and used in the
  9. UK
  10. Recommend a set of priorities for a practical and workable minimum of physico-chemical characterisation needs for the chosen candidate materials
- **Website:** <http://randd.defra.gov.uk/Document.aspx?DocumentID2208>

## **Project:**

- **Title: New Tools for Nanometrology**
- **Acronym**
- **Project leader / Coordinator:**  
Imperial College, London
- **Partners:**  
University College, London
- **Starting date:**  
2007
- **Expected end date:**  
2012
- **Funding body/ies:**  
Engineering and Physical Sciences Research Council (EPSRC)
- **Total amount of funding ... of which ... public**  
£2,746,000
- **Objectives:**  
Establishment of a new UK research capacity
- **Website**

## **Project: Nanonet**

- **Title: Engineered nanoparticles in the natural aquatic environment**
- **Acronym: Nanonet**
- **Project leader / Coordinator:**  
University of Birmingham – Jamie Lead
- **Partners**
- **Starting date:**  
April 2007
- **Expected end date:**  
2010
- **Funding body/ies:**  
Natural Environment Research Council
- **Total amount of funding ... of which ... public:**  
£786k
- **Objectives:**  
Knowledge transfer network in the area of manufactured nanomaterials in the natural aquatic environment
- **Website**

## **Project:**

- **Title: Nanometrology for Molecular Science, Medicine and Manufacture**
- **Acronym**
- **Project leader / Coordinator:**  
University of Strathclyde
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2012
- **Funding body/ies:**  
EPSRC
- **Total amount of funding ... of which ... public:**  
£3,118,000
- **Objectives:**  
Support for Centre for Molecular Nanometrology founded in 2005
- **Website**

## **Project:**

- **Title: Research network on Nanoparticles at the science and engineering/Medicine Interface**
- **Acronym**
- **Project leader / Coordinator:**  
University of Birmingham
- **Partners**
- **Starting date:**  
2007
- **Expected end date**
- **Funding body/ies:**  
EPSRC
- **Total amount of funding ... of which ... public:**  
£61,400
- **Objectives:**  
Network set up of people conducting research on both the science and applications of nanoparticles and on the environmental and medical effects.
- **Website**

## **Project: NANOsafE.NET**

- **Title:** Nanotechnology Safety Network
- **Acronym** NANOsafE.NET
- **Project leader / Coordinator:**  
University of Oxford
- **Partners**
- **Starting date:**  
2005
- **Expected end date:**  
2007
- **Funding body/ies:**  
EPSRC
- **Total amount of funding ... of which ... public:**  
£61,900
- **Objectives:**  
Multidisciplinary network of active researchers and observers in their fields from a wide range of organisations and institutes
- **Website**

## **Project:**

- **Title: Examining the host response to polymer conetworks**
- **Acronym**
- **Project leader / Coordinator:**  
University of Sheffield
- **Partners**
- **Starting date:**  
2006
- **Expected end date:**  
2007
- **Funding body/ies:**  
Medical Research Council (MRC)
- **Total amount of funding ... of which ... public:**  
£84,500
- **Objectives:**  
Evaluate host response to a series of novel polymeric materials including nanostructures
- **Website**

## **Project:**

- **Title: Centre for Inflammation reserach**
- **Acronym**
- **Project leader / Coordinator:**  
University College, London
- **Partners**
- **Starting date:**  
2005
- **Expected end date:**  
2010
- **Funding body/ies:**  
Medical Research Council (MRC)
- **Total amount of funding ... of which ... public:**  
£1.017,824
- **Objectives:**  
Work on nanoparticle toxicology
- **Website**

## **Project:**

- **Title: A proof of concept study for a structure activity model for the toxicity of nanoparticles**
- **Acronym**
- **Project leader / Coordinator:**  
University of Edinburgh
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
Natural Environment Research Council (NERC)
- **Total amount of funding ... of which ... public:**  
£109,844
- **Objectives:**  
A pilot study to relate the physico/chemical characteristics of nanoparticles, such as size and surface chemistry with the toxicity of the particles in short-term cell toxicology tests.
- **Website**

## **Project:**

- **Title: An exploratory study investigating the physicochemical characteristics of ambient air particles responsible for the dysregulation of pulmonary genes**
- **Acronym**
- **Project leader / Coordinator:**  
Cardiff University
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£114,452
- **Objectives:**  
The effects of particles of different size and chemical constitution sampled from urban and rural environments on human tissue cultured in the laboratory
- **Website**

## **Project:**

- **Title: Assessing human exposure, uptake and toxicity of nanoparticles from contaminated environments**
- **Acronym**
- **Project leader / Coordinator:**  
Napier University
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2009
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£121,078
- **Objectives:**  
To investigate whether nanoparticles released into water can be taken up by water fleas and fish and to what levels.
- **Website**

## **Project:**

- **Title: Determinants of oxidative potential, a health-based metric to assess particulate matter toxicity**
- **Acronym**
- **Project leader / Coordinator:**  
University of Birmingham
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£124,316
- **Objectives:**  
To understand which properties of nanoparticles have the greatest influence on their oxidative potential
- **Website**

## **Project:**

- **Title: Exploring the link between surface structures and toxicity in mineral particles: case study of induced and intrinsic toxicity in quartz**
- **Acronym**
- **Project leader / Coordinator:**  
University of St Andrews
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£44,198
- **Objectives:**  
To test whether additional toxicity can be induced in quartz samples with already high intrinsic toxicity.
- **Website**

## **Project:**

- **Title: hazards of nanoparticles to the environment and human health**
- **Acronym**
- **Project leader / Coordinator:**  
Natural History Museum
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2009
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£118,300
- **Objectives:**  
An investigation of the behavior of nanoparticles, following inhalation and possible transition into the blood stream
- **Website**

## **Project:**

- **Title: Identification and verification of ultrafine particle affinity zones in Urban neighborhoods: a proof of concept proposal**
- **Acronym**
- **Project leader / Coordinator:**  
University of Manchester
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2009
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£78,310
- **Objectives:**  
Comparison of concentrations of UFP between different residential zones in Manchester
- **Website**

## **Project:**

- **Title: Metal-colloid interactions in freshwaters**
- **Acronym**
- **Project leader / Coordinator:**  
University of Birmingham
- **Partners**
- **Starting date:**  
2005
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£154,838
- **Objectives:**  
Characterisation of NPs in the presence and absence of natural colloids
- **Website**

## **Project:**

- **Title: Toxicology of Nanomaterials to fish: a fact finding pilot study**
- **Acronym**
- **Project leader / Coordinator:**  
University of Plymouth
- **Partners**
- **Starting date:**  
2007
- **Expected end date**
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£60,391
- **Objectives:**  
Study to look at the possible effects of nanoparticles on fish, especially carbon  
nanotubes and titanium dioxide
- **Website**

## **Project:**

- **Title: The Big Issue – the ecotoxicology of nanoparticles**
- **Acronym**
- **Project leader / Coordinator:**  
University of Exeter
- **Partners**
- **Starting date:**  
2005
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£N/A
- **Objectives:**  
Study of the uptake and distribution of nanoparticles in fish using carbon nanotubes and C60 fullerenes
- **Website**

## **Project:**

- **Title: Trace metal interactions with manufactured and natural nanoparticles**
- **Acronym**
- **Project leader / Coordinator:**  
University of Birmingham
- **Partners**
- **Starting date:**  
2006
- **Expected end date:**  
2009
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£N/A
- **Objectives:**  
To understand the flow of trace metals and manufactured nanoparticles at the interface between the surface and subsurface flow regimes
- **Website**

## **Project:**

- **Title: Effects of C60 fullerenes and carbon nanotubes on marine mussels**
- **Acronym**
- **Project leader / Coordinator:**  
Plymouth Marine Laboratory
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£19,849
- **Objectives:**  
Study of the toxicity of Carbon nanotubes and fullerenes to marine mussels
- **Website**

## **Project:**

- **Title: Dietary Exposure to nanoparticles in fish: a pilot study**
- **Acronym**
- **Project leader / Coordinator:**  
University of Plymouth
- **Partners**
- **Starting date:**  
2007
- **Expected end date**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£55,383
- **Objectives:**  
To measure the responses of fish to a dietary exposure to two types of nanoparticles, carbon nanotubes and titanium dioxide
- **Website**

## **Project:**

- **Title: Manufactured nanoparticle migration in groundwaters**
- **Acronym**
- **Project leader / Coordinator:**  
University of Birmingham
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£57,981
- **Objectives:**  
Prediction of particle movement in pore waters
- **Website**

## **Project:**

- **Title: Genomic and oxidation-related biological responses in fish exposed to fullerenes of different physicochemical characteristics**
- **Acronym**
- **Project leader / Coordinator:**  
University of Birmingham
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£28,827
- **Objectives:**  
To compare the generic environmental risk of model nanomaterials presented to water in different formats
- **Website**

## **Project:**

- **Title: Model nanoparticles for environmental risk studies**
- **Acronym**
- **Project leader / Coordinator:**  
Natural History Museum
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£56,564
- **Objectives:**  
To investigate the behaviour of nanoparticles following inhalation and possible transition to the blood stream
- **Website**

## **Project:**

- **Title: Nanoparticle immunotoxicity using an environmental sentinel as a model**
- **Acronym**
- **Project leader / Coordinator:**  
Centre for Ecology and Hydrology
- **Partners**
- **Starting date:**  
2007
- **Expected end date**  
2008
- **Funding body/ies**  
NERC
- **Total amount of funding ... of which ... public:**  
£38,993
- **Objectives:**  
To look at how exposure to metals as nanoparticles, as bulk materials and as the dissolved free metal form impacts on the workings of cells of the immune system
- **Website**

## **Project:**

- **Title: Pharmaceutical and cosmetic silica nanoparticles: towards an understanding of their structure in aquatic systems**
- **Acronym**
- **Project leader / Coordinator:**  
Kings College London
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£63,879
- **Objectives:**  
To examine the loadings of SiO<sub>2</sub> nanoparticles to wastewaters from typical domestic use of cosmetic and pharmaceutical formulations
- **Website**

## **Project:**

- **Title: Synthetic polymer nanoparticles: effects of size and composition on uptake, toxicity and interactions with environmental contaminants**
- **Acronym**
- **Project leader / Coordinator:**  
University of East Anglia
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£61,991
- **Objectives:**  
To make nanoparticles of three different sizes and three different chemical compositions and to determine their toxicity to a fungus, an aquatic alga and a freshwater invertebrate
- **Website**

## **Project:**

- **Title: Understanding the fate and behaviour of manufactured nanoparticles in natural waters**
- **Acronym**
- **Project leader / Coordinator:**  
University of Birmingham
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£48,327
- **Objectives:**  
To look at the chemistry of manufactured nanoparticles under realistic environmental conditions and how this relates to aggregation and sedimentation
- **Website**

## **Project:**

- **Title: Visualisation of nanoparticles in the environment**
- **Acronym**
- **Project leader / Coordinator:**  
University of Lancaster
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£19,668
- **Objectives:**  
Identify whether a new technology two-photon excitation microscopy coupled with autofluorescence (TPEM-AF) can be used as a tool to visualise engineered nanoparticles in living systems
- **Website**

## **Project:**

- **Title: Impact of manufactured nanoparticles on the catabolic capabilities and phenotypic structure of soil microbial communities**
- **Acronym**
- **Project leader / Coordinator:**  
University of Cranfield
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£56,857
- **Objectives:**  
To determine the effects of manufactured nanoparticles on soil microbial community characteristics
- **Website**

## Project:

- **Title: Biomembrane interactions in the toxicology of nanoparticles to microorganisms**
- **Acronym**
- **Project leader / Coordinator:**  
University of Leeds
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£20,015
- **Objectives:**  
To initiate investigation into the mechanisms of biological activity of nanoparticles on relevant *in vitro* and *in vivo* models
- **Website**

## **Project:**

- **Title: Impact and recovery of groundwater microbial communities exposed to manufactured nanomaterials**
- **Acronym**
- **Project leader / Coordinator:**  
University of Oxford
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£53,435
- **Objectives:**  
To determine the impact of MNP exposure on the diversity and activities of natural microbial communities in groundwater
- **Website**

## **Project:**

- **Title: A study of the effects of silver surface chemistry on bactericidal properties of silver nanoparticles**
- **Acronym**
- **Project leader / Coordinator:**  
University of Manchester
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£20,167
- **Objectives:**  
To study the effect of silver nanoparticles and assess the effects of their surface chemistry on their toxicity to single species of bacteria
- **Website**

## **Project:**

- **Title: An investigation into the effects of nanoparticles on the bacterial diversity of freshwater and coastal marine sediments**
- **Acronym**
- **Project leader / Coordinator:**  
Plymouth Marine Laboratory
- **Partners**
- **Starting date:**  
2008
- **Expected end date:**  
2009
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£37,997
- **Objectives:**  
To use laboratory-based exposure experiments to test the hypothesis that nanoparticles with known antibacterial properties could alter the diversity of the bacterial population in the sediment and the overlying water of freshwater and coastal environments.
- **Website**

## Project:

- **Title: Interaction of nanoparticles with microbial populations during particle transport**
- **Acronym**
- **Project leader / Coordinator:**  
University of Sheffield
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2009
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£48,316
- **Objectives:**  
To investigate new and innovative methods that will allow the *in vitro* and *in vivo* application of Raman microspectroscopy to study the impact of nanoparticles on microbial communities
- **Website**

## Project:

- **Title: Nanoscale zerovalent iron (nZVI) impact on soil microbial communities**
- **Acronym**
- **Project leader / Coordinator:**  
University of Reading
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
NERC
- **Total amount of funding ... of which ... public:**  
£64,682
- **Objectives:**  
To advance understanding of nanoscale zerovalent iron impacts on microbial communities important for bioremediation, stabilisation and improvement of soils contaminated with chlorinated aromatic compounds.
- **Website**

## **Project:**

- **Title:** A study to identify physicochemical factors controlling the capacity of nanoparticles to penetrate cells of the respiratory epithelium, especially those of first contact on inhalation of the particles
- **Acronym**
- **Project leader / Coordinator:**  
Imperial College London
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
Defra
- **Total amount of funding ... of which ... public:**  
£36,949
- **Objectives:**  
See title
- **Website**

## **Project:**

- **Title: Evaluation of Risk Assessment Approaches for Manufactured Nanomaterials**
- **Acronym**
- **Project leader / Coordinator:**  
Cranfield University
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
Defra
- **Total amount of funding ... of which ... public:**  
£51,765
- **Objectives:**  
To evaluate and make recommendations on risk assessment approaches for manufactured nanomaterials through information exchange and through an understanding of any unique challenges nanomaterials present, to identify opportunities to strengthen and enhance risk assessment capacity
- **Website**

## **Project:**

- **Title:** A study to identify physicochemical factors controlling the capacity of nanoparticles to penetrate cells of the respiratory epithelium, especially those of first contact on inhalation of the particles
- **Acronym**
- **Project leader / Coordinator:**  
Institute of Occupational Medicine
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
Defra
- **Total amount of funding ... of which ... public:**  
£57,349
- **Objectives:**  
See title
- **Website**

## Project:

- **Title: An outline scoping study to determine whether high aspect ratio nanoparticles (HARN) should raise the same concerns as do asbestos fibres**
- **Acronym**
- **Project leader / Coordinator:**  
Institute of occupational medicine
- **Partners**
- **Starting date:**  
2007
- **Expected end date:**  
2008
- **Funding body/ies:**  
Defra
- **Total amount of funding ... of which ... public:**  
£55,532
- **Objectives:**  
See title
- **Website**

<b>SWITZERLAND:</b>
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## **Project: NanoBioTox**

- **Title: Health effects of manufactured nanoparticles\_ molecular and cellular biology and toxicology**
- **Acronym: NanoBioTox**
- **Project leader / Coordinator**  
Dr. W. Kreyling (GSF Neuherberg, Munich)
- **Partners**  
Dr. M. Semmler-Behnke (GSF Neuherberg/Munich); Prof. U. Nienhaus, Dr. C. Röcker (Univ. of Ulm); Prof. W. Parak (Univ. of Marburg); Prof. P. Gehr, Dr. B. Rothen (Univ. of Bern)
- **Starting date**
- **Expected end date**
- **Funding body/ies**  
DFG (SPP 1313)
- **Total amount of funding ... of which ... public**  
120'000 Euro
- **Objectives**
- **Website**

## **Project: NanoHealth**

- **Title: Nanotechnology and Health – Technical Options, Risk Evaluation and Preventive Strategies**
- **Acronym: NanoHealth**
- **Project leader / Coordinator**  
Institute for Technology Assessment and Systems Analysis (coordinator)
- **Partners**  
Hans Kastenholz, Empa St. Gallen; Institute of Toxicology and Genetics and the Institute for Applied Computer Science, Karlsruhe Research Center, the Programme Group Humans-Environment-Technology (MUT) at the Jülich Research Center, the Max-Delbrück-Centre in Berlin, the European Academy in Bad Neuenahr-Ahrweiler.
- **Starting date**  
4/06
- **Expected end date**  
4/09
- **Funding body/ies**  
Helmholtz System Analysis and Technology Assessment, Germany
- **Total amount of funding ... of which ... public**
- **Objectives**
- **Website**

## **Project: NanoHealthNet**

- **Title: European Network for the Coordination of Science and Technology in the field of Health Effects of Manufactured Nanoparticles**
- **Acronym: NanoHealthNet**
- **Project leader / Coordinator:**  
Michael Riediker Head of Research group "Particles and Health", Institute for Work and Health, (Institut universitaire romand de Santé au Travail), Université Lausanne + Université Genève, Switzerland
- **Partners :**  
80 European research institutes
- **Starting date:** October 2006
- **Expected end date:** Summer 2008
- **Funding body/ies:** This network is currently self-financed by the participating researchers.
- **Total amount of funding of which public**
- **Objectives**  
This Network promotes research cooperation in four areas:
  - 1) What types of particles are being produced in bulk, which of them present likelihood for large-scale human exposure and how can unwanted exposures be prevented?
  - 2) How are particles taken up, translocated and distributed in cells, organs, and compartments?
  - 3) How do particles interact with cells and organs?
  - 4) How are the interactions manifested in animals and humans? This network provides an opportunity to researchers to exchange research ideas, to identify knowledge gaps and to find partners for future research collaborations.
- **Website**      <http://www.i-s-t.ch>

## **Project: Nanoinventory**

- **Title: Nanoinventory: manufactured nanoparticles in Swiss industries and the potential for human exposures**
- **Acronym: Nanoinventory**
- **Project leader / Coordinator**  
Michael Riediker, Head of Research group "Particles and Health", Institute for Work and Health, (Institut universitaire romand de Santé au Travail), Université Lausanne + Université Genève, Switzerland
- **Partners**  
Swiss Federal Offices for Health (OFSP), Environment (OFEV) and Economy (SECO)  
The (SUVA)  
The French Agency for Environmental and Occupational Health Safety (AFSSET)
- **Starting date:** Spring 2005
- **Expected end date:** Summer 2008
- **Funding body/ies:**  
Swiss (SUVA, OFSP, OFEV, SECO) and French authorities (AFSSET), and Institut universitaire romand de Santé au Travail.
- **Total amount of funding** 181,325 € (exchange rate at 29/11/07) **of which 100% public**
- **Objectives**  
The principal aim of this study is to estimate the prevalence and extent of nanoparticle applications in the Swiss industry as well as the potential for exposure to manufactured nanoparticles of the Swiss working population. A representative questionnaire-based survey of Swiss companies will be used to create a nano-inventory that will contain the number of companies in different industrial branches using or producing nanoparticles, the type of particles used, and the number of potentially exposed employees. This information will be combined with data about protection measures for humans and the aquatic and atmospheric environment, and with exposure profiles of typical workplaces to estimate the potential exposure of the Swiss working population to nanoparticles. The data collected during this study will be useful for targeting prevention efforts, for designing research projects investigating the health of potentially exposed workers and for environmental risk assessments.
- **Website**      <http://www.i-s-t.ch>

## **Project: Nanorisk**

- **Title: Nanorisk: Safety and Risks of Carbon Nanotubes**
- **Acronym:** Nanorisk

### **Project leader / Coordinator**

Bruinink, EMPA, Lerchenfeldstrasse 5, 9014 St. Gallen

### • **Partners**

Som , EMPA, Lerchenfeldstrasse 5, 9014 St. Gallen

### • **Starting date**

7.12.05

### • **Expected end date**

21.9.07

### • **Funding body/ies**

CTI (Swiss Innovation Promotion Agency), BAG (Federal Office of Public Health), BAFU (Federal Office for the environment), EMPA (Materials science and technology research institution)

### • **Total amount of funding part risk:**

336000 Euro... all public

### • **Objectives**

Successful introduction of nanoparticles will rely on an early and realistic assessment of risks and appropriate precautionary measures. This project focuses on Carbon Nanotubes (CNT) and aims:

- To present the status quo of existing knowledge and uncertainties regarding safety and risk issues of CNT
- To perform research to obtain toxicological in vitro data for the hazard identification
- To identify the CNT toxicomechanism
- To perform a foresight of which potential problems that can arise

### • **Website**

[www.empa.ch/tsl](http://www.empa.ch/tsl)

# Project

**Title: Centre for toxicology and fine dust research. Electron microscope tomography for the study of the distribution of nano-tissue and cells.**

- **Acronym**
- **Project leader / Coordinator**  
Prof. Peter Gehr, Abteilung für Histologie, Institut für Anatomie, Universität Bern, Baltzerstrasse 2, CH-3012 Bern
- **Partners**
- **Starting date**
- **Expected end date**
- **Funding body/ies**  
Schenkung von Dr. Alfred Bretscher
- **Total amount of funding 1,510,898 €(exchange rate at 29/11/07)of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Interaction of ultrafine particles with the internal surface of the lung**
- **Acronym**
- **Project leader / Coordinator**  
Prof. P. Gehr
- **Partners**  
Prof. S. Schürch
- **Starting date**
- **Expected end date**
- **Funding body/ies**  
Bangerter-Stiftung
- **Total amount of funding 90,659 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Development of a particle exposure system to investigate the inflammation and toxicity potential of nanoparticles in an epithelial airway barrier model**
- **Acronym**
- **Project leader / Coordinator**  
Dr. B. Rothen-Rutishauser, Institut für Anatomie, Universität Bern
- **Partners**  
Prof. P. Gehr (Uni Bern),  
Dr. Ch. Mühlfeld, Dr. K. Maier (GSF Neuherberg/Munich)
- **Starting date**
- **Expected end date**
- **Funding body/ies**  
Doerenkamp-Zbinden Foundation, FFVFF Foundation
- **Total amount of funding 36,265 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Comparison of the effect of asbestos fibres and Carbon-Nanotubes.**
- **Acronym**
- **Project leader / Coordinator**  
Prof. P. Gehr, Institut für Anatomie, Universität Bern
- **Partners**
- **Starting date**
- **Expected end date**
- **Funding body/ies**  
Swiss Federal Office for Environment
- **Total amount of funding 45,331 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Behaviour of ultrafine Particles in tissue and cells of the lung – Importance for our health.**
- **Acronym**
- **Project leader / Coordinator**  
Prof. P. Gehr, Institut für Anatomie, Universität Bern
- **Partners**
- **Starting date**
- **Expected end date**
- **Funding body/ies**  
Swiss Federal Office for Environment
- **Total amount of funding 36,265 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Characterization of Particulate Matter (incl. Nanoparticles) for the Life Cycle Assessment Methodology according to their Impact on Human Health**
- **Acronym**
- **Project leader / Coordinator**  
D. Kellenberger, EMPA
- **Partners**
- **Starting date**  
10.2006
- **Expected end date**  
12.2007
- **Funding body/ies**  
SUVA (Swiss Accident Insurance Fund), BAG (Federal Office of Public Health), BAFU (Federal Office for the environment), EMPA (Materials science and technology research institution)
- **Total amount of funding 120,893 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## **Project: NeuroCNTox**

- **Title: NeuroCNTox - Neurotoxicity of Carbon Nanotubes**
- **Acronym:** NeuroCNTox
- **Project leader / Coordinator**  
P. Wick, EMPA
- **Partners**
- **Starting date**  
01.2006
- **Expected end date**  
01.2007
- **Funding body/ies**  
EMPA (Materials science and technology research institution)
- **Total amount of funding** 143,258 €(exchange rate at 29/11/2007) **of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Quantitative risk assessment of nanoparticles in the environment: Exposure modeling and ecotoxicological considerations**
- **Acronym**
- **Project leader / Coordinator**  
B. Nowack
- **Partners**  
H. Krug, K. Knauer, A. Boxall
- **Starting date**  
1.9.2007
- **Expected end date**  
30.8.2009
- **Funding body/ies**  
Empa (Materials science and technology research institution)
- **Total amount of funding** 184,388 €(exchange rate at 29/11/2007) **of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Protein - carbon nanotubes interaction, uptake and the influence on oxidative stress and inflammation as key factors in nanoparticles - cell interaction**
- **Acronym**
- **Project leader / Coordinator**  
P. Wick, EMPA
- **Partners**  
Uni Bern (NCCR Basel)
- **Starting date**  
07.2007
- **Expected end date**  
07.2010
- **Funding body/ies**
- **Total amount of funding 240,603 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Particle-lung interaction: mechanisms and effects on lung cell function**
- **Acronym**
- **Project leader / Coordinator**  
Prof. Peter Gehr, Abteilung für Histologie, Institut für Anatomie, Universität Bern, Baltzerstrasse 2, CH-3012 Bern
- **Partners**  
Rothen-Rutishauser Barbara, Schürch Samuel
- **Starting date**  
01.04.2005
- **Expected end date**  
31.03.2008
- **Funding body/ies**  
Swiss National Science Foundation
- **Total amount of funding 157,144 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Nanosciences - conception and ecopolitical establishment of technology risks with an international comparison.**
- **Acronym**
- **Project leader / Coordinator**  
Dr. Monika Maria Kurath, Wissenschaftsforschung, Universität Basel
- **Partners**
- **Starting date**  
01.06.2006
- **Expected end date**  
28.02.2010
- **Funding body/ies**  
Swiss National Science Foundation
- **Total amount of funding 218,222 €(exchange rate at 29/11/2007) of which 100% public**
- **Objectives**
- **Website**

## Project

- **Title: „Solubilization of carbon nanotubes and fullerenes in natural waters under environmental conditions“**
- **Acronym**
- **Project leader / Coordinator**  
B. Nowack
- **Partners**  
L. Sigg, R. Kägi, Irène Schwyzer
- **Starting date**  
1.7.2007
- **Expected end date**  
31.6.2010
- **Funding body/ies**  
Swiss National Science Foundation
- **Total amount of funding 85,860 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives (Summary)**

The forecasted increase in the manufacture and use of nanoparticles makes it likely that increasing human and environmental exposure will occur, and as a result, nanoparticles are beginning to come under scrutiny. Assessing the risks of nanomaterials in commercial products and environmental applications requires a better understanding of their mobility, bioavailability, and toxicity. For nanomaterials to present a risk, there must be both a potential for exposure and a hazard that results after exposure. In natural waters, nanoparticles have to be present in “solubilized” form because otherwise they will aggregate and flocculate and are removed (e.g. during wastewater treatment) or are retained in soil or groundwater. Both mobility and bioavailability depend therefore on the state of solubilization. The carbon-based fullerenes and carbon nanotubes (CNT) are an important group of novel nanoparticles. Pristine fullerenes and CNT are virtually insoluble in water and do not form stable suspensions. However, they can be solubilized by formation of clusters (fullerenes) or by addition of polymers (e.g. proteins and polysaccharides) or detergents. We hypothesize that natural polymers which are always present in waters (e.g. humic and fulvic acids) are able to solubilize CNT and fullerenes. Nanoparticles discharged with wastewater from a production facility or from households are inevitably in contact with anthropogenic detergents. We hypothesize that low concentrations of anthropogenic detergents in wastewater have a solubilizing effect on the particles. We also hypothesize that biosurfactants exuded by plants or microorganisms present in natural waters or soil solution are able to solubilize CNT and fullerenes. The solubilization will be studied by bringing fullerenes and CNT in contact with biopolymers, detergents and biosurfactants in aqueous solution and measuring the formation of solubilized, non-aggregated nanoparticles. Solubilization will be followed over time, as function of pH, background ions, and metals, and in various natural waters of different composition. Separation between solubilized and aggregated particles will be done by filtration (fullerenes) or centrifugation (CNT). Analysis of solubilized particles will be performed by UV/Vis, fluorescence or HPLC. The results from this project will yield basic information on the possibility that fullerenes and CNT can be solubilized under natural conditions.
- **Website**

## Project

- **Title: Ecotoxicology of Nanoparticles: Biota-Nanoparticle-Pollutant Interactions in aqueous systems - Comparison of Black Carbon and Carbon Nanotubes**
- **Acronym**
- **Project leader / Coordinator**  
B. Nowack
- **Partners**  
K. Knauer, T. Bucheli  
EAWAG, Uni Basel, Agroscope Reckenholz-Tänikon
- **Starting date**  
1.1.2008
- **Expected end date**  
31.12.2010
- **Funding body/ies**  
Swiss National Science Foundation
- **Total amount of funding 96,427 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**  
The aim of this work is to systematically quantify the interactions in a ternary system organism-nanoparticle-pollutant. The green algae *Chlorella vulgaris* will be used as a model organism, BC and CNT as nanoparticles, and the herbicide diuron as model pollutant. In a first step binary systems (particle-pollutant, particle-algae, algae-pollutant) will be studied and then the complexity will be stepwise increased to the algae-BC/CNT-diuron system. Particles and algae will also be separated physically through dialysis membranes to separate the effect of reduced pollutant concentration by adsorption to BC/CNT from direct effects of NP on the algae. The research will advance our understanding of the effects of NP in natural systems by studying the complex interactions between the various players in the environment. By comparing the effects of combustion byproducts and engineered NP, the results will contribute to a realistic risk assessment of anthropogenic NP.
- **Website**

## Project

- **Title: Interplay of lung cells and their cellular responses upon exposure to combustion-generated ultrafine particles and manufactured nanoparticles**
- **Acronym**
- **Project leader / Coordinator**  
Dr. Barbara Rothen-Rutishauser, Abteilung für Histologie, Institut für Anatomie, Universität Bern, Baltzerstrasse 2, CH-3012 Bern
- **Partners**  
Gehr Peter, Mühlfeld Christian
- **Starting date**  
01.10.2007
- **Expected end date**  
30.09.2010
- **Funding body/ies**  
Swiss National Science Foundation
- **Total amount of funding 118,773 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
- **Website**

## Project

- **Title: Fate of hydrophilic nanoparticles in biological environment**

- **Acronym**

- **Project leader / Coordinator**

Dr. Catherine Schütz, Laboratoire de médecine régénérative et de pharmacobiologie 2

Ecole polytechnique fédérale de Lausanne, EPFL - SB - ISIC - LMRP2

- **Partners**

- **Starting date**

01.06.2007

- **Expected end date**

31.05.2011

### **Funding body/ies**

Swiss National Science Foundation

- **Total amount of funding** 109,013 €(exchange rate at 29/11/2007) **of which ... public**

- **Objectives**

- **Website**

<http://www.nfp47.ch/>

# Project

- **Title: Analysis of the nanomaterials exposure on humans in Switzerland – Identification of frequent situations for exposure situations with today's and possible future use of consumer products on the basis of nanomaterials.**
- **Acronym**
- **Project leader / Coordinator**  
Reinhard Eva
- **Partners**
- **Starting date**  
01.07.2006
- **Expected end date**  
30.06.2009
- **Funding body/ies**  
BAG (Federal Office of Public Health)
- **Total amount of funding 108,805 €(exchange rate at 29/11/2007) of which ... public**
- **Objectives**
  - a) Creation of exposition models on the basis of realistic exposition situations of workers, evaluation of the models on the basis of the models on the basis of present measured values for worker exposition
  - b) Research of today's and possible future use of nanomaterials in consumer products
  - c) Definition of realistic use scenarios (exposition scenarios) for the use of important consumer products which contain nanomaterials.
  - d) Calculation of the consumers affected from resulting consumer exposition vis-à-vis nanomaterials and estimation of the number.
- **Website**

## **Project: Chemical reactivity of NP**

- **Title:** In vitro reactivity of fine and ultrafine particles
- **Acronym:** Chemical reactivity of NP
- **Project leader / Coordinator**  
Jean-Jacques Sauvain, Research group "Particles and Health", Institute for Work and Health, (Institut universitaire romand de Santé au Travail), Université Lausanne + Université Genève, Switzerland
- **Partners**  
French Agency for Environmental and Occupational Health Safety (AFSSET), Service de la toxicologie industrielle et de protection contre les pollutions intérieures (STIPI), Lausanne University Hospital (CHUV, Institut de pathologie)
- **Starting date:** Spring 2007
- **Expected end date:** Spring 2010
- **Funding body/ies** French AFSSET and Institut universitaire romand de Santé au Travail
- **Total amount of funding** € 213'000 of which 100% public
- **Objectives**  
Toxicity of particulates may be due to the reactivity of their surface when entering in contact with cells. Among other, their potential to generate reactive oxygen species seems to be very important.  
This work intends to use a simple method in order to determine the ability of some particles (ultrafine TiO<sub>2</sub>, crocidolite, diesel SRM 1650 and particles from real occupation situations) to catalyse the oxygen reduction by ascorbic acid.  
The results obtained indicated that:  
It is possible to detect such reaction with simple equipment (specific oxygen electrode)  
In the experimental conditions, diesel SRM 1650 reacts about 10 times faster than crocidolite and that ultrafine TiO<sub>2</sub> didn't showed any reactivity.  
Particles sampled in a bus depot indicated a very high reactivity. Heavy metals (Fe, Cu) could be potential important elements to explain this reactivity.  
Experimental improvement has to be done mainly for getting a particulate suspension without artefacts.
- **Website** <http://www.i-s-t.ch>

## Project: NanoWorkRisk

- **Title:** Use of nanoparticles in industry: safety aspects
- **Acronym:** NanoWorkRisk
- **Project leader / Coordinator**  
Michael Riediker, Head of Research group "Particles and Health", Institute for Work and Health, (Institut universitaire romand de Santé au Travail), Université Lausanne + Université Genève, Switzerland
- **Partners**  
Industry (as investigation object)
- **Starting date:** April 2007 (pilot study)
- **Expected end date:** June 2010 (main study)
- **Funding body/ies:** Institut universitaire romand de Santé au Travail (external funding requested)
- **Total amount of funding** 108,790 €(exchange rate at 29/11/2007) **of which** 100% **public**
- **Objectives:**  
The principal aim of this study is to evaluate the risk for workers due to exposure to non-controlled emission of nanoparticles in industry. This information will be contributing to safer work conditions and to establish rules and strategies for protection in case of accident. The project successfully finished the pilot phase. Main phase currently awaits funding.
- **Website**      <http://www.i-s-t.ch>

## Project

- **Title: How to assess the adequacy of safety measures for manufactured nanoparticles**

- **Acronym**

- **Project leader / Coordinator**

Michael Riediker Head of Research group "Particles and Health", Institute for Work and Health, (Institut universitaire romand de Santé au Travail), Université Lausanne + Université Genève, Switzerland

- **Partners**

### **World Health Organisation Collaborating Centers in Occupational Health Global Plan 2006-2010**

Activity AA 6: Communication and Networking, Subgroup NM  
2Nanomaterials.

- Federal Institute for Occupational Safety & Health (BAuA), DE (Bruno Orthen)
- National Institute for Occupational Safety and Health (NIOSH) U.S.A (Charles Geraci; Vladimir Murashov)
- Health and Safety Laboratory, UK (Rosemary Gibson)
- Institute of Occupational Medicine, UK (Lang Tran)

- **Starting date:** 2006

- **Expected end date:** 2010

- **Funding body/ies** Financed by the participating institutes.

- **Total amount of funding of which public**

- **Objectives**

The objective is to identify work processes that involve manufactured nanoparticles, to categorize the health risks associated with these processes with regard to particle type and quantity used, to describe existing and new safety measures, and to develop guidelines for the assessment of safety measures used in production, application, use and disposal of nanoparticles and nanoparticle-containing products. The target group and beneficiaries are all bodies dealing with occupational health risks related to nanoparticles (governments, insurances, industries). The project responds to the potential health risk workers face when they are exposed to novel insufficiently characterized substances. Current knowledge about types, frequencies and levels of nanoparticle exposures is very limited. Also many questions regarding the efficiency of current protective measures that were developed for larger particles are unanswered. This project aims at gathering information about exposures, health risks and existing and new safety measures, which will be used to develop a guide to safety and health experts. This guide will help them assess the adequacy of safety measures for manufactured nanoparticles.

**Website**      <http://www.i-s-t.ch>