6th FRAMEWORK PROGRAMME

NANOFUNCT: NANOSCALE FUNCTIONALITIES FOR MEDICINE, NUTRITION AND HEALTH

NANOFUNCT: Participants

Universities - 12

- University of Copenhagen - DENMARK
- RWTH Aachen - GERMANY
- C.R.I.S.M.A. University of Siena - ITALY
- University of Trieste - ITALY
- University of Milano - ITALY
- Hebrew University - ISRAEL
- Polish Academy of Sciences - POLAND
- Moscow State University - RUSSIA
- University of Twente - THE NETHERLANDS
- Eindhoven University of Technology - THE NETHERLANDS
- Matiere Molle & Chimie E.S.P.C.I. - FRANCE
- Welsh School of Pharmacy - UNITED KINGDOM

NANOFUNCT: Participants

Research Institutions - 4

- DECHEMA - GERMANY
- CPERI/CERTH - GREECE
- Max-Planck-Institute of Colloids & Interfaces - GERMANY
- NCSR Demokritos - GREECE

Industries & SMEs - 8

- CHEMPILOTS - DENMARK
- FLAMEL Technologies - FRANCE
- BASF AG - GERMANY
- SCHERING AG - GERMANY
- SusTech GmbH - GERMANY
- DSM - THE NETHERLANDS
- NIZO Food Research - THE NETHERLANDS
- UNILEVER - UNITED KINGDOM

NANOFUNCT: Vision and Goals

Overall Research Objectives:

- Production and characterization of biodegradable nanoparticles with tailored surface functionalities
- Understanding the interactions between nanoparticles, molecules , cells and surfaces
- Controlling nanoparticle assembly and its responsiveness
- Nanoparticles and nanoparticle assemblies as probes for chemical analysis and study of biological transformations and properties

NANOFUNCT: Vision and Goals

- Several core technologies will be employed as synthesis tools:
  - controlled particle formation in microemulsions;
  - self-assembly;
  - surface functionalization and grafting
- The synthesized molecular and nanoscopic structures will be tailored for:
  - biodegradability; biocompatibility; stability;
  - integration in metabolism (including eco- and human toxicity)
  - specific biofunctionality

Specific tools will be provided to evaluate the nanoscopic functionality:

- special optical and vibrational spectroscopy;
- techniques for single molecule detection;
- advanced microscopy; nanoscale analysis;
- biological *in-vivo* and *in-vitro* tests.

NANOFUNCT: Applications

- New nanoparticulate formulations for controlled release applications in pharmacy, nutrition and plant protection.
- New nanoscale formulations for gene therapy that enormously broaden their therapeutic potential by effecting and targeting delivery (e.g., to cancer cells and organs) of new types of medicine to previously inaccessible sites in the body.
- Biological probes and biosensor systems and new imaging technologies that detect emerging disease in the body, which will shift the focus of patient care from disease treatment to early detection and prevention.
- More effective and less expensive healthcare using remote and in-vivo diagnostics and treatment devices.

- The listing has to revised according to the new target definitions of participating companies

Preliminary Work Programme

I: MANAGING UMBRELLA

WP1: MANAGEMENT / COORDINATION
- 1.1: Management Company
- 1.2: Advisory Council
- 1.3: Scientific / Technical Steering Committee
- 1.4: Exploitation / Dissemination Committee

II: SCIENTIFIC & RESEARCH COMPONENT / NEW KNOWLEDGE

- **WP2** — Nanoparticles
- **WP3** — Surface Funct.
- **WP4** — Markers …

III: DEMONSTRATION & APPLICATIONS

- **WP5 : MARKET APPLICATIONS**
- **WP6 : Product Evaluation**

WP1: Project Management / Coordination

1/2

- **Objectives**: To develop an understanding of the individual factors that contribute to the successful collaboration and innovation, in a way that:
  - Identifies organizational, managerial, technical and implementation strategies to enhance collaboration and innovation.
  - Provides quality tools for collaboration and technology transfer.
  - Provides innovative information management technology.
  - Determines the impact of organizational climate on the implementation of nanotechnology.
  - Identifies key factors for innovation and disseminates information.
  - Identifies needs for effective leadership of centers and provides best practice guidance.
  - Focuses on dissemination of project results, industry survey-feedback, technology transfer practices, recruitment and retention of new scientists in supercritical science and engineering, collection of qualitative data on industry, firming and rolling of factors that affect member benefits.
- So that the Integrated Project is successful in reaching its scientific, technological, and exploitation goals.

WP1: Project Management / Coordination

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Coordination:

- **Management Company: responsible for day-to-day coordination of research activities, interface with the EU and EU relations, economic aspects and financial records, contractual and legal aspects, etc.**
- **Advisory Council: responsible for review of project results and of new developments, high-level policy making.**
- **Scientific/Technical (S/T) Steering Committee: responsible for overall supervision and monitoring of the programme, coordination of scientific and technological developments in relation to the programme objectives and applications, planning of future activities based on the input of the advisory council, budget allocation, call for proposals, etc.**
- **Exploitation/Dissemination (E/D) Committee: responsible for patent issues, IPRs, workshops. Conferences, issuing of newsletter, set-up of a web site, training aspects.**

Fundamental Aspects / New Knowledge - WP2: Nanoparticles

Objectives: Development of novel concepts for the economically feasible production of nanoparticles with tailored surface functionality. Specifically,

- Particles built from organic materials such as sub-microscopic vesicles, dendrimers and highly branched and aggregated polymers
- To tailor solubility, self-assembly, bioacitivty, specificity in targeting.
- Nanoparticles as markers and probes, e.g., functional Au particles, magnetic nanoparticles or luminescent nanoparticles.
- Responsive nanoparticles and assemblies

Fundamental Aspects / New Knowledge - WP3: Surface Functionalization

- **Objectives**: Development of a better understanding of the interactions between nanoparticles, molecules , cells and surfaces . The challenge is to control their agglomeration, assembly, compatibility and affinity.

- Different aspects of particle interactions have to be determined , including:

  - biocompatibility, homogeneity,
  - Self-assembly and ordering at interfaces
  - stability, specificity,
  - capability of chemical and biological functionalization.

Fundamental Aspects / New Knowledge - WP4: Markers, Probes and Characterization

- **Objectives**: Use of nanoparticles for chemical analysis and as biological and medical probes.
- Attachment of molecular markers on nanoparticles has several advantages due to technical as well as biochemical reasons:

  - Shielding , multilayering and cascading of probes
  - Reduction of the assay volume to the size of the molecule
  - Excellent signal-to-noise ratio and a low background from out-of-focus objects

Controlled Delivery Applications

Overview

- Drug Delivery Systems
- Food additives, Nutrients
- Protein nanoparticles for controlled delivery in food applications
- Plant protection

- **To be revised and completed by the partners**

WP5: Controlled Delivery Applications

Objectives: Development of nanoparticulate assemblies for use in controlled delivery applications .

- By reproducibly attaching targeting ligands to drug-loaded nanoparticles, the drug will be localized to the desired tissues in the human body, thereby dramatically enhancing the efficacy and speed of drug action.
- Nanoparticles carrying DNA fragments with controlled composition, size, shape, polydispersity, morphology, stability, encapsulation capability, and targetability will be used to incorporate specific genes into target cells resulting in new technologies with improved in-vivo transfection efficiency.
- The circulation duration of the nanoparticles in biological milieu will be enhanced by “pegylation”.
- Biodegradation kinetics,

- To be revised and completed by the partners

WP 6: Product Evaluation

- Toxicological Studies
- Ecological Evaluation
- Scale-up Studies
- Economic feasibility studies
- Market penetration of the new products

- To be filled by the industrial partners

ACTION POINTS

- Nomination of a working committee (Prof. Kipparissides, CPERI; Prof. Möller, Aachen; Dr. Visser, DSM; Dr. Rößling, Schering; Dr. Förster,DECHEMA). Done
- Preparation of the new work packages(C.K. ,M.M)
  02/12/02. First version sent
- Send them to all partners for comments . Secrecy agreement (DECHEMA, DSM, Aachen, CPERI, Schering) to be signed by all partners who are willing to continue participating in the proposal. 12/12/02 Dr Visser, DSM will prepare a first draft
- Each partner sends back one-two pages with his contribution to be used for the preparation of the first draft of the proposal. Specifications will be set (Objectives, Innovation, Methods, Potential applications, links sought, deliverables, etc.) To be sent to Costas Kiparrisides by 20/12/02

ACTION POINTS

- Budgetary issues. Prepare a tentative budget distribution among the partners based upon the individual contributions. Working committee
- Management issues. Overall project coordination. Governing Council.Scientific Council. Exploitation committee. DECHEMA
- Consider the addition of an academic partner with a specialization on biology/toxicology. All partners
- Consider the addition of some SMEs. All partners
- January 16, 2003, Consortium Meeting in Frankfurt. All
- Should a partner fail to meet deadlines, the management committee might decide to ask him to withdraw from the project.