NANOSOST: TOWARDS A SUSTAINABLE, RESPONSIBLE AND SAFE NANOTECHNOLOGY

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The great potential of the Nanotechnology is becoming a reality in the form of new materials with innovative and, in some cases, amazing characteristics. Nowadays, this is a technological area with a fast growing with more than 700 consumer products currently in market [1]. Moreover, new diagnosis systems with extremely sensitive and specific properties, highly selective and efficient chemical catalysts, drug carriers able to recognize their targets, clean energy nanovectors, chemically inert and mechanically tough coatings, carbon nanotubes and nanowires with unprecedented properties, nanoporous interfaces for molecular recognition and sieving or even high performance composite nanomaterials, are just some examples of the Nanotechnology that is currently under development.

Nevertheless, the question arises from the same properties that make nanomaterials so attractive constitute a potential risk for the health and the environment. This is especially worrying for the nanoparticles and nanotubes/nanowires, which ability to penetrate through the cell and nuclear membrane has been widely proved [2]. Five grand challenges have been proposed to stimulate the research and the progress of innovative nanotechnologies regarding aspects relative to the safety and to the environment [3]. The needed knowledge basis must be created for the expansion of new technologies that allow a sustainable development of Nanotechnology and for ensuring the production processes, workplaces and harmless products to the human health and environment safety. It is worth noting that it could not be accepted without further questions the validity of standard procedures of Industrial Hygiene related to atmospheres containing breathable solids when particle sizes are several magnitude orders smaller. The unsuitability of the current methods and the need to tackle this problem as soon as possible has been stated by official institutions in other countries, as in the United States and the United Kingdom.

The objective of Nanosost (PSE-420000-2008-3) is the development of scientific and technical basis for assuring the safety in both processing and production in Nanotechnology. Indeed, the techniques and technologies derived from the results of this research will set up the necessary means to help in the early decision of the viability of nanostructured products in the research and development stage, to design environmentally friendly and health harmless industrial processes and to ensure the safety in the final products. This work will be carried out taking into account three fundamental aspects of the Nanotechnology effects:

(a) Exposure effects on the health of workers
(b) Effects on the industrial processes, with the objective of controlling the risk that the use of Nanomaterials could cause in the people, installations and the environment.
(c) The release of harmful agents to the people and environment.

The overall structure of the project is based in seven work-packages for tackling all the related aspects of nanotechnology, from the development of safer synthesis processes of nanomaterials to the elaboration of a good laboratory practice guides for nanotechnology. Nanosost will also take into account other important aspects for safety like the chemical and toxicological risks, the production of undesirable nanoparticulate aerosols in laboratory and

industrial environments and the development of new personal protective equipments for workers. The following is an overview of the subprojects considered in Nanosost.

1. Characterization, metrology and generation of references
2. Chemical risks
3. Toxicological risks
4. Scientific basis for risk assessment
5. Scientific basis for risk control
6. Materials for barrier applications
7. Technical basis for the risk management

The members of Nanosost belong to 21 Spanish research groups distributed among Universities, Technological centers and companies from Aragon, the Basque Country, Catalonia and Madrid. All the participants have a wide experience in several areas of the Nanotechnology that cover the seven work packages of Nanosost.

References:

[1] Woodrow Wilson Center. "Woodrow Wilson Nanotechnology Consumer Products Inventory", http://www.nanotechproject.org/consumerproducts
[2] Baker G.L. et al., Toxicol. Sci. **101** (2008) 122.
[3] Balbus J.M. et al., Environ. Health Perspect. **115** (2007) 1664.

Figures:

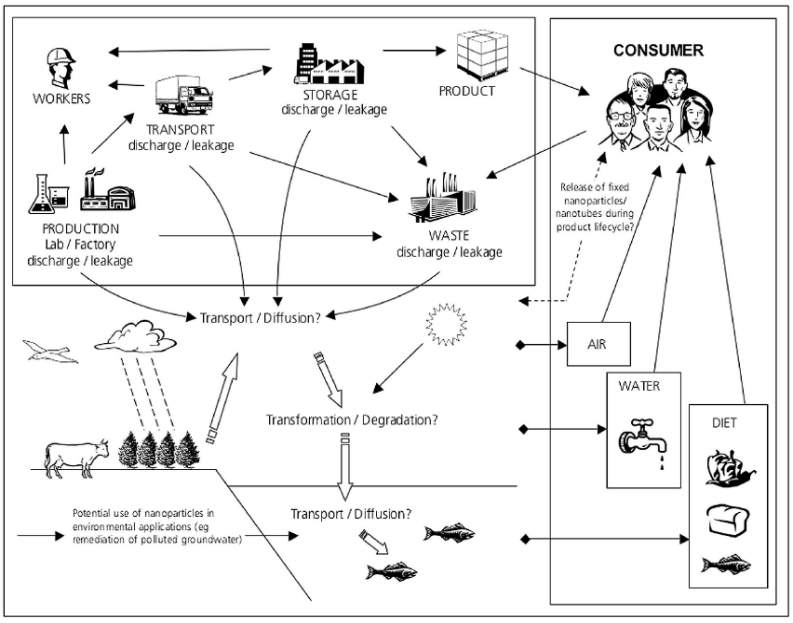

Figure 1. Exposition routes to nanomaterials (adapted from the National Institute for Resources and Environment of Japan, http://www.nire.go.jp/eco_tec_e/hyouka_e.htm)