



Science & Technology

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Report

“Nano for sustainable food”

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WG FOOD

“Nano for Sustainable Food”



REPORT on the Foundation Seminar (December 5th - 6th, 2013)

Cecilia Bartolucci, January 2014

The aim of the seminar was to identify foresight priorities within the topic “Nano for sustainable food” and to propose a road map for the face-to-face workshops. This requires us to separate the long term objectives from the intermediate steps and milestones along the way.

In order to do that, we invited 8 experts representing different sectors who introduced, in a ten minutes contribution, their point of view regarding future challenges (slides are available at <http://foresight.cnr.it/index.php/events>). In particular the potential of a nanotechnological approach to be applied in agriculture, processing, packaging and consumption was considered and toxicological and safety issues, as well as social acceptance, were addressed.

Ample time was given to discussion so as to address all important subjects, prioritize them and discover the interactions between them.

1. Main observations

The seminar was a validation of the background document (available at the previously mentioned website). However, applying a foresight perspective, specific points were emphasized during the discussion. This document reports a recapitulation of the main seven observations.

1.1. Terminology

The use of the word nanotechnology as the only technology addressed was perceived as a limitation. In the future we should make sure to specify that, even though we may want to stress nano, all converging technologies should be taken into account in a foresight exercise. Synergistic or competing technologies

should be considered as well. Furthermore it is important to specify, when necessary, whether we are talking about nanomaterials (NMs) and nanoparticles (NPs) or nanotechnologies.

1.2. Risk assessment

The development of appropriate **analytical methods**, allowing for the characterization and quantification of NMs and NPs within a life cycle framework, is of primary importance. It would allow for the **toxicological evaluation** necessary for the development of **intelligent hazard strategies for risk assessment**. It is however not a long range foresight objective: its priority, in fact, demands that the analytical and toxicological aspects be considered at every step of innovation; its complexity is such that it needs to be addressed in an interdisciplinary way and in a time frame that considers immediate, as well mid-term and long-term approaches; it concerns equally the food sector and all other sectors which use NMs and NPs. Both the international scientific community as well policy makers are aware of this and there are several ongoing initiatives, supported at different levels, which may require better coordination, but are already active. An expert representing this issue should be present at each f2f workshop, regardless of the topic addressed.

1.3. Regulatory environment

The same reasoning applies to **regulations**. They are important and there is a need for regulations to be more standardized internationally. However, it was pointed out several times that there is no need for nano-specific regulations, especially if it is the properties of NMs and NPs we want to address and regulate and not the size. Science-based knowledge could reduce the need for regulations and encourage knowledge-based decision-making. Also, an evaluation of the advantages and disadvantages of a regulatory environment is important. All this, however, should not be the topic of a foresight f2f.

1.4. Advancements in packaging

It was agreed that many problems can be addressed through innovative **packaging**. It was also agreed that while there is still need for research and development, in particular regarding intelligent and active packaging, this can be done in a short or medium term time scale. Nanotechnology already plays an important role in packaging. A synergistic approach with other converging or emerging technologies should be further developed, and this should also encourage the consideration of packaging as an integral part of the food chain.

It was proposed that instead of thinking of food packaging we should consider food contact materials. These could play an important role in the reduction of pathogens and spoilage both during storage and during processing. New contact materials could also reduce energy and water consumption and play an important role in waste reduction at almost every level along the food chain. Both nanotechnology and NMs can be extremely important in such a development and their use should be better accepted by the consumers who perceive a lesser risk if the NMs are outside the food.

In conclusion, packaging is already the object of intensive, successful research and some innovative products have already been introduced in the market. While food packaging and its development should certainly be included in future studies regarding any part of the food chain, it would not constitute a long range foresight topic on its own. However, food contact materials should be considered in other technological applications in the food sector beyond packaging and could have a very high impact.

1.5. Challenges in agriculture

The development of **smart agriculture** could bring important benefits regarding safety, security, health and environment. Several different technologies could contribute to reach this goal and their possible synergy should be researched and then exploited. A nanotechnological approach (including all converging technologies) could be developed and applied at different levels, in particular if knowledge and experience from the nanomedicine were to be transferred to agricultural challenges. It could help identify the needs of crops as well as of animals (“diagnosis”) and deliver precisely targeted inputs in a controlled manner (“therapy”). It could further address new inputs and enable their application.

1.6. Innovative food processing

Through nanoscience we acquired the capability of imaging **structures in food** and we can now find links between the technologies we apply and the structures we create, and follow the process. Our knowledge of the link between **processing** and structure allows us to design new structures. We can improve the quality and, applying old or new technologies, we can form and stabilize new structures and adapt them to our requirements.

Nanotechnology may bring not a disruptive change, but continuous incremental changes, which will have great impact on the market. Having a better knowledge and understanding about what is happening at nano-level gives great potential to all converging technologies, and, in the future, nanostructures could be present in many products and have a great impact on the market and play a role in safety, security, health and environment. In this context it will be important to identify and develop synergistic technologies.

1.7. Social acceptance

In the past it was shown that the **consumers’ acceptance** plays a fundamental role in the success of technological transfer of innovation. Initiatives that encourage a more informed consumer choice particularly through better communication and transparency should be endorsed by all, public and private stake holders alike. In particular when innovation concerns products that get so close to them such as food, consumers will want to know if the use of a new technology, e.g. nanotechnology is a necessity or just a marketing strategy. Any strategy that encourages **social awareness** such as communication techniques, interactive labeling technologies or traceability etc., and by promoting curiosity and knowledge contributes to move the perceived risk closer to the real risk, should be considered a priority and addressed at all times.

2. Conclusions

The interdisciplinary approach of the seminar, highlighted by the presence of experts representing distinct areas provided different views of the topic “Nano for sustainable food”. This eventually allowed the acquisition of a comprehensive picture summarized in a list of benefits, functionalities and technologies considered in a risk/time plot. Even though we lacked the time to reach a general consensus, a few priorities were selected. Based on these results, a proposal for a roadmap has been outlined and the topic is described in the document “F2F Workshop: Diversified Adaptable Food”.

Experts

Dr. Karin Aschberger	Institute of Health and Consumer Protection, Nanobiosciences Unit, JRC, Italy
Dr. David Carlander	Director of Advocacy, Nanotechnology Industries; Association, Belgium
Dr. Ralf Greiner	Head of the Department of Food Technology and Bioprocess Engineering, MRI Federal Research Institute of Nutrition and Food, Germany
Dr. Mélanie Kah	Department of Environmental Geoscience, University of Vienna, Austria
Prof. Doris Marko	Head of the Institute of Food Chemistry and Toxicology, University of Vienna, Austria
Dr. Domenico Rossetti	Principal Administrator for Social Sciences and Humanities at the EC, DG for Research and Innovation, Belgium
Dr. Clara Silvestre	Institute of Chemistry and Technology of Polymers, CNR, Italy
Dr. Nicola Trevisan	General Director, Veneto Nanotech