



Nanotechnology in Food Production A challenge?!

Dr. Anne Theobald – Scientific Panel on Food Additives, Flavourings,
Processing Aids and Materials in Contact with Food - AFC Panel

What are we talking about?

Nano (greek) – dwarf

1 nm = 0.000 000 001 m = 10^{-9} m

A thousandth of the width of a human hair.



Although there is presently no international agreement on the definition of terms, a general consensus prevails that **nanoparticles** are elements which measure less than 100 nanometers (nm)

Nanoparticles exhibit different physical and chemical properties in contrast to the respective bulk material (e.g. different colour, chemical reactivity!)

Expected Application Areas

- Materials sciences (esp., ceramics; more generally, lighter and stronger materials);
- Chemistry (e.g., tailor-made catalysts, Paints, vanishes, and other coatings);
- Information and communication technology (e.g., nano-electronics);
- Energy capture and storage technology (e.g., solar cells, batteries, fuel cells, fuels and catalysts);
- Environmental remediation technology;
- Biomedical applications (e.g., “lab-on-a-chip”, biosensors, implants, drug delivery devices);
- Agriculture (e.g., sensors, seed improvement);
- Consumer goods;
 - cosmetics (e.g., more potent sunscreen, nano-liposome-based skin care products);
 - house-cleaning products (e.g., window-washing sprays);
 - textiles, surface finishing and lubrication agents
- **Food and food packaging;**



- **Food packaging**, e.g. new packaging materials intended to extend the shelf life of food by using sensors to indicate when a food spoils
- **Taste and texture**, e.g. spreads and ice creams with nanoparticle emulsions to improve the texture and reduce the fat content
- **Functional foods**, e.g. nanocapsules incorporating nutrients into the food (“nano-ceuticals”),
- **Seed production**
- **Pesticides**, e.g pesticides enclosed in nanocapsules which can be more easy taken up by plants
- **Animal health**, e.g. Vaccines incorporated into nanoparticles aiming for a more efficient absorption and a dosed release

Examples of Products and Applications for Food / Nutraceuticals

Product	Application/ Claims
Aquanova® Novasol® Aquanova® GmbH	Nano-carrier for antioxidants into food and beverage products
Nano-Sized Self-assembled Liquid Structures (NSSL) Supplements NutraLease Ltd. Israel	Nano-carriers for nutraceuticals
Canola Active Oil Shemen Industries, Israel	NSSL-based nano micelle carrier for increased penetration of vitamins, minerals and phytochemicals etc.
Nanoceuticals™ Artichoke Nanoclusters RBC Life Sciences® Inc. USA	reduces surface tension of foods and supplements to increase wetness and absorption of nutrients
Nanoceuticals™ Hydracel RBC Life Sciences® Inc., USA	Claimed to lower the surface tension of drinking water (and hence increase solvent properties).
Nanoceuticals™ Slim Shake Chocolate RBC Life Sciences® Inc. USA	RBC's NanoCluster™ delivery system to give CocoaClusters with enhanced flavour.
Nanoceuticals™ Spirulina Nanoclusters RBC Life Sciences® Inc. USA	NanoClusters delivery system for the food product.
Nanotea Shenzhen Become Industry & Trade Co., Ltd. China	The nano-tea is claimed to release effectively all the 'excellent essences' of the tea.



Slide courtesy of Dr. Qasim Chaudhry, Central Science Laboratory, UK

- Definition and distinction (manufactured vs natural NM)
- Methods of analysis/detection (distinguishing between natural and manufactured, nano and bulk form, detection in a complex matrix such as food)
- Applicability of current Risk assessment paradigm
- Need of toxicological data
- Need of additional legislative framework?
- What and how do we communicate – establish trust?

...and the potential Answers

- OECD established a Working Party on Manufactured Nanomaterials
 - Identification, Characterisation, Definitions, Terminology and Standards
 - Testing Methods and Risk Assessment
 - Information sharing, Co-operation and Dissemination
- ISO technical committee (ISO/TC 229, Nanotechnologies)
 - standards for classification, basic metrology, calibration and certification, and environmental issues.
- EU Commissions 7th Framework program: nanotechnology Action Plan
- German Agencies prepared a Joint Research Strategy on Nanotech Health and Environmental Risks
- The UK committees on toxicity (COT), Mutagenicity (COM) and Carcinogenicity (COC) launched a joint statement on nanomaterial toxicology

EFSA is currently following these activities very closely.

Among the 9 Scientific Panels the following ones could possibly be addressed in the future with questions concerning the use of nanotechnology

- Panel on food additives, flavourings, processing aids and materials in contact with food [AFC]
- Panel on additives and products or substances used in animal feed [FEEDAP]
- Panel on dietetic products, nutrition and allergies [NDA]
- Panel on contaminants in the food chain [CONTAM]

The role of the EFSA's Scientific Committee will be to ensure a harmonised approach of RA within EFSA's Panels