

Nan Café

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Are we sure nanofood applications are safe?

Relatively few studies have been done on risks related to nanofood.

Significant uncertainties and data gaps remain, and risk assessment needs to be done.

Early studies show that nanoparticles may cause short-term toxicity and long-term human health effects.

Do you think more studies should be done prior to commercialization?

Is public health protected?

We don't know. In spite of the various unknowns & risks, there are no regulations to ensure nanofood safety. Manufacturers are not required to demonstrate the safety of the nanofood they sell.

How are consumers informed about nanotechnology in food?

At the moment there is **no requirement for nano labeling**.

For fear of consumer backlash, many food processors that are using nanotechnology are wary of attaching a "nano label" to their products.

If you want to know more about nanofood, go to our website*, at www.nanocafes.org/nanoproducts_food where you can find articles, reports and radio shows on this issue.

Do you think nanofood should be labeled as such?

Nanofood raises many other questions

What if nanochips used as RFID tags remain active once we leave a store? Is your privacy threatened?

Will nanotechnology reduce the need for farm workers and our chemical dependence, by leading to greater automation of farm management?

Will extending the shelf life of food take us further away from eating fresh food?

Etc....

What questions do you have related to nanofood?

We are very interested in what YOU think of "nanofood" and the various issues it raises

Leave your ideas, comments and suggestions at www.nanocafes.org/nanoproducts_food

*Our website-- www.nanocafes.org-- offers also a whole range of general resources, information, and the latest news on societal, environmental, ethical and risk issues raised by nanotechnology.

Nanotechnology in Food & Agriculture?

First, what is nanotechnology?

Nanotechnology is an emerging field that involves the understanding, manufacture and manipulation of materials at the molecular or atomic level.

Nano means "dwarf." A **nanometer** is one billionth of a meter or 1/80,000 the diameter of an average human hair!

What kind of applications does nanotechnology enable?

Nanotechnology applications are **already in everyday life**, for example:

- stain-resistant clothes
- stronger, lighter baseball bats or aircraft materials
- cosmetics and sunscreens
- self-cleaning windows
- faster and more integrated circuits
- smell-resistant & antimicrobial clothes and athletic or military attire
- weapons
- processed food

Tomorrow nanotechnology may help create enhanced cancer treatments, thanks to new tumor-targeting medicines, and detect explosives, chemical and biological agents thanks to new sensors. It may improve energy storage, water desalination and decontamination, etc.

So, what is "nanofood"?

Food is **nanofood** when nanoparticles, nanotechnology techniques or tools are used during cultivation, production, processing, or packaging of the food.

Nanofood is often associated with **color & flavor improvement, better storage & preservation, pathogen detection, antimicrobial properties, intelligent packaging, etc.**

Just a few concrete examples first:

- Drinks that turn pink or yellow when microwaved:



- Nanocapsules incorporating... tuna fish oil, a source of Ω -3 fatty acids into... bread:








- Easy-to-make chocolate mousse with nano-chocolate



- And soon: that tastes just like



Examples of nanofood applications (Source: Nanowerk)

Agriculture	Food Processing	Food Packaging
 <p>Nanocapsules for delivery of pesticides, fertilizers, and other agrichemicals</p> <p>Nanosensors for monitoring soil conditions and crop growth</p> <p>Nanoparticles to deliver DNA to plants (targeted genetic engineering)</p> <p>Delivery of growth hormones</p> <p>Nanocapsules to deliver vaccines</p> <p>Nanosensors for detection of animal and plant pathogens</p> <p>Nanochips for identity preservation and tracking</p> 	 <p>Nanocapsulated flavor enhancers</p> <p>Nanocapsules to improve bioavailability of nutraceuticals in standard ingredients such as cooking oils</p> <p>Nanotubes and nanoparticles as gelation and viscosifying agents</p> <p>Nanocapsule infusion of plant based steroids to replace a meat's cholesterol</p> <p>Nanoparticles to selectively bind and remove chemicals or pathogens from food</p> <p>Nanoemulsions and -particles for better availability and dispersion of nutrients</p> 	 <p>Antibodies attached to fluorescent nanoparticles to detect chemicals or foodborne pathogens</p> <p>Nanosensors for temperature, moisture and time monitoring</p> <p>Nanoclays and nanofilms as barrier materials to prevent spoilage and oxygen absorption</p> <p>Electrochemical nanosensors to detect ethylene</p> <p>Antimicrobial and antifungal surface coatings with nanoparticles (silver, magnesium, zinc)</p> <p>Lighter, stronger, and more heat-resistant films with silicate nanoparticles</p> <p>Modified permeation behavior of foils</p>

Nanotechnology is also used in supplements

- Nanosize powders to increase absorption of nutrients
- Cellulose nanocrystals composite as drug carriers
- Nanoencapsulation of nutraceuticals for better absorption, better stability or targeted delivery
- Nanochocleates (coiled nanoparticles) to deliver nutrients to cells without affecting color or taste of food
- Vitamin sprays dispersing molecules into nanodroplets for better absorption

Nanofood in numbers (Source: Helmut Kaiser Consultancy)

According to estimates:

- There are now over **600 nanofood products available on the market worldwide.**
- The nanotechnology and nano-bio-info convergence will influence over **40% of the food industries up to 2025.**
- The nanofood market has been soaring from **\$2.6 billion in 2003 to \$5.3 billion in 2005** and is expected to reach **\$20.4 billion in 2015.**
- Nano-featured food packaging market will grow from \$ 1.1 billion in 2005 to \$ 3.7 billion up to 2010.
- More than 600 Companies around the world are today active in research and development and production.
- USA is the leader followed by Japan and China. By 2015 Asia, with more than 50 percent of the world population, will become the biggest market for the Nanofood, with China in the leading position.

