

# Nanotechnology in Europe: Small Particles, Big Risks

## What is Nanotechnology?

Nanotechnology is a new field of science in which particles smaller than 100 billionths of a meter can be manufactured by controlling matter on the molecular scale. Made from carbon, silver, zinc, gold and other elements, these minuscule bundles and rods are used in electronics, medical equipment and consumer products such as toothpaste, lotions and sunscreen.

Now, nanoparticles are increasingly being used by the food and agriculture industries, and are finding their way into processed foods, food packaging materials, fertilisers, storage containers, cutlery and cutting boards. More than 150 foods and more than 400 food packaging materials containing nanoparticles are now on the market internationally, according to Friends of the Earth. An inventory compiled by the Woodrow Wilson Center gives the public a chance to review more than 500 nanotechnology-based consumer products currently on the market.

## Is Nanotechnology Dangerous?

The short answer to this question is: Nobody knows for sure. Described as “the new industrial revolution,” nanotechnology could bring great progress but could also be harmful to humans, animals and the environment.

Because they are so small, nanoparticles can penetrate cells, tissues and organs more easily than larger particles. It has not been determined whether nanoparticles from food packaging can migrate into foods and drinks.<sup>1</sup> Despite these risks, no research on the potential long-term health effects of nanoparticles has been conducted, and no safety testing is required before nanoparticles can be used in or added to food or agricultural products.

Numerous short-term experiments have revealed health risks. Carbon nanoparticles have been shown to cause brain damage and death when ingested by fish.<sup>2</sup> Nanotubes caused cancer to develop in the lining of the lungs of lab mice, similar to cancer caused by asbestos.<sup>3</sup> Seven types of nanoparticles which are used increasingly by industry were tested on human and rodent cells by Swiss Federal Institute of Technology in Zurich. Such substances as iron oxide in nano form showed levels of toxicity that surprised even the researchers.<sup>4</sup> In a 2005 study in *Environmental Science & Technology*, zinc oxide nanoparticles were shown to be toxic to human lung cells, even at low concentrations. In other tests, tiny silver particles killed liver and brain cells from rats.<sup>5</sup>



The effects of nanoparticles on the environment, especially waterways and landfills, are largely unknown. Preliminary environmental studies suggest they may be toxic to ecologically important species such as water fleas.<sup>6</sup> When silver nanoparticles used to control odor in socks are released in washing machines, they may go on to destroy beneficial bacteria in waste treatment plants.<sup>7</sup>

The Woodrow Wilson Center’s Project on Emerging Technologies in Washington, DC, along with NanoAction, a coalition of more than 100 consumer, environmental and animal health groups, has concluded there is insufficient funding for human health and safety research, which is limiting the understanding of the human health risks of nanotechnology.<sup>8</sup>

## Nanotechnology and the EU's Food Supply

The European Commission's code of conduct on nanotechnology advises extreme caution on the use of nanomaterials in food. But these calls may be falling on deaf ears, as nanoparticles are already being used in food supplements, food ingredients and food packaging. More uses could be on the horizon, as no moratorium on nanotechnology is in sight.

Similarly to in the US and Australia, all particles are considered equal within current EU food law. So if a food ingredient is approved in normal form, it can automatically be approved in nano form. No labelling is required. Food companies are failing to inform the public about their use of nanotechnology for fear of public backlash. The result is that consumers may be unknowingly consuming nanofood or eating food from packaging containing nanomaterials.

According to Friends of the Earth, nanotechnology has potential uses in all areas of agriculture, food processing and food packaging, including:

- Marketing soft drinks, ice cream, chocolate and chips as "health" foods by reducing fat, carbohydrate or calorie content, or increasing protein, fibre or vitamin content;
- Making stronger flavourings, colorings and nutritional additives;
- Making processing aids to increase manufacturing speed, and lower ingredient and processing costs;
- Changing the color, flavour or nutritional properties of food according to a person's dietary needs, allergies or tastes;
- Increasing shelf life by detecting spoilage, bacteria or nutritional loss, and by releasing antimicrobials, flavours, colours or nutritional supplements; and
- Producing more potent fertilisers and pesticides.<sup>9</sup>

Germany is taking a leading role in nanotech research. The Munich University of Technology is working with industry and research institutes to develop non-stick nanoparticle-based food packaging that will spare consumers from having to tap or shake near-empty condiment bottles. The German company Aquanova is working on nanoparticles for sausage and cured meat to speed processing, make ingredients cheaper and stabilise colours.

Industry interest in nanotechnology is vast and growing. Among the many agri-food corporations conducting research are Campbell Soup, Cargill, DuPont, General Mills, Heinz, Hershey, Kraft, Mars, Nestlé, PepsiCo, Sara Lee and Unilever.<sup>10</sup>

## The Future of Nanotechnology in Europe

The value of all products using nanotechnology in Europe has been estimated at 10 billion euros, with the potential to reach 2 trillion euros within a decade. Still, there is a feeling in Europe that the EU is lagging behind the US and Asia.

In 2004 the European Commission (EC) said the EU wants to be competitive yet responsible. In February 2008, the EC released a voluntary code of conduct for nanotechnology research, acknowledging previous research into the health effects was "inadequate" and advising the precautionary principle.<sup>11</sup>

Later in 2008, the European Food Safety Authority (EFSA) issued a draft opinion that outlined the limitations in assessing the safety of nanoparticles. These include difficulty in detecting and measuring nanoparticles in food and in the body; difficulty in measuring the metabolism, excretion and toxicity of nanoparticles; and the fact it is currently impossible to extrapolate scientific data on non-nanochemicals to their nano-sized versions. Due to these concerns, the EFSA recommended the risks of nanoparticles be assessed on a case-by-case basis, and that further research be conducted into the uncertainties and limitations surrounding nanoparticles and their safety.<sup>12</sup>

Many corporations and ethicists argue current EU law on consumer protection is sufficient. Many civil society groups disagree and have raised health concerns. The Soil Association, which certifies organic food in the UK, said in 2007 that food, clothes and cosmetics containing nanoparticles cannot be called organic. And the UK's Royal Society, the world's oldest scientific organisation, has called for nanoparticles to be treated as new substances that should be labelled and undergo full safety assessments.

## Endnotes

- 1 Biello, David, "Do Nanoparticles in Food Pose a Health Risk?" *Scientific American*, 13 March 2008
- 2 Feder, Barnaby, "Study Raises Concerns About Carbon Particles," *New York Times*, 29 March 2004
- 3 Greenemeier, Larry, "Study Says Carbon Nanotubes as Dangerous as Asbestos," *Scientific American*, 20 May 2008
- 4 "Nano World: Nanoparticle Toxicity Tests", United Press International, 6 April 2006.
- 5 Biello, David, "Do Nanoparticles in Food Pose a Health Risk?" *Scientific American*, 13 March 2008.
- 6 Miller, G. and Senjen, R. "Out of the Laboratory and Onto our Plates: Nanotechnology in Food & Agriculture," Friends of the Earth Australia, Europe and USA, April 2008
- 7 "Silver Nanoparticles May Be Killing Beneficial Bacteria in Wastewater Treatment," *ScienceDaily*, 30 April 2008.
- 8 "Nanotechnology Development Suffers from Lack of Risk Research Plan, Inadequate Funding & Leadership," Woodrow Wilson International Center for Scholars, 21 September 2006.
- 9 Op. cit., Miller and Senjen, 2008.
- 10 Ibid.
- 11 In May 2008, Food & Water Europe participated in the European Commission's public consultation on the EU's Code of Conduct for Responsible Nanosciences and Nanotechnologies Research. The presentation can be viewed at: [http://ec.europa.eu/research/science-society/document\\_library/pdf\\_06/witowska-rezentacjabrussels\\_en.pdf](http://ec.europa.eu/research/science-society/document_library/pdf_06/witowska-rezentacjabrussels_en.pdf)
- 12 "EFSA consults on draft opinion on nanotechnologies and food and feed safety," Press Release, European Food Safety Authority, 17 October 2008.

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