

The Nano Gamble

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Nano-Foods Are Coming to a Grocery Near You, Regulated or Not

By Andrew Schneider

Senior Public Health Correspondent
AOL News

For centuries, it was the cook and the heat of the fire that cajoled taste, texture, flavor and aroma from the pot. Today, that culinary Voodoo is being crafted by white-coated scientists toiling in pristine labs, rearranging atoms into chemical particles never before seen.

At last year's Institute of Food Technologists international conference, nanotechnology was the topic that generated the most buzz among the 14,000 food-scientists, chefs and manufacturers crammed into an Anaheim, Calif., hall. Though it's a word that has probably never been printed on any menu, and probably never will be, there was so much interest in the potential uses of nanotechnology for food that a separate day-long session focused just on that subject was packed to overflowing.

In one corner of the convention center, a chemist, a flavorist and two food-marketing specialists clustered around a large chart of the [Periodic Table of Elements](#) (think back to high school science class). The food chemist, from China, ran her hands over the chart, pausing at different chemicals just long enough to say how a nano-ized version of each would improve existing flavors or create new ones.

One of the marketing guys questioned what would happen if the consumer found out.

The flavorist asked whether the Food and Drug Administration would even allow nanoingredients.

Posed a variation of the latter question, Dr. Jesse Goodman, the agency's Chief Scientist and Deputy Commissioner for Science and Public Health, gave a revealing answer. He said he wasn't involved enough with how FDA was handling nanomaterials in food to discuss that issue. And the agency wouldn't provide anyone else to talk about it.

This despite the fact that hundreds of peer-reviewed studies have shown that nanoparticles pose potential risks to human health -- and, more specifically, that when ingested can cause DNA damage that can prefigure cancer and heart and brain disease

Truth is questioned

Officially, the FDA says there aren't any nano-containing food products currently sold in the U.S.

Not true, say some of the agency's own safety experts, pointing to scientific studies published in food science journals, reports from foreign safety agencies, and discussions in gatherings like the IFT conference.

In fact, the arrival of nanomaterial onto the food scene is already causing some big chain safety managers to demand greater scrutiny of what they're being offered, especially with imported food and beverages

Many of those "The problem is compounded," he said, "because it's almost impossible to test for nanomaterial, especially with the volume and variety these huge chains deal in."

Craig Wilson, assistant vice president for safety for Costco, says the chain does not test for nanomaterial in the food it is offered. But, he adds, Costco is looking "far more carefully at everything we buy. We have to rely on the accuracy of the labels and the integrity of our vendors. Our buyers know that if they find

nanomaterial or anything else they might consider unsafe, the vendors either remove it, or we don't buy it."

Another government scientist says nanoparticles can be found today in produce sections in some large grocery chains and vegetable wholesalers. This scientist, a researcher with the USDA's Agricultural Research Service, was part of a group that examined Central and South American farms and packers that ship fruits and vegetables into the U.S. and Canada. According to the USDA researcher, who asked that his name not be used because he's not authorized to speak for the agency, apples, pears, peppers, cucumbers and other fruit and vegetables are being coated with a thin, wax-like nano-coating to extend shelf-life. The edible nanomaterial skin will also protect the color and flavor of the fruit longer.

"We found no indication that the nano coating, which is manufactured in Asia, has ever been tested for health effects," said the researcher.

There's evidence of other nano-containing food finding its way to American stores. A seller of health food products says that an Israeli canola oil produced by Shemen Industries is being sold under various names both online and in health food shops in the U.S. and Canada. The oil uses nanoparticles to block cholesterol from entering the bloodstream.

Some foreign governments, apparently more worried about the influx of nano-related products to their grocery shelves, are gathering their own research. In December, a science committee of the British House of Lords issued a lengthy study on nanotechnology and food. Scores of scientific groups, consumer activists and even several international food manufactures told the committee investigators that engineered particles were already being sold in salad dressings; sauces; diet beverages; and boxed cake, muffin and pancakes mixes, to which they're added to ensure easy pouring.

Other researchers responding to the committee's request for information talked about hundreds more items that could be in stores by year's end.

For example, a team in Munich has used nano non-stick coatings to end the worldwide frustration of having to endlessly shake an upturned mustard or ketchup bottle to get at the last bit clinging to the bottom. Another person told the investigators that Nestlé and Unilever have about completed developing a nano-emulsion-based ice cream that has a lower fat content but retains its texture and flavor.

Who's Stirring the Pot

Nearly 20 of the world's largest food manufacturers -- including Nestlé, Hershey, Unilever Foods, Cargill, Campbell Soups, Sara Lee, and H.J. Heinz -- have their own in-house nano-labs, or have contracted with major universities to do nano-related food product development. But they are not eager to broadcast those efforts.

Kraft was the first major food company to hoist the banner of nanotechnology. Spokesman Richard Buino, however, now says that while "we have sponsored nanotech research at various universities and research institutions in the past" Kraft has no labs focusing on it today.

The reticence is in stark contrast to the stance Kraft struck in late 2000, when it loudly and repeatedly proclaimed that it had formed the Nanotek Consortium with engineers, molecular chemists and physicists from 15 universities in the U.S. and abroad. The mission of the team was to show how nanotechnology would completely revolutionize the food manufacturing industry, or so said its then-director, Kraft research chemist Manuel Marquez. But by the end of 2004, the much-touted operation seemed to vanish. All mentions of Nanotek Consortium disappeared from Kraft's news releases and corporate reports.

Kraft quietly renamed the Nanotek Consortium as the Interdisciplinary Network of Emerging Science and Technologies and shipped it to sister company Philip Morris.

An investment analyst who specializes in nanotech issues says the newer effort has nothing to do with food, and Kraft declined to say what happened, offering only an email response from Buino that said: “We are not part of the Nanotek Consortium.”

“We have not nor are we currently using nanotechnology in our products or packaging,” he added in another email.

Industry Secrecy Thwarts Risk Awareness

The British government investigation into nanofood strongly criticized the UK’s food industry for “failing to be transparent about its research into the uses of nanotechnologies and nanomaterials.” On this side of the Atlantic, corporate secrecy isn’t a problem, as some FDA officials tell it.

Investigators on Capitol Hill say that the FDA’s congressional liaisons have repeatedly assured them -- from the George W. Bush’s administration through President Barack Obama’s first year -- that the big U.S. food companies have been upfront and open about their plans and progress in using nanomaterial in food.

But FDA and USDA food safety specialists interviewed over the past three months stressed that based on past performance; industry cannot be relied on to voluntarily advance safety efforts.

These government scientists, who are actively attempting to evaluate the risk of introducing nanotechnology to food, say that only a handful of corporations are candid about what they’re doing and collaborating with the FDA and USDA to help develop regulations that will both protect the public and permit their products to reach market. Most companies, the government scientists add, submit little or no information unless forced. Even then, much of the info crucial to evaluating hazards -- such as the

chemicals used and results of company health studies -- is withheld, with corporate lawyers claiming it constitutes confidential business information.

Both regulators and some industry consultants say that the evasiveness from food manufacturers could blow up in their faces. As precedent, they point to what happened in the mid-90s with genetically modified food – the last major scientific innovation that was, in many cases, force-fed to consumers. “There was a lack of transparency on what companies were doing. So promoting genetically modified foods was perceived by some of the public as being just profit-driven,” says Prof. Rickey Yada of the Department of Food Science at the University of Guelph in Ontario, Canada.

“In retrospect, food manufacturers should have highlighted the benefits that the technology could bring as well as discussing the potential concerns.”

Study What’s Been Eaten

The House of Lords’ study identified “severe shortfalls” in research into the dangers of nanotechnology in food. Its authors called for funding studies that address the behavior of nanomaterials within the digestive system. Similar recommendations are being made in the U.S., where the majority of research on nanomaterial focuses on it entering the body via inhalation and absorption.

The food industry is very competitive, with thin profit margins. And safety evaluations are very expensive, notes Bernadene Magnuson, senior scientific and regulatory consultant with risk-assessment firm Cantox Health Sciences International. “You need to be pretty sure you’ve got something that’s likely to benefit you and your product in some way before you’re going to start launching into safety evaluations,” she explains. Magnuson believes that additional studies must be done on chronic exposure to and ingestion of nanomaterials.

One of the few ingestion studies recently completed was a two-year-long examination of nano titanium dioxide at UCLA, which showed that the compound caused DNA and chromosome damage after lab animals drank large quantities of the particles in their water.

It is widely known that nano titanium dioxide is used as filler in hundreds of medicines and cosmetics and as a blocking agent in sunscreens. But Jaydee Hanson, policy analyst for the Center for Food Safety, worries that the danger is greater “when the nano-titanium dioxide is used in food.”

Bread makers, says Hanson, are spraying nanomaterials on their loaves “to make them shinier and help them keep microbe-free longer.” Ice cream companies are using them to make their products “look richer and better textured.

“This is happening,” Hanson says. He calls on FDA to “immediately seek a ban on any products that contain these nanoparticles, especially those in products that are likely to be ingested by children.

“The UCLA study means we need to research the health effects of these products before people get sick, not after.”

There is nothing to mandate that such safety research take place. application

FDA Ignores Safety

The FDA includes titanium dioxide among the food additives it classifies under the designation “generally recognized as safe,” or GRAS. New additives with that label can bypass extensive and costly health testing that is otherwise required of items bound for grocery shelves.

A report issued last month by the Government Accountability Office denounced the enormous loophole that FDA has permitted through GRAS. And the GAO investigators also echoed the concerns of consumer and food safety activists who argue that giving nanomaterials the GRAS free pass is perilous.

Food safety agencies in Canada and the European Union require all ingredients that incorporate engineered nanomaterials to be submitted to regulators before they can be put on the market, the GAO noted. No so with the FDA.

“Because GRAS notification is voluntary and companies are not required to identify nanomaterials in their GRAS substances, FDA has no way of knowing the full extent to which engineered nanomaterials have entered the U.S. food supply,” the GAO told Congress.

Amid that uncertainty, calls for safety analysis are growing.

“Testing must always be done,” says food regulatory consultant George Burdock, a toxicologist and the head of the Burdock Group, “because if it’s nano-sized its chemical properties will most assuredly be different and so might the biological impact.”

What’s Next on the Plate

Interviews with more than a dozen food scientists revealed strikingly similar predictions on how the food industry will employ nanoscale technology. They say firms are creating nanostructures to enhance flavor, shelf life and appearance. They even foresee using encapsulated or engineered nanoscale particles to create foods from scratch.

Experts agreed that the first widespread use of nanotechnology to hit the U.S. food market would be nanoscale packing materials and nano sensors for food safety, bacteria detection and traceability.

While acknowledging that many more nano-related food products are on the way, Magnuson, the industry risk consultant, says the greatest degree of research right now is directed at food safety and quality.

“Using nanotechnology to improve the sensitivity and speed of detection of food-borne pathogens in the food itself or in the

supply chain or in the processing equipment could be lifesaving,” she says.

For example, researchers at Clemson University, according to USDA, have used nanoparticles to identify campylobacter, a sometimes-lethal food-borne pathogen, in poultry intestinal tracts prior to processing.

At the [University of Massachusetts Amherst](#), food scientist Julian McClements and his colleagues have developed time-release nanolaminated coatings to add bioactive components to food to enhance delivery of ingredients to help prevent diseases such as cancer, osteoporosis, heart disease and hypertension.

But if the medical benefits of such an application are something to cheer, the prospect of eating them in the first place isn't viewed as enthusiastically.

Advertising and marketing consultants for food and beverage makers are still apprehensive about a study done two years ago by the German Federal Institute of Risk Assessment, which commissioned pollsters to measure public acceptance of nanomaterials in food. The study showed that only 20 percent of respondents would buy nanotechnology-enhanced food products.

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*AOL News - Andrew Schneider can be contacted at
investigate(at)mac.com*