



Global Food Safety Monitor August 3, 2010

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Big potential, small budgets: Food safety on the cheap

One of the mysteries of food safety management is why the food and feed industry, whose bottom line is protected by food safety programs, often views them as a regulatory "burden" and an excessive cost rather than as an investment in the future of the industry. Even governments are loath to pay for the costs of setting international food standards, much less for international food safety intervention that has little impact on trade. The budget-related items of the latest Executive Committee of the Codex Alimentarius Commission (CCEXEC) report serves as a sober reminder of just how narrow the financial ledge is for global food safety. (Codex is the international, intergovernmental organization that sets food standards presumed to conform to World Trade Organization agreements.)

The UN Food and Agriculture Organization (FAO) reported to CCEXEC that, following its "results-based budgeting process," the budget for the expert meetings to advise Codex standard setting would be about \$500,000 USD. We at the Monitor would not be surprised if this figure were smaller than the cost of mounting a single major food industry meeting. The World Health Organization (WHO), which is the co-sponsor with FAO of Codex, announced the overall WHO budget likely would be reduced, and that only 25 percent of it came from regular UN member government dues. The rest of the WHO budget is assembled ad hoc to respond to public health emergencies and the program interests of member countries. The clear implication was that the WHO contribution to Codex would likely be reduced too. In anticipation of reduced budgets, the Codex Secretariat cut back travel to the approximately three dozen Codex committee meetings the Secretariat staffs annually, reduced the printing of standards-negotiating documents, experimented with automated translation programs to cut translation costs, and began to develop a business plan with CCEXEC to make even more efficient use of the ever-dwindling Codex budget. The Codex "Trust Fund" to enable developing country delegate participation is facing nonrenewal.

In this budgetary context, the hundreds of millions of dollars that governments have invested in the research and development phase of agri-nanotechnology products may seem disproportionate, if not grotesquely so. However, governments often publicize nanotechnology as the "next Industrial Revolution" and investments in it as necessary to "remain competitive" with other investing countries and companies. Furthermore, agri-nanotechnology products are often discussed in terms of their vast potential to solve the food safety, animal and plant health problems endemic to the highly standardized crop monocultures and livestock varieties that are characteristic of industrial farming. For governments hoping that nanotechnology will create a new generation of jobs and wealth, product development is the priority-not development of environmental, health and safety data.

The nanotechnology conference reported in this issue is typical in its focus on products and their potential, e.g., to detect the pathogens that contaminate our food supply. Aside from whether new nanotechnology applications under development will actually work as hoped, it is unclear whether

governments will ultimately be able to afford to deploy them and develop the integrated food safety information systems necessary to monitor pathogens and take preventative measures against foodborne illness. As we report in the resources section of this issue, the United States is among those countries far from having the integrated information system necessary for effective food safety management.

Source: "Report of the Sixty-Fourth Session of the Executive Committee of the Codex Alimentarius Commission," June 29–July 2, 2010, ftp://ftp.fao.org/codex/Alinorm10/al33_03Ae.pdf.

Food safety at the NanoAgri 2010 conference

The Institute for Agriculture and Trade Policy participated in NanoAgri 2010, a conference on the agricultural and food applications of nanotechnology, held June 20–25 in São Pedro, Brazil. The conference attracted about 300 scientists and a handful of regulators and nongovernmental organization representatives. It featured over 125 presentations on the manipulation of molecular level matter in agricultural chemicals, veterinary medicines, plant genetics and other agricultural and food products. (A nanometer is a billionth of a meter in length. A human hair measures 80,000–100,000 nanometers in diameter.) There were about a dozen presentations on nanotechnology regulatory issues, including one by IATP. Although several of the academic scientists had formed startup companies, big corporations with agricultural nanotechnology projects did not participate.

(In Chicago at the International Food NanoScience Conference in mid-July, company representatives said they were waiting for governments to produce nanotechnology regulations before they would invest to commercialize their nanofood research and development projects, and submit their product data for regulatory approval. Some companies, such as Kraft, that had previously advertised coming nanofood products have disavowed them. The companies agreed that regulators, and not the companies, should bear the burden of demonstrating the safety of nanofoods.)

The Brazilian Agricultural Research Corporation (EMBRAPA, the Brazilian government's agricultural research service), and FAO co-organized the NanoAgri 2010 conference. EMBRAPA has about 2,000 researchers in 18 units and four international cooperation programs, including one with the U.S. Department of Agriculture's research service. Professor Sérgio Mascarenhas, one of the main conference organizers, wrote that EMBRAPA's Agricultural Instrumentation unit, the main EMBRAPA source of nanotechnology applications, "is essential to the effective insertion of Brazil in the global economy, by taking advantage of an opportunity, unique in its 500-year history, to transform the country, into the world's tropical agribusiness leader, with pharmaceuticals, nutraceuticals, and bioenergy, particularly alcohol and oil; chemistry rather than commodities of low added value. (sic)" The agribusiness purpose and geo-political ambition of EMBRAPA's research was explicit in many of the scientific presentations.

FAO organized three roundtables: regulatory issues, agricultural applications and food applications. FAO's Renata Clarke introduced the roundtables by saying that FAO was not interested in nanotechnology as such. Rather FAO was interested in whether and how applications of nanotechnologies could contribute to reduce food insecurity and enhance rural development in developing countries. Participants received copies of the [report of the FAO/WHO inaugural expert meeting](#) in June 2009 on agri-nanotechnology. That meeting focused on "the use of nanotechnology in food production and processing; the potential human health risks associated with that use; [and] the elements of transparent and constructive dialogues on nanotechnology among stakeholders" (p. 16).

(The Codex Alimentarius Commission met July 5–9 in Geneva and discussed an Egyptian proposal to form a task force on agri-nanotechnology. Egypt noted that foods and food packaging materials claiming to incorporate engineered nanomaterials (ENMs) had been commercialized without regulatory approval. The official report of the Codex meeting has not yet been published, but according to a Consumers International report on the meeting, Commission members decided that FAO's and WHO's nanotechnology work was "extensive," hence there was no need for a Codex task force for the time being. Egypt was encouraged to cooperate with FAO and WHO on agri-nanotechnology.)

EMBRAPA divided conference presentations into six topics: 1) food packaging and biosensors; 2) food design (e.g., edible coatings on fruits); 3) plant production and animal breeding; 4) environmental

cleanup; 5) safety evaluation; and 6) regulatory frameworks. The conference program and background papers for the FAO round tables and a few presentations, including IATP's "Three Approaches to Regulating Agri-Nanotechnology," are available at <http://www.nanoagri2010.com/>. Unfortunately the 272-page book of NanoAgri abstracts has not been posted online and not all of the presentations were included in the abstracts. Some applications and regulatory issues pertain more directly to food safety than others.

Because nanocoated fruit and vegetables may already be commercialized and because there are very few, if any, peer-reviewed studies of the affect of ENMs on the gastro-intestinal system, nanocoatings of produce are perhaps the most controversial food application. The desire by fruit and vegetable importers and exporters to reduce the amount of produce lost to spoilage or due to aesthetic flaws has led to public and private investment in nanocoatings as a barrier against moisture and bacterial attack. For example, Brazilian university researchers showed that covering avocados with a nanocoating derived from cassava starch resulted in less weight loss. The nanoparticles reinforce the edible films to reduce moisture loss.

"Active packaging," enabled by ENMs, serves a similar purpose to nanocoatings but by different means. One presentation described a packaging material for apples that incorporated nanosilver particles as a bactericidal agent to prolong shelf life and reduce decay. Bill Orts of USDA summarized an Agricultural Research Service project to prolong the appearance of freshness in sliced apples packaged by the McDonald's fast food corporation using similar active packaging. Unknown, because untested, is whether the nanosilver particles migrate from the polyvinyl film in which they are incorporated to penetrate the apples themselves.

Perhaps of most interest to food safety regulators is the capacity of nano-enabled biosensors to detect contaminants in food, feed and water. An Indian university project describes a microbial-sized biosensor able to analyze 150 chemical and heavy metal values in herbicides and report their ecotoxicity. A French and Australian group presented work that would produce biosensors capable of locating a wide array of pathogens in agricultural runoff. The research base could also be miniaturized to a handheld device for horticulture, meat or dairy inspectors to use.

A German university researcher, Michael Köhler, discussed a "nanoliter fluid segment technique" (not in the abstracts) intended to assay the toxicity of combinations of 80,000-plus chemicals that are to be regulated under the EU's Registration, Evaluation, Authorization and Restriction of Chemicals program (REACH). The combinations are computer generated with toxic samples so small as to radically reduce the cost of chemical testing, making it economically and technically feasible to implement REACH. Agricultural chemicals, of course, would be among those reviewed. Presently, only 600 chemicals have been subject to long-term toxicity testing, according to Professor William Waismann, who proposed a four-tier testing sequence for nanotoxicology assays.

Professor Günter Oberdörster, of the University of Rochester (U.S.), showed how some scientific papers reporting acute toxicity in laboratory animals exposed to ENMs were based on unrealistic exposure conditions that would not occur in the real world. Unrealistic exposures could not provide a basis for risk assessment or regulation. Alarmist reporting about these papers in the popular press has led to what Oberdörster called the "Nanotoxicity-Hype Correlation." He said, however, that in view of the lack of research into the health effects of chronic, low-dose exposure to ENMs, exposure should be prevented by precautionary measures and regulations. This presentation is available on the NanoAgri 2010 website.

A major problem for food safety regulators discussed during the FAO roundtable was the cost of the various electron microscopes and other technologies for visualizing ENMs, a requirement for the pre-market safety assessment that Alan Reilly, chief executive of the Food Safety Authority of Ireland, said should be required of all ENMs in foods. For port-of-entry food testing laboratories, the cost of such technologies could be prohibitive. A Dutch regulator responding to Reilly's presentation said that even with such technologies, it might not be possible to detect ENMs in the typical testing laboratory, depending on their shape and mobility within food and feed.. Reilly further noted that traditional food safety parameters, such as Maximum Residue Levels (MRLs) of toxins and veterinary drugs, or Tolerable Daily Intakes (TDIs) of food additives, would likely have to be redefined given the size and other properties of ENMs. In extemporaneous remarks he noted that nanotechnology-enabled labeling presented

unprecedented privacy issues because of its capacity to trace foods into the homes of consumers. Walmart, for example, has announced its intention to label all its food with biodegradable nano-enabled Radio Frequency Identification devices by 2015.

Because of the agribusiness orientation of the conference, there was just one presentation that questioned how agri-nanotechnology would affect smallholder farms and just one presentation on the consumers' perspective. Both presentations were part of the FAO roundtables. Georgia Miller of Friends of the Earth Australia pointed out that agri-nanotechnology's announced program to "produce more with less" includes fewer farmers. Because farming is the major occupation in many developing countries, government investments to apply nanotechnology to "feed the world," would likely result in massive loss of employment and rural-to-urban migration. She also suggested that analysis of potential benefits of nanotechnology was not rigorous compared to the risk-analysis paradigm that focused largely on narrowly defined toxicological risks. Sue Davies, of the British consumer organization Which? summarized consumer responses to nanotechnology—based partly on her organization's "Citizens' Panel on Nanotechnologies" (2008). The lack of transparency concerning nanotechnology products, not only among agribusinesses but among UK regulators, did not inspire consumer confidence. While consumers thought medical applications of nanotechnology might produce benefits worth the risks there was little interest in the purported benefits of incorporating ENMs in foods.

At the close of the conference, northern Brazil was proposed as the site of NanoAgri 2012 in conjunction with the International Materials Science conference. David Carlander, an EU Food Safety Authority risk assessor, suggested that many more regulators be invited to the next NanoAgri to give scientists and product developers a better sense of the review to which their products will be put.

Sources: Thomas MacMillan, "Super Chewing Gum: Not So Fast," *New Haven Independent*, July 21, 2010, http://www.newhavenindependent.org/index.php/archives/entry/what_is_a_nano_food; Caroline Scott Thomas, "Food companies go quiet on nanotech research activity," July 19, 2010, *Food Production Daily*; Labex USA, Virtual Laboratory of Empraba in the United States, http://www.embrapa.br/a_embrapa/labex/labex-estados-unidos/labexusa; "Embrapa Agricultural Instrumentation," Brazilian Agricultural Research Corporation, Ministry of Agriculture, Livestock and Supply, www.cnpdia.embrapa.br; Ursula Trüeb and Paul Zwicker, "Report of the Thirty-Third Session of the Codex Alimentarius Commission," *Consumers International*, July 2010; A.R.T. Machado et al., "Effects of cassava starch based coating in the preservation of avocado fruit," 100; P. Ponce et al., "Active Packaging for Fruits and Vegetables," 103; Shanthi Sundaram et al., "Preparation and optimization of biomaterials for the development of a Biosensor," 108. D.K. Martin et al., "Biomimetic Membrane System with Incorporated Biological Transport Proteins Provide Stable Platformers for Novel Biosensors," 109; Alan Reilly, "General insight on regulatory framework and nanotechnologies," 44–47; Georgia Miller, "Nanotechnology in agriculture: increasing pressure on small scale farmers," 34–40; Sue Davies, "A consumer group's point of view on the regulatory framework and nanotechnologies," 48–53; all from NanoAgri 2010 Abstracts, EMBRAPA, São Pedro, Brazil.

A simple solution: Don't spread raw manure on your fields

The Monitor often reports conflict and controversy, not because it is fun to do so, but because there is more of it to report than agreement about simple measures to prevent foodborne illness. From this year's Codex commission meeting, for example, we could point to more than a dozen issues of conflict, e.g., ractopamine, a livestock growth hormone ardently advocated by the U.S. government and veterinary drug industry and rejected by the rest of the world; the broader battle over the non-therapeutic use of antibiotics in animal feed and the drug resistance transferred to consumers of antibiotic-laced dairy and meat products; and the growing conflict between Codex standards and private standards of transnational retailers.

Let us instead simply applaud the July decision by Codex commission delegates to approve in an annex for leafy green vegetables to the Codex food hygiene guidelines. Among other Good Agricultural Practices (GAPs), the annex advises produce growers not to fertilize their fields with uncomposted, untreated manure, whose pathogens, such as *Salmonella*, can be taken up into the plants' root systems and cause foodborne illness requiring hospitalization. To underline the importance of a Codex GAP for the retail food industry, at the Codex food hygiene committee meeting in November 2009 in California, Frank Yiannis, vice president of food safety for WalMart, publicly addressed the delegates—a rare privilege at the predominantly intergovernmental meeting.

United States–based growers were quick to note that their Leafy Greens Marketing Agreements for Arizona and California (2007) were more stringent than the Codex standard. "Our common practice is not to use raw manure," said one industry official. Nevertheless, as reported in the previous Monitor, the estimated annual cost of acute U.S. foodborne illness resulting from the contamination of produce by pathogens of animal origin is about \$39 billion. As WHO Food Safety Director Joergen Schlundt noted following approval of the standard, "the problem is global." If this relatively simple GAP can be enforced globally, a great deal of money can be saved and a great deal of human suffering spared.

Sources: Stephen Clapp, "Codex fails to agree on standard for ractopamine," Food Chemical News, July 12, 2010. "Report of the Forty-First Session of the Codex Committee on Food Hygiene," November 16–20, 2009, ftp://ftp.fao.org/codex/Alinorm10/al33_13e.pdf. Bruce Blythe, "UN food safety group proposes new standards on leafy greens," The Packer, July 12, 2010.

Resources

Michael Batz and J. Glenn Morris Jr., "Building the Science Foundation of a Modern Food Safety System: Lessons from Denmark, The Netherlands, and the United Kingdom on Creating a More Coordinated and Integrated Approach to Food Safety Information," [Produce Safety Project](#), Georgetown University, May 2010.

In the previous issue of the Monitor, we reviewed a March 2010 study by the Produce Safety Project that reported more than half of all cases of acute (i.e., requiring medical care) foodborne illness in the United States were attributed to "unknown agents." The inability of the U.S. Food and Drug Administration and state food safety agencies to trace back the origin of the majority of acute foodborne illness cases has many causes. One cause that we overlooked in our review is the lack of integrated and up-to-date reporting by U.S. food safety agencies of human, animal, feed and food data about pathogenic prevalence and severity. In this thoroughly researched and lucidly written report, Batz and Morris state, "Indeed, it [the U.S. government] does not regularly publish reports on human surveillance of foodborne pathogens or on the monitoring of animals or foods that include data from multiple surveillance programs. Rather, each data-collection program publishes its own data, in its own format, in its own time, sometimes after a delay of years" (p. 21). For example, the Centers for Disease Control published its latest major report on the prevalence and severity of U.S. foodborne illness in 1999, on the basis of 1997 data. The ad hoc, unintegrated and belated publishing of food safety data is a crucial factor in making U.S. food safety management reactive to emergencies rather than preventative. And yet 10 years ago, Batz and Morris report, European food safety data was as unintegrated, ad hoc and out of date as U.S. food safety information is today.

Batz and Morris are careful not to recommend that the U.S. government and food industry emulate European food safety management. Not only do many in the U.S. Congress, food industry and even food safety agencies view EU food safety measures as barriers to trade, but the high degree of centralization of U.S. food, food inputs production and distribution makes such direct emulation technically, and politically, improbable. Furthermore, the integration and modernization of the nearly two dozen current federal pathogen surveillance and attribution programs would require institutional reform to insulate risk assessment from the economic imperatives that often govern risk-management decisions. The authors' proposed Federal Institute for Food Safety Risk Analysis would be a small but important step towards making U.S. food safety management more independent of food marketing. Perhaps more importantly, the authors make a thoroughly compelling case that U.S. food safety management cannot improve until and unless it builds an integrated and centralized system of food safety information.

Batz and Morris offer several case studies from Denmark, the Netherlands and the United Kingdom to show how the integration of human, food, feed and animal surveillance data enables integrated attribution of the causes of foodborne illness and cost-effective interventions to prevent future outbreaks. Many U.S. food safety and industry officials support reform if it does not harm perceived economic interests. However, as the public health bill for medical care, lost labor productivity and shortened lifespan (to say nothing of the incalculable human suffering) due to acute U.S. foodborne illness continues to climb—\$152 billion annually, just for FDA-regulated foods alone, according to a [March 2010 study](#)—the political cost of "business as usual" may become untenable. This study will be a widely consulted

document to move U.S. food safety management from "business as usual" to a full-fledged public health program that is truly cost effective—not just for the public, but the food industry as well.