Emerging Nanotechnology Regulation:

Samsung's SilverCare Washing Machine

Ancient Egyptians drank from silver cups for its health benefits and tossed silver coins into water barrels to clean them. More recently, nanosilver had been added to bandages to aid healing.

Samsung developed a line of eco-friendly washing machines that washed clothes at low rather than high temperatures. Samsung claimed a "92% energy savings over hot water sanitization." The tub was coated with silver, and during use "metallic silver atoms electrolytically stripped of an electron are injected during the wash and rinse cycles, allowing over 100 quadrillion silver ions—which act as a super cleaning solution—to penetrate deep into the fabric to sanitize clothing without the need for hot water or bleach.... Prominent scientists have shown that [washing in cold or warm water] commonly results in clean wet laundry with a significant microbial contamination. Samsung's SilverCare washer specifically targets the microbial contamination of the typical American washing methods."1 "Samsung is committed to being first to market with advanced technologies that benefit and enhance people's lives, and the new washers with Silver Care technology are a perfect example," said Peter Weedfald, senior vice president.

The SilverCare technology was eco-friendly in two ways. First, washing in cold or warm, as opposed to hot, water reduced energy consumption. Second, bleach was not needed to reduce microbial health risks.

Milliken & Company, a manufacturer of fabric, yarn, and chemicals, put its silver-ion biocide and a stain treatment in all the carpets, fabrics, and upholstery it produced. Its silver-ion biocide was intended to reduce odors.2

Pure Bioscience of El Cajon, California produced microbial product, Axenhol, which used as an active ingredient silver dihydrogen citrate. Pure Bioscience claimed that the product was "less toxic to humans and the environment than triclosan, the additive produced by Ciba that is widely used in products labeled "antibacterial."3

Gillian Morris, industry manager of the Chemical and Materials practice of Kline & Company, commented on the difference in attitudes about nanotechnology and the use of silver ion biocides: "The Japanese are quite sophisticated in terms of the technology and demand for protection and the method in which it is delivered to the final article. On the other hand, in Europe, there is growing concern about overexposure to antimicrobial substances. The fear is that sanitizing everything may reduce people's natural immunity to common germs and help antibiotic-resistant strains of bacteria to develop.4 The European Union's Biocidal Products Directive governed such products.

---

1Samsung Electronics America, Press Release, March 23, 2006. "[T]his process removed or killed 99.9% of odor-causing bacteria."
The Woodrow Wilson International Center for Scholars maintained a list of products that used nanotechnology and had identified a list of 350 as of late 2006.\(^5\) The most widely used nanoparticle was nanosilver.

**Emerging Regulation**

Nanotechnology had the promise of providing benefits to consumers, producers, and the environment; for example, in cleaning toxic waste spills and sites. Environmentalists, however, warned of the risks to health and the environment.\(^6\) Dr. Jennifer Sass of the Natural Resources Defense Council (NRDC) warned, "Nanoparticles behave unpredictably and could harm human beings, wildlife and the environment."\(^7\) Sass criticized the Environmental Protection Agency: "In the face of such a significant jump in the number of everyday products containing untested and unlabeled nanoparticles, the Environmental Protection Agency is moving much too slowly to ensure that they are safe."

The National Association of Clean Water Agencies wrote to the EPA on February 14, 2006 asking that the silver in washing machines be regulated because silver is highly toxic to marine life, even in small amounts. The NACWA represented wastewater treatment agencies that were required to meet strict toxicity requirements of the Clean Water Act for their discharges. The letter stated, "To allow unrestricted use of a product that intentionally releases silver into the environment would be an irresponsible neglect of the principles of environmental sustainability that should strongly influence such decisions."\(^8\)

In response to the NACWA the EPA announced that it would regulate the silver ions released in a Samsung machine as a pesticide under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The EPA's jurisdiction under FIFRA apparently resulted from Samsung's claims about the microbial properties of its SilverCare technology. The EPA filed a notice in the Federal Register.

This was not a decision to regulate nanotechnology per se, since Samsung had not filed a pesticide registration application. The EPA stated, "Recent press articles have referred to the Samsung washing machine as a product of nanotechnology. However, since we have not yet received an application for registration from Samsung, the agency has not yet come to any conclusions about a washing machine that releases silver ions or any other similar product involving nanomaterial." The EPA potentially could regulate nanomaterials under the Toxic Substances Control Act (TSCA).\(^9\)

In response to the decision the NRDC wrote to the EPA stating "We are confident that once EPA has specifically examined nanosilver pursuant to the appropriate FIFRA risk assessment provisions, EPA will recognize the significant harm that this substance inflicts on the environment (particularly aquatic organisms) and will be compelled to prohibit or significantly restrict its use."

Jim Jones, director of the Office of Pesticide Programs of the EPA, said of the EPA's planned regulation, "We will be able to evaluate them and ensure that these products are not going to do

---

5 www.nanotechproject.org/consumerproducts.
9 Silver ions likely would be classified as nanomaterials, which are defined by the National Nanotechnology Initiative as “of roughly 1 to 100 nanometers” in size. The silver ions of concern to the environmentalists were from 20 to 30 nanometers in size.
damage to the aquatic environment." The EPA could require manufacturers to provide scientific evidence that their products did not produce environmental risks. Jones, however, made it clear that the regulation would apply only to those products advertised as germ-killing. He explained, "Unless you're making a claim to kill a pest, you're not a pesticide." Mae Wu, an attorney with the NRDC, noted, "It sounds like a major legal loophole and is probably something that will have to be dealt with in the courts."

The NRDC wrote to Jones praising the agency for its action, arguing that nanosilver was a pesticide and asking for stronger action. The NRDC called attention to the products marketed by the Sharper Image and Samsung's SilverCare™ Technology. The NRDC stated, "Animal studies suggest that nanoparticles can cause inflammation, damage brain cells and cause pre-cancerous lesions."

Earlier, Tri-TAC, an advisory group for the California Association of Sanitation Agencies, the California Water Environment Association, and the League of California Cities, had written to Jones and the California Department of Pesticide Regulation asking for regulation of Samsung's "SilverWash" washing machine.

Although regulation under FIFRA was a concern to the nanotechnology industry, a greater threat was that TSCA could be used to ban products thought to pose an "unreasonable risk." A product containing nanomaterials could be classified as a new chemical, requiring the maker to register it, in which case the burden was on the government to show that the material was hazardous. The government, however, could require the maker to provide the data needed to conduct a risk assessment. In addition, the Food and Drug Administration was preparing regulations of medical and cosmetic products containing nanomaterials. In addition to existing regulatory authority, Congress could establish new requirements such as labeling of products with nanomaterials or requiring premarketing approval. In 2005 the House of Representatives Science Committee had held hearings on nanotechnology, but no legislation advanced.

The city of Berkeley, California drafted an ordinance to regulate nanomaterials because of their potential hazards. Nabil Al-Hadithy, the city's hazardous materials manager, explained, "There has been a great number of attempts to regulate them, and they've all amounted to nothing because of the fear of upsetting industry, which leaves workers and the community at some unknown risk. It's the unknown that's a concern to us."

Samsung and the Sharper Image

Samsung, which was selling its washing machines in Asia, had to decide what to do in light of the EPA's pending regulation.

The Sharper Image, an upscale specialty retailer, sold a variety of consumer products including slippers and socks containing silver ions. The products were said to be "anti-germ, anti-mold, and anti-fungus." In the aftermath of the EPA decision to regulate nanosilver the Sharper Image quietly dropped its statements about the benefits of anti-microbial particles in its products.

---

12 NRDC letter to Jim Jones, November 22, 2006.
15 San Francisco Chronicle, November 24, 2006.