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*From the Baltimore Sun*

## SMALL TALK

**Nanotechnology can be found in everyday products like sunscreen and may even someday cure cancer. But what do we really know about it?**

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You can't see it, but it makes sunscreen clear, tennis rackets light and khaki pants stain repellent. And someday, it might help cure cancer.

It's called nanotechnology.

Dealing with particles that are 1/100,000th as wide as a human hair, nanotechnology is one of today's most promising avenues of research in medicine, science and manufacturing.

But experts say it could also be one of the most perilous, dealing as it does with particles so minuscule they can be ingested into the lungs or seep into the bloodstream through the skin without detection.

"The biggest worry is that you're creating materials that behave in different ways because they are so small. It seems very foolish to cross our fingers and hope for the best -- without doing tests," said Andrew Maynard, science adviser to the Project on Emerging Technologies, an initiative by the Woodrow Wilson International Center for Scholars in Washington.

The technology has also progressed faster than federal regulatory agencies can issue guidelines, he said. The result is many consumer products with nano-particles that have not undergone rigorous testing. The greatest concerns are products with nano-particles that might be absorbed by the body.

"We don't know what is safe and what is harmful," Maynard said, yet new nano-products appear on store shelves every day.

Consider Revitalift Double Lifting by L'Oreal, an anti-wrinkle cream, and Neutrogena's Ultra Sheer Dry-Touch SPF 45, a sunscreen.

Nano-sunscreens contain the same ingredients as regular sunscreens, but the active ingredients that block ultraviolet light -- titanium oxide and zinc oxide -- are nano-sized.



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"These are ingredients that have been around for a long time at the larger particle size," said John Bailey, executive vice president for science at the Cosmetics, Toiletry and Fragrance Association.

When the particles are nano-sized, the sunscreen is "transparent when applied," rather than whitish, and "aesthetically pleasing," Bailey said.

Similarly, L'Oreal's anti-wrinkle cream has nano-particles of Pro-Retinol A, the same active ingredient that fights wrinkles in other anti-wrinkle creams.

But activists, including the ETC Group, a Canada-based watchdog organization, have called for a moratorium on nano-products that are applied to the body or ingested as food until researchers learn more about the emerging technology.

"We're not saying that they are dangerous," said Pat Mooney, executive director of the ETC Group. "We simply don't know."

Industry, meanwhile, is racing ahead. By 2014, an estimated \$2.6 trillion in manufactured goods will contain nanotechnology, according to Lux Research, a scientific and technical marketing consultant. That's 15 percent of the world market share.

Federal funding of nanotechnology has also tripled over the past seven years, with the 2008 budget set at about \$1.5 billion. Much of that research has been aimed at the military.

For the consumer, distinguishing between what is nanotech and what is not can be confusing. "Companies are under no obligation to tell consumers anything. There are no guidelines or requirements," Maynard said.

There are no regulations preventing false advertising of nano-products and conversely, no requirement that companies disclose nano-products. The ETC Group is lobbying for more informative product labels.

The July issue of Consumer Reports includes a list of sunscreens with nano-particles. Another list of more than 400 nanotechnology-based consumer products can be found on the Project on Emerging Nanotechnologies' Web site at nanotech project.org.

Nanotechnology's most ambitious medical goals are in curing cancer -- there are 20 centers in the U.S. devoted to the cause.

One of the most promising projects would detect cancer and treat it immediately with glass nano-shells, according to Kristen Kulinowski, executive director for the Center for Biological and Environmental Nanotechnology at Rice University.

Injected intravenously, nano-shells naturally collect around cancerous cells and transfer heat, essentially burning them to death, Kulinowski said. Unlike traditional chemotherapy and radiation, which weaken the rest of the body, nano-shells only target cancerous cells.

At the Brady Urological Institute at the Johns Hopkins School of Medicine, researchers will soon "be injecting nano-sized iron particles with probes into patients with prostate cancer," according to Dr. Robert Getzberg, director of research.

The particles warm up the cancerous tumors, which makes them more responsive to chemotherapy. "It's definitely going to make a tremendous difference in the near future," Getzberg said, "and I don't mean in 10 years, more like one year."

So far, animal trials have been successful, and researchers expect human trials to commence shortly.

Outside of medicine, nano-particles have become popular in a variety of consumer products. For example, Nano-Tex is a popular cloth treatment that uses nanotechnology to produce clothing that sheds water and shrugs off stains.

Stain-fighting nano-fibers permanently attach themselves to clothing without changing the fabric's look or feel. The technology is used on pants, shirts and other items sold by more than 100 retailers including Hugo Boss, Eddie Bauer and Lands' End.

Maynard of the Center for Emerging Technologies has a Nano-Tex Brooks Brothers tie that fascinates his children. The

fledgling scientists, ages 10 and 11, borrowed their dad's nano-tie and found it performed well after being subjected to ketchup, mustard and coffee.

"People are cautious but interested in nanotechnology -- and intrigued by what it can do for them," Maynard said.

Although nanotechnology may be the future, its roots are ancient. Artists used gold and silver nano-particles to manipulate stained-glass. Gold nano-particles produced a ruby red color and silver particles a golden yellow.

Not long after World War II, nano-particles of carbon black -- essentially soot -- were used to slow tire wear, said Dr. Clayton Teague, director of the National Initiative on Nanotechnology.

"But they certainly did not understand the science behind it," Teague said. It was in 1981, with the invention of the scanning tunneling microscope at IBM's laboratories, that scientists were able to view and then manipulate nano-sized particles, he said. That discovery spurred decades of interest in the subject.

Nanotechnology has been most popular in Asia -- in countries such as Taiwan, Korea and Japan, Maynard said. In the U.S., "the jury is still out," he said.

It is a matter of choice, Kulinowski says, and a trade-off. "I use a high SPF. ... I don't necessarily look to see whether it has nano or not."

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