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INSIGHTS

Fullerene For The Face

Cosmetics containing C₆₀ nanoparticles are entering the market, even if their safety is unclear

By Bethany Halford

Buying cosmetics used to be easy for me. The shallowness in my quest for beauty was matched only by the shallowness with which I chose my cosmetics: How does it smell? Does the bottle look pretty? Will this green lotion coordinate with my green bathroom?



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The advent of nanotechnology has changed all that. Nanoparticles are showing up in all manner of cosmetics. Now I find myself scrutinizing moisturizer and lip gloss labels, trying to separate science from marketing and wondering just what it is I'm putting on my face.

It's not that I think all nanoparticles are dangerous. I just know that nanoparticle toxicity is a highly active area of research. Scientists are trying to address a number of concerns, notably the extent to which these materials are absorbed into the skin. I also know that with the exception of sunscreens (which are treated like drugs) and some color additives, cosmetic products and ingredients are not subject to premarket approval by the Food & Drug Administration. Their safety, in all likelihood, has been examined only by the people selling them.

The Nanotechnology Consumer Products Inventory, launched this month by the Project on Emerging Nanotechnologies at the Woodrow Wilson International Center for Scholars, lists about 30 nanotechnology-based cosmetic products, as identified by their manufacturers. Among these are three products that contain engineered C_{60} nanoparticles: Radical Sponge, made by Tokyo-

based <u>Vitamin C60 BioResearch</u>; Dr. Brandt Lineless Cream, from New York City-based Dr. Brandt; and Zelens Fullerene C-60 Day Cream made by <u>Zelens</u> in London.

I've been following nanotoxicology and have reported on studies that have shown C₆₀ can be toxic in vitro (<u>C&EN, Sept. 27, 2004,</u> page 22) and may cause damage in fish brains via lipid peroxidatior (<u>C&EN, April 5, 2004, page 14</u>). So I was surprised to discover that the compound was turning up in face creams.

These fullerene-based products are marketed as cutting-edge science, touting the antioxidant and radical-scavenging properties o C_{60}^{-1} . Zelens, for example, calls C_{60}^{-1} its "Nobel Prize-winning ingredient."

Chemical common sense tells us that a Nobel Prize-winning discovery doesn't necessarily translate to a fantastic consumer product. After all, Marie Curie won a Nobel Prize for the discovery o radium and polonium, but we wouldn't put those in a skin cream. You can see how this might confuse the average consumer.

I first learned about Zelens, which costs around \$250 for a 30-mL jar, in late January at an international nanotoxicology meeting. Curious if a couple hundred nanotoxicology experts were as surprised about this product as I was, I asked the audience who among them would feel comfortable using this product. By a show of hands, fewer than 10 indicated that they would. I decided to follow up further with a few fullerene scientists and nanotoxicology experts. Everyone I spoke with basically said the same thing: There's just not enough information out there to make a good decision either way.

"I would take the conservative path of avoiding using such cosmetics while withholding judgment on the actual merits or demerits of their use," responds Rice University chemistry professor Robert F. Curl Jr., who shared the <u>1996 Nobel Prize in Chemistry</u> for his codiscovery of fullerenes.

Curl and University of Paris pharmacy professor Fathi Moussa both worry about chemical problems. Sunlight or even artificial light, they explain, can excite C_{60} , which then undergoes intersystem crossing

to the triplet state and transfers energy to oxygen, forming potentially hazardous singlet oxygen in the process.

North Carolina State University's <u>Nancy Monteiro-Riviere</u>, an expert in how nanoparticles behave in skin, wonders just how deeply fullerenes can penetrate the skin. If they stay in the skin's upper layer and get sloughed off, there's probably nothing to worry about, she says. But if the material moves deeper into the skin, it could get picked up systemically.

Monteiro-Riviere's own research with fullerenes indicates that the particles can move beyond the top layers of skin, but she adds that because fullerenes can be formulated in different ways, her results don't necessarily tell us anything about the products on the market.

Marko Lens, the dermatologist and skin cancer expert behind Zelens, assures me that he's done extensive in vitro and human safety testing on the skin cream, although it's not been published. "The priority is the safety of the patient," he says. The experts I spoke with say they'd feel far more comfortable using a fullerene-based cosmetic if they could review the safety testing that's been done on the material. Surveys have shown that this sentiment is shared by the public, not just with cosmetics but with regard to all consumer products that use nanotechnology.

In the course of his work as chief science adviser with the Project on Emerging Nanotechnologies, Andrew D. Maynard has learned that many manufacturers have been diligent about carrying out safety tests, some going so far as to have independent safety tests conducted outside the company. "They don't seem to have thought about telling anybody that they've done it," he says. "There is very little out there that the manufacturers have made publicly available. We find that consumers usually have to ask the manufacturer for that information. It's not something that they seem to be publicizing widely."

Why don't manufacturers make that data readily available to their customers, particularly when the tests have been done by an independent lab? It doesn't seem that much to ask when you're paying about \$250 for a jar of face cream.

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