“Nanoparticles” may seep through skin

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Courtesy University of Rochester Medical Center and World Science staff

Scientists are finding that particles that are barely there—tiny objects known as nanoparticles that have found a home in electronics, food containers, sunscreens, and a variety of applications—can breach our most personal protective barrier: the skin.

The particles under scrutiny by Lisa DeLouise at the University of Rochester Medical Center, in New York, are almost unfathomably tiny. The specks are less than one five-thousandth the width of a human hair. If the width of that strand of hair were equivalent to the length of a football field, a typical nanoparticle wouldn’t even reach the one-inch line.

In the September issue of the journal Nano Letters, a team led by DeLouise published a paper reporting that nanoparticles pass through the skin of a living organism, a type of mouse commonly used as a model to study the damaging effects of sunlight.

The health implications of nanoparticles in the body are uncertain, said DeLouise. Other scientists have found that the particles can accumulate in the lymph system, the liver, the nervous system, and in other areas of the body. In her study, she found that the particles accumulate around the hair follicles and in tiny skin folds.

DeLouise, a chemist, notes that her study did not directly address the safety question. “We simply wanted to see if nanoparticles could pass through the skin, and we found that they can under certain conditions,” she said.

While nanoparticles are becoming widely used in the manufacture of consumer products, they are also under a great deal of study in research labs, and there are some processes—including ordinary candle flames—that produce them naturally. Some of the objects are so small, less than 10 nanometers wide (a nanometer is one-millionth of a millimeter), that they are nearly as small as the gaps between some skin cells.

DeLouise’s team studied the penetration of nanoparticles known as quantum dots that fluoresce under some conditions, making them easier to see and track compared to other nanoparticles. The scientists looked at the distribution of quantum dots in mice whose skin had been exposed to about the same amount of ultraviolet light as might cause a slight sunburn on a person. The team found that while the nanoparticles were able to breach the skin of all the mice, they passed more quickly through “sunburnt” skin.

DeLouise plans later to study titanium dioxide and zinc oxide, widely used in sunscreens and cosmetics to help block ultraviolet light. In recent years the metal oxide particles used in many consumer products has become smaller and smaller, so that many now are nanoparticles. The results are visible to anyone who takes a walk on the beach or stops by the cosmetics counter at a department store: The materials are often completely transparent when applied to skin. A transparent lip gloss that protects against UV light, for example, or a see-through sunscreen may contain nanoparticles, DeLouise said.

“A few years ago, a lifeguard at the swimming pool wearing sunscreen might have had his nose completely covered in white. Older sunscreens have larger particles that reflect visible light. But many newer sunscreens contain nanoparticles that are one thousand times smaller, that do not reflect visible light,” said DeLouise, noting that many people apply sunscreens after they’re sunburnt.