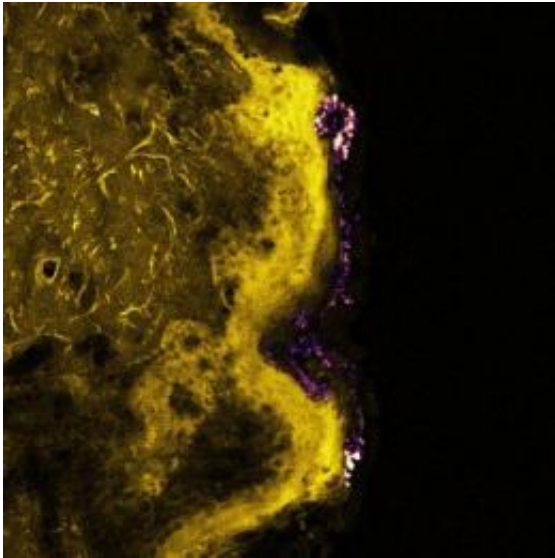


Scientists use laser imaging to assess safety of zinc oxide nanoparticles in sunscreen

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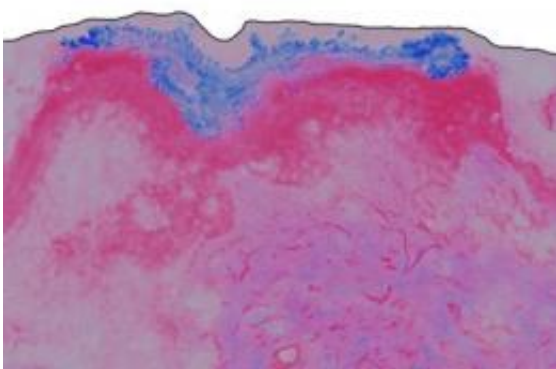


Overlay of the confocal/multiphoton image of the excised human skin. Yellow color represents skin autofluorescence excited by 405 nm; Purple color represents zinc oxide nanoparticle distribution in skin (stratum corneum) excited by 770 nm, with collagen-induced faint SHG signals in the dermal layer. Credit: *Biomedical Optics Express*

Ultra-tiny zinc oxide (ZnO) particles with dimensions less than one-ten-millionth of a meter are among the ingredients list of some commercially available sunscreen products, raising concerns about whether the particles may be absorbed beneath the outer layer of skin.

To help answer these safety questions, an international team of scientists

from Australia and Switzerland have developed a way to optically test the concentration of ZnO nanoparticles at different skin depths. They found that the nanoparticles did not penetrate beneath the outermost layer of cells when applied to patches of excised skin. The results, which were published this month in the Optical Society's (OSA) open-access journal [Biomedical Optics Express](#), lay the groundwork for future studies in live patients.



Zinc oxide (ZnO) nanoparticle distribution in excised human skin. The black line represents the surface of the skin (top), blue represents ZnO nanoparticle distribution in the skin (stratum corneum), and pink represents skin. Credit: Timothy Kelf, Macquarie University.

The high [optical absorption](#) of ZnO nanoparticles in the UVA and UVB range, along with their transparency in the visible spectrum when mixed into lotions, makes them appealing candidates for inclusion in sunscreen cosmetics. However, the particles have been shown to be toxic to certain types of cells within the body, making it important to study the nanoparticles' fate after being applied to the skin. By characterizing the optical properties of ZnO nanoparticles, the Australian and Swiss research team found a way to quantitatively assess how far the

nanoparticles might migrate into skin.

The team used a technique called nonlinear [optical microscopy](#), which illuminates the sample with short pulses of laser light and measures a return signal. Initial results show that ZnO nanoparticles from a formulation that had been rubbed into [skin patches](#) for 5 minutes, incubated at body temperature for 8 hours, and then washed off, did not penetrate beneath the stratum corneum, or topmost layer of the skin. The new optical characterization should be a useful tool for future non-invasive in vivo studies, the researchers write.

More information: "[Characterization of optical properties of ZnO nanoparticles for quantitative imaging of transdermal transport](#)," *Biomedical Optics Express*, Vol. 2, Issue 12, pp. 3321-3333 (2011).

Provided by Optical Society of America

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