

Researchers discover how the sun damages our skin

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Binghamton University Assistant Professor of Biomedical Engineering Guy K. German oversaw the study. Credit: Binghamton University, State University of New York

Researchers at Binghamton University, State University of New York

have discovered the mechanism through which ultraviolet radiation, given off by the sun, damages our skin.

What kind of [ultraviolet radiation](#) is the worst for our skin? And how exactly does the sun damage it? Those two questions are at the heart of a new study by Zachary W. Lipsky, a biomedical engineering Ph.D. candidate at Binghamton University. The study was overseen by Assistant Professor of Biomedical Engineering Guy K. German.

"The cosmetics industry is a huge multibillion-dollar business, and they're all trying different things to add to their sunscreens to make them better at protecting skin," German said. "Up until this point, however, there have been a lot of studies about skin damage, but none that properly look at how UV affects the mechanical integrity of skin."

Ultraviolet [radiation](#)—which the human eye can't perceive—is broken down into four categories depending on wavelength and photon energy. Previous studies have documented how each type of UV radiation penetrates to different depths into the skin and that prolonged exposure can lead to skin cancer, but exactly how it damages [human skin](#) in other ways has received less attention. Researchers from the cosmetics industry have debated for years whether UVA is worse than UVB for causing photodamage, which leads to the early onset of wrinkles and increased tissue fragility.

The Binghamton study used samples of female breast skin—chosen because it is typically exposed only to low levels of sunlight—that were subjected to various wavelengths of UV radiation. What Lipsky and German found is that no UV range is more harmful than another—rather, the damage scales with the amount of UV energy that the skin absorbs. A more significant discovery, however, is the mechanism for how exactly UV damages skin. The study shows that UV weakens the bonds between cells in the stratum corneum—the top layer

of skin—by affecting proteins in corneodesmosomes that help the cells to adhere together. That's why sunburn leads to skin peeling.

"What we noticed when we applied more and more UV radiation is that the dispersion of these corneodesmosomes was increasing," Lipsky said. "They're supposed to be these nice little distinct points surrounding cells, but with more irradiation, they essentially look exploded, moving away from their position. We conclude that because of the disruption of these corneodesmosomes, it damages the skin's [structural integrity](#)."

Building on the findings of this study, Lipsky and German are doing further research about how UV radiation affects deeper layers of the skin.

As those experiments continue, Lipsky said the most important takeaway for now is that skin protection is important no matter what season of the year it is.

"We're trying to push the message to use sunscreen not just for preventing skin cancer, but also to keep the integrity of your [skin](#) so you don't get infections or other problems," he said.

"The stratum corneum is the first barrier to the outside environment, so we need to protect it against all these different bacteria and nasty stuff that can get into our bodies."

The study, "Ultraviolet light degrades the mechanical and structural properties of human stratum corneum," was published in the *Journal of the Mechanical Behavior of Biomedical Materials*.

More information: Zachary W. Lipsky et al, Ultraviolet light degrades the mechanical and structural properties of human stratum corneum, *Journal of the Mechanical Behavior of Biomedical Materials* (2019).

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