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Human skin begins tanning in seconds, and here's how

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We all know that human skin tans after days spent in the sun. That relatively slow process has known links to ultraviolet (and specifically UVB) exposure, which leads to tanning only after it damages the DNA of skin cells. Now, researchers reporting online on November 3 in *Current Biology*, a Cell Press publication, have uncovered a much speedier path to pigmentation.

The newly discovered response is likely to provide rapid protection against UV damage, the researchers say, and understanding how it works might impact the design of sunscreens in the future.

"Our work shows that a dedicated UV receptor allows skin cells to immediately detect and respond to UV light," said Elena Oancea of Brown University. "We found that human skin detects light using a mechanism similar to that used by the retina, on a timescale significantly faster than was previously known."

That immediate response occurs within a matter of seconds in response to UVA light. UVA accounts for about 95 percent of the ultraviolet radiation at the Earth's surface. UVB makes up the other 5 percent. Scientists did know that UVA causes oxidative damage to cells and leads to pigment darkening in a matter of minutes. The question was how.

Oancea's team found that exposure of pigment-producing cells from human skin to UVA leads to the early synthesis of melanin pigment in a process involving calcium release. What's more, the skin's UVA

response depends on rhodopsin, a light-sensitive ingredient also found in the retina of the eye.

"Our findings show that both the eye and skin—the only two organs constantly exposed to solar radiation—use similar molecular mechanisms to decode light," Oancea said.

The studies show that melanin production can be measured in human skin cells within an hour of UV exposure. That's key because melanin doesn't just make the skin darker. It also protects the skin by absorbing ultraviolet radiation and converting it to a less harmful energy in the form of heat.

"We hypothesize that the early melanin production triggered by rhodopsin activation provides a first line of defense against ultraviolet light-induced damage," Oancea says. "If this is the case, then this pathway and its protective capacity should be taken into consideration in the design and use of broad-spectrum sunscreens."

Provided by Cell Press