

# Sun-seekers court addiction

Studies in mice hint at a dark side of sunbathing.

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If shown to be possible in humans, addiction to the Sun could help explain why some tanners continue to seek out sunlight despite being well aware of the risks.

The lure of a sunny day at the beach may be more than merely the promise of fun and relaxation. A study published today reports that mice exposed to ultraviolet (UV) rays exhibit behaviours akin to addiction.

The researchers found that mice exposed repeatedly to UV light produced an opioid called  $\beta$ -endorphin, which numbs pain and is associated with addiction to drugs. When they were given a drug that blocks the effect of opioids, the mice also showed signs of withdrawal — including shaky paws and chattering teeth.

If the results hold true in humans, they would suggest an explanation for why many tanners continue to seek out sunlight, despite the risks — and, in some cases, even after being diagnosed with skin cancer.

“This offers a clear potential mechanism for how UV radiation can be rewarding and, in turn, potentially addictive,” says Bryon Adinoff, an addiction psychiatrist at the University of Texas Southwestern Medical Center in Dallas, who was not involved with the study. “That’s a big deal.”

## Unhealthy reward

Oncologist David Fisher of the Massachusetts General Hospital in Boston and his colleagues became interested in sunlight addiction after studying the molecular mechanisms of pigment production in the skin after UV light exposure. In the new study published today in *Cell*<sup>1</sup>, they show that in mice, some skin cells also synthesize  $\beta$ -endorphin in response to chronic, low doses of UV light.

That  $\beta$ -endorphin generated was enough to boost pain tolerance in the mice and change their behaviour. Although mice normally prefer the dark, the mice exposed to UV light would seek out a brightly lit box if they were taught to associate the darker box with treatment with naloxone, a drug that blocks the action of opioids. But mice that were genetically unable to make  $\beta$ -endorphin lacked these behavioural changes.

One caveat, however, is that although the mice were shaved for the experiment, they are nocturnal, fur-covered animals whose responses to the Sun may not mimic those of humans. And Adinoff notes that although the study shows that mice experience a physical reward for UV exposure, it does not show that they have become addicted.

Plus, the effects of  $\beta$ -endorphin were not as pronounced as those seen in previous studies of mice given morphine. Even so, Fisher says that even if the results hold true in humans, the impact on society could be far greater because Sun exposure affects a much larger population than do opioid drugs.

### **An underappreciated problem**

For years, researchers have been interested in what pushes people to tan compulsively. Adinoff and his team, for example, have shown that exposure to UV light boosted blood flow to the brain's reward centres in humans<sup>2</sup>.

Still, Steven Feldman, a dermatologist at the Wake Forest University School of Medicine in Winston-Salem, North Carolina, says that the public is largely unaware of the addictive potential of tanning. Fisher's work provides important insights. "This work establishes a firm scientific foundation for what we maybe already should have known, but haven't been paying attention to," he says.

Even if the Sun is shown to be addictive, social pressures are still likely to compel people — especially young adults — to sunbathe, Feldman notes. "We're constantly telling people not to expose themselves to the Sun," he says. "But there's an impression among teenagers that they're more likely to get a date this weekend if they tan."

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### **References**

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1. Fell, G.L., *et al.* *Cell* **157**, 1527–1534 (2014).
2. Harrington, C. R. *et al.* *Addict. Biol.* **17**, 680–686 (2012).