

Top Stories in Research

By Dr. Jan Dutz

What's new on the research front? The articles from which these summaries of the latest in skin research are taken are so hot off the press the ink has barely dried.

Skin dendritic cells can sample the external environment

The skin is a virtually impermeable barrier that prevents us from drying out and keeps external threats at bay. Much of the barrier function of the skin comes from the outermost layer, a protein and lipid (fat) "brick wall" called the stratum corneum. However, dendritic cells in the outer layer of the skin have octopus-like tendrils that can sample the skin's surroundings even outside this wall.

In an article published in the *Journal of Experimental Medicine*, investigators showed that these tendrils can sample the outside of the skin without permanently damaging the barrier. The dendritic cells are crucial for sensing

the outside environment and developing antibody responses to bacteria living on the skin's surface.

Removing the dendritic cells makes mice more

susceptible to common bacterial infections that can be limited by antibodies.

This finding suggests it may be possible to develop vaccines that can be placed onto the skin, without the need for needles. Dendritic cells in the skin could then sample these vaccines and carry them into the body.

Circadian rhythms and skin cancer: Is evening sun more dangerous than morning sun?

All organisms have time-tracking mechanisms called circadian clocks. These are regulated by the brain, under the influence of light and other stimuli, to control day/night cycles



such as sleep and feeding.

A report by Sancar and colleagues (published by the *Proceedings of the National Academy of Sciences*) recently revealed that

genes controlling the repair of DNA damaged by UV light (from sunlight) work in such a circadian rhythm. In mice (nocturnal animals), these repair genes are most active in the afternoon. Consequently, tumours were more readily induced when mice were exposed to high levels of UV radiation in the morning compared with the afternoon, when the repair mechanisms were more efficient.

As the circadian cycles in humans are opposite to those in rodents, it is possible that evening sun—rather than morning sun—is more dangerous to people. Whether this truly applies to humans is not yet clear, but it will be important to find out. Certainly sunburn is a known risk factor for skin cancer and should be avoided at all times.

Zinc deficiency results in skin inflammation

Deficiency of zinc, a trace element, that presents in infants as a scaly and weeping rash around the mouth and groin can indicate an inherited disorder. This condition is called acrodermatitis enteropathica. Recently, the gene responsible for this genetic form of zinc deficiency was found to

encode a molecule that transports zinc from the gut. The same skin eruptions can also be caused by a low dietary intake of zinc. Now, investigators have reproduced zinc deficiency in a mouse model and published their findings in the *Journal of Clinical Investigation*.

Analysis of dietary zinc-deficient mice showed that altered energy levels in skin cells or keratinocytes made them more susceptible to common irritants such as soap and oils. The keratinocytes release adenosine triphosphate (ATP), which then results in the expression of molecules that attract neutrophils or early inflammatory cells. The number of dendritic cells—immune cells that initiate immune responses—in the skin is also diminished as a consequence of zinc deficiency. The lack of dendritic cells paradoxically results in increased inflammation after irritant exposure. It turns out that dendritic cells release substances that break down ATP and limit inflammation in this system.

These results are important. They demonstrate that dendritic cells in the skin can dampen inflammation caused by irritants and that zinc is essential to skin health. **CS**

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