Thomas Edlinger
Public Relations and Event Management

Medical University of Graz
Neue Stiftingtalstraße 6
8010 Graz
thomas.edlinger@medunigraz.at

Press release
For immediate release

Summer, sun and skin protection:
How the microbiome influences the immune response of the skin

Graz, 27 May 2025: The temperatures are rising, the sun is shining brighter and summer is getting closer. As the anticipation of holidays and free time outdoors increases, the topic of skin health also becomes more important. In an international study, Medical University of Graz researchers have investigated what role the skin microbiome plays in protecting the skin from UV radiation. Exciting new findings about natural sun protection have come to light. Peter Wolf, Professor of Dermatology and Venerology at Med Uni Graz, and his team were the driving force behind the study.

The skin is alive—along with billions of microorganisms

Although the skin is often perceived as being a passive shell, it is anything but an inanimate object. Not only does it act as a barrier to the environment, produce signaling molecules and serve as the most external active outpost of the complex immune system; as the largest organ in the human body, it also hosts a variety of microorganisms—bacteria, viruses and fungi—that are referred to as the skin microbiome. Invisible to the naked eye, these organisms are by no means merely silent occupants: Many of them perform important functions for skin health.

The focus of the current study is on whether and how the microbiome protects the skin from the damaging effects of UV radiation—especially UV-B radiation. UV-B rays have more energy than UV-A rays and are mainly responsible for sunburn and DNA damage to skin cells.

How microbes support immune response

With the help of modern methods such as microbiome sequencing, immunological tests, cell cultures and biological models, the researchers were able to prove that certain skin bacteria influence the immune response triggered by UV radiation. The focus is on a substance called urocanic acid, which naturally occurs in its trans form in the keratin layer of the skin. After exposure to UV radiation, this trans-urocanic acid is converted into cis-urocanic acid, which has an immunosuppressive effect.

This suppression can be problematic because a weakened immune system is less effective at recognizing and eliminating damaged skin cells, which can increase the risk of skin cancer. This is precisely where the microbiome comes into play: Certain bacteria on the surface of the skin produce the enzyme isomerase, which can convert cis-urocanic acid into its harmless trans form.

Other bacteria produce the enzyme urocanase, which metabolizes cis-urocanic acid, and use the resulting nitrogen and oxygen molecules for their own growth. In this way, these bacteria take cis-urocanic acid away from the skin and indirectly contribute to maintaining the natural immune response of the skin—a previously unknown protective mechanism.

No replacement for sunscreen—but a supplement

This discovery broadens our understanding of skin protection but does not in any way replace classic sun protection measures such as using sunscreen with UV filters. Instead, it shows how complex the protective mechanisms of our skin are—and how much they depend on the microbial world on the surface of the skin.

New approaches to dermatology

This mechanism opens up new perspectives for dermatological research. Future sunscreen products could specifically take into account the microbiome of the skin. Peter Wolf explains, "These findings open the door to microbiome-savvy sun protection. Not only do we protect the skin from UV radiation, but we also take into account how the resident microbes can alter the immune landscape following exposure. In the future, the next generation of sunscreen as well as topical treatments that modulate microbial metabolism will be used to minimize, maintain or increase UV-induced immunosuppression when it is clinically advantageous, for example in phototherapy."

Link to the study:
https://www.sciencedirect.com/science/article/pii/S0022202X25004051?via%3Dihub

Further information and contact

Peter Wolf
Department of Dermatology and Venereology
Medical University of Graz
Tel.: +43 316 385 13026
Email: peter.wolf@medunigraz.at

Profile: Peter Wolf
Peter Wolf is head of the Department of Dermatology and Venereology and directs the Photodermatology research unit at Med Uni Graz. He has many years of expertise as a dermatologist specializing in inflammatory skin diseases as well as clinical and experimental photoimmunobiology. He also focuses on investigating cellular mechanisms of photo(chemo)therapy, specifically pathogen participation in immune cells in order to develop new ways to treat psoriasis, neurodermatitis as well as malignant diseases with strong inflammatory components such as skin lymphoma.
The international research project was embedded in the Med Uni Graz PhD program and received support from the FWF (Austrian Science Fund) and the ANR (Agence Nationale de la Recherche) in France (Lyon), among others.