

Skin has an internal clock: study

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A German research team at Charité – Universitätsmedizin Berlin together with scientists at a company in Hamburg has now discovered that human skin has an internal clock responsible for the time-based steering of its repair and regeneration, among other things. The team published its first results from their basic research in the current issue of *Proceedings of the National Academy of Sciences (PNAS)*.

Our skin is one of the body's essential organs and perhaps the most versatile: Besides representative, communicative and sensory functions, it serves as our body's boundary to the environment, forms an active and passive barrier against germs and helps keeping conditions constant for other important systems of the body, even though environmental conditions can change drastically. Frost, heat, sunlight and moisture — a variety of challenges for our skin — have different effects depending on the time of day.

Prof. Achim Kramer's research team from the field of chronological biology at Charité and Dr. Thomas Blatt from the Skin Research Center in Hamburg have now found out that skin adapts to these time-dependent conditions.

The researchers took cell samples (keratinocytes) from the uppermost layer of skin from young, healthy test persons at various times of the day. Analysis of numerous genes in the keratinocytes showed that important factors for the regeneration and repair of skin cells are regulated by a biological clock. One of these factors, the molecule called the Krüppel-like-factor (Klf9) slows down cell division in the

keratinocytes: When the researchers reduced the activity of this factor, they observed faster growth in the skin cell cultures. On the other hand, increased activity of Klf9 was connected with slower cell division. At the same time, it was shown that the stress hormone cortisol also controls the activity of Klf9 and can thus deploy a medical effect on common skin diseases like psoriasis.

The job of the biological clock is to control the exact timing of various processes like cell division, cell differentiation and DNA repair in [skin](#). Prof. Kramer is already looking to the future: “If we understand these processes better, we could target the use of medication to the time of day in which they work best and have the fewest side effects.”

More information: Florian Spörl, Thomas Blatt, Achim Kramer et al.: Krüppel-like factor 9 is a circadian transcription factor in human epidermis that controls proliferation of keratinocytes. *PNAS*, July 3; 109(27):10903-8. [DOI: 10.1073/pnas.1118641109](https://doi.org/10.1073/pnas.1118641109)

Provided by Charité - Universitätsmedizin Berlin

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