

Research breakthrough for drugs via the skin

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Lars Norlén. Photo:Ulf Sirborn

(Medical Xpress) -- A research team at Karolinska Institutet has succeeded in describing the structure and function of the outermost layer of the skin - the stratum corneum - at a molecular level. This opens the way not only for the large-scale delivery of drugs via the skin, but also for a deeper understanding of skin diseases.

"You could say that we've solved the puzzle of the skin barrier, something that has great potential significance for dermatology," says principal investigator Lars Norlén, associate professor at Karolinska Institutet's Dermatology and Venereology Unit.

The upper layer of the skin is a watertight barrier called the stratum corneum. A research group at Karolinska Institutet have now structure determined this barrier layer at a [molecular level](#), unlocking the secrets

of the skin's perviousness. This will hopefully enable the widespread administration of drugs through the skin instead of via pills or injections, which brings several advantages; for example, it means that drugs can be delivered evenly over time instead of in doses, and patients bypass the first-passage metabolism, whereby the entire dose passes the liver, thus increasing the risk of adverse effects.

"We can now construct computer simulations to help us find out which substances have to be added to different drugs to open up the skin," says Dr Norlén. "We hope to one day be able to administer regular drugs like insulin and antibiotics this way."

To conduct their study, the researchers developed an entirely new experimental approach involving rapidly freezing tiny [skin](#) samples and studying them under a low-temperature electron microscope.

"This has given us an unprecedented opportunity to determine the molecular structure and function of native cells and tissues in situ without having our data muddied by the addition of dyes, solvents or plastics," adds Dr Norlén.

Their discovery has profound significance for dermatology. The majority of [skin diseases](#) manifest themselves in some kind of functional disorder of the skin's protective barrier, and the researchers now want to use their method to determine such changes at a molecular level. If they succeed in this, it will be a decisive step towards a deeper understanding of these diseases and, hopefully, the development of new, improved treatments.

"This may be a breakthrough for [dermatology](#)," says Dr Norlén. "Our team has devoted the past 20 years to unlocking the mysteries of the stratum corneum."

All land-living organisms are surrounded by a protective watertight shell. In humans and other vertebrates, it comprises a uniquely complex layer of fat between the cells of the stratum corneum.

"Understanding how this protective barrier has developed is an important step towards explaining why life on land exists and is even possible," says Dr Lars Norlén.

More information: Ichiro Iwai, HongMei Han, Lianne den Hollander, Stina Svensson, Lars-Göran Öfverstedt, Jamshed Anwar, Jonathan Brewer, Maria Bloksgaard, Aurelie Laloef, Daniel Nosek, Sergej Masich, Luis A. Bagatolli, Ulf Skoglund & Lars Norlén, The Human Skin Barrier is Organized as Stacked Bilayers of Fully-extended Ceramides With Cholesterol Molecules Associated With the Ceramide Sphingoid Moiety, *Journal of Investigative Dermatology*, online 26th April 2012. www.nature.com/jid/index.html

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