Moisturising products can help improve the look and feel of dry skin, but little is known about how these products may impact the bacterial ecosystem of the skin, the skin microbiome. Researchers Dr Barry Murphy and Dr Andrew Mayes from Unilever R&D explored the changes in skin health and the associated microbiome after using a body lotion for five weeks. They found that improvements in the skin’s barrier function, which included increases in essential skin lipids and ceramides, were supported by changes in the composition and function of the microbiome. Understanding how the skin microbiome contributes to skin health is important in developing more effective products to help address dry skin. Unilever has a large range of moisturising cosmetic products, including under the Dove and Vaseline brands.

Skin functions as the body’s first line of defence against invaders such as bacteria and viruses, as well as acting as a vital sensory organ. It helps regulate body temperature, protects us from external exposures such as sunlight and pollution, and helps maintain the balance of fluids in the body. Skin is one of the body’s largest organs, covering nearly 25m², and makes up almost a sixth of our body weight. Due to its visibility and purpose, skin health and appearance can have significant impact on mental and physical health and wellness.

Dry skin affects around a third of the population globally. It is typically characterised by dry, itchy and rough skin, sometimes with flaking or scaling. It is caused by a lack of moisture, something that is usually regulated by the upper layers of the skin, the epidermis. There are a number of different factors that can contribute to dry skin, such as the environment (especially the weather), pollution, hot baths and showers, certain soaps, and genetics.

The stratum corneum is the outermost skin layer and is made up of specialised cells and lipids, which form a structure similar to a wall. In this so-called ‘bricks and mortar’ arrangement, the cells (corneocytes) are the ‘bricks’ and are held together by the lipid ‘mortar’ composed of ceramides, fatty acids, and cholesterol.

These essential lipids are produced by the skin to help prevent moisture loss due to evaporation and to block out irritants that may inflame the skin. Disruption or depletion of lipid levels often causes dryness and irritation. Thus, ceramides, free fatty acids, and cholesterol play a vital role in ensuring that skin remains in good condition. These molecules also help maintain skin at a slightly acidic pH (between 5.4 and 5.9). This ‘acid mantle’ provides the ideal environment for the beneficial skin microbiome to thrive while protecting against invading pathogens.

The human microbiome is a community of naturally occurring microorganisms, consisting mostly of bacteria but also fungi and viruses, and plays a vital role in human health. Each part of the body has its own microbiome, including the mouth, gut, urogenital system, and skin. Unilever scientist Michael Hoptroff suggests that a ‘balanced’ skin microbiome can help to support skin health, but when disturbed or ‘unbalanced’ it can contribute to skin problems. Alterations in the skin microbiome have been associated with a number of skin-related concerns, including acne, dandruff, and underarm odour.

Cosmetic products that support the function of a healthy skin microbiome can help maintain skin health. While a range of products exist that can effectively moisturise the skin, it is not known how these improvements in the skin are reflected in the skin microbiome. To progress this research area, Dr Barry Murphy, Dr Andrew Mayes, and their teams from Unilever R&D investigated how skin is impacted by product use and how this relates to the skin microbiome.

The researchers studied the impact of a body lotion on skin health, lipid composition and skin microbiome in a group of female subjects, between 18 and 55 years of age, with moderately dry skin on their lower legs. Participants applied the body lotion twice a day.

At the start of the study and after a five-week application period, skin health metrics were assessed using both visual and instrumental measures. A range of samples were also collected from the skin of the participants and analysed for lipid and microbiome changes using both qualitative and quantitative methods.

Skin remains in good condition.

As well as the increase in the amount of lipids present, the researchers also investigated whether the composition of the lipids had changed. They discovered that the body lotion resulted in an increase in longer-chain lipids (both fatty acids and ceramides) – which are critically important for ensuring a more effective skin barrier.

While the body lotion applied contained lipid ingredients with 16 or 18 carbon molecules in their structures, there was evidence that these molecules were elongated to longer chain lengths in the skin by the end of the five-week application period, demonstrating the effectiveness of the product. Although data were analysed after five weeks of use, positive changes to skin in terms of visual dryness were observed even sooner than this.

Stratum corneum cohesion is a measure of how strong and resilient the upper layer of skin is. In order to test this, the researchers used sticky tape, similar to Sellotape®, to sample the surface of the skin. If the skin has lower levels of cohesion, more protein from the skin is bound on the tape, providing evidence that the skin is less-well held together, i.e., it is less cohesive. Improvements in this measure demonstrated that the lotion application improved the strength of the skin and made it more moisturised.

Using state-of-the-art mass spectrometry techniques, the researchers were able to quantify the levels of over 500 lipid species. They discovered increases in a large number of lipids in all three classes, i.e., ceramides, free fatty acids, and cholesterol which are all essential in ensuring that skin cells are held tightly together – a feature of healthy and moisturised skin.

Maintaining good skin barrier function and ensuring good hydration of the stratum corneum is important for skin health.

The lotion was able to improve signs of dry skin when applied for five weeks.
The data published suggests that the product used in the current study has exciting implications for skin health. It is important to ensure that skincare products you use are mindful of both the skin barrier and the microbiome. Using products that hydrate and nourish skin and support the growth and function of beneficial skin microbes is the best way to ensure that your skin and its microbial inhabitants function correctly.

Research Objectives

Researchers Barry Murphy, Andrew Mayes, and Michael Hoptroff at Unilever are investigating how the skin microbiome and lipidome are related to skin health and lotion effects.

Detail

Barry Murphy & Michael Hoptroff
Unilever R&D Port Sunlight, Quarry Road East, Bebington, Wirral, CH63 3JW, UK

Andrew Mayes
Unilever R&D Colworth, Bedfordshire, MK44 1LG, UK

Bio
Unilever has an established R&D global capability in human biology and human microbiomics. In partnership with leading experts in the field of next generation sequencing and bioinformatics, the group has undertaken numerous clinical studies to obtain a deeper understanding of the role of the skin and its microbiome in consumer-relevant conditions across the Beauty & Wellbeing and Personal Care brands, examining the skin and its microbiome associated with cosmetic skin conditions such as dry skin, axillary malodour, and skin ageing.

References


Personal Response

What is the best thing that we can do to keep our skin healthy?

Healthy skin is a combination of having a healthy barrier but also a healthy microbiome. Disruption to one or the other can potentially lead to impairment of skin roulting in dry skin but also concerns like acne or skin discomfort. It is important to ensure that skincare products you use are mindful of both the skin barrier and the microbiome. Using products that hydrate and nourish skin and support the growth and function of beneficial skin microbes is the best way to ensure that your skin and its microbial inhabitants function correctly.