Skin Barrier SCIENCE

Supporting skin's most important function

BY KATHRYN MAZIERSKI

Understanding the skin barrier is essential for an esthetician. Supporting this important system is the first step in correcting any inflammatory skin condition: acne, rosacea, and a host of others.

An amazing body of scientific discovery on the topic of corneobiology—the study of the skin barrier—has been produced by researchers such as Peter Elias, Richard Gallo, Albert Kligman, Hans Lautenschläger, Lars Norlén, and others. One of the things this research reveals is that dermatologists, estheticians, and other skin care professionals may unwittingly be recreating the inflammatory processes they are trying to treat. We routinely strip away the skin's first line of defense, the acid mantle, as a side effect of our treatments and, too often, we do not pay enough attention to restoring it. Any time you see redness in the skin, it is a sign that the skin barrier has been compromised.

The Skin's Barrier Functions

The role of the stratum corneum (the skin's outer layer) is to protect us against environmental hazards while preventing water loss from the skin. It contains an entire set of defenses—Kligman counted 16 separate types of barrier function operating within this skin layer. All are interconnected, co-regulated, and interdependent. If one barrier function is compromised, others will also be affected.

The barrier function that most estheticians are familar with is the permeability barrier, which prevents transepidermal water loss (TEWL), and, in the other direction, prevents allergens, irritants, microbes, and pathogens from entering the body through the skin. To understand how we can support this permeability barrier and repair it when it becomes damaged, we need to know a little about three lipids that are found in the stratum corneum.

THREE VITAL LIPIDS

Under a microscope, the stratum corneum looks similar to a brick wall. The corneocytes are the "bricks," embedded in "mortar" that is made up of multiple sheets of lamellar membranes. These membranes are the permeability barrier, and they are made of a mixture of three different lipids: ceramides, cholesterol, and long-chain free fatty acids. These three lipids account for up to 10 percent of the dry weight of the stratum corneum, and they work together to waterproof the skin.

The proportion of the lipids is vital for correct skin barrier function. All three must be present, and normal skin requires a ratio of 1:1:1 (in other words, each of the three is present in the same amount). If the epidermis overproduces or underproduces one of the lipids, a good permeability barrier cannot form. Skin problems are the result. An example is atopic dermatitis, a chronic inflammatory skin condition in which ceramides are not produced in sufficient quantities. Clients with atopic dermatitis need more ceramides, so a 3:1:1 ratio is used in products aimed at these clients.

Although ceramides are a popular ingredient, the well-informed esthetician must realize that ceramides on their own are not the key to skin barrier repair, because all three key species of lipids within the permeability barrier are equally important. All three lipids must be present in sufficient amounts, and in the correct ratio, for the condition being treated.

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The Acid Mantle

The stratum corneum's first line of barrier defense is the acid mantle on the surface of the skin. The acid mantle has many tasks. It contains trans-urocanic acid, our natural defense against ultraviolet (UV) radiation—this acid is responsible for filtering out around 70 percent of the UV-B rays that we are exposed to. Deeper within the skin, a key protein called filaggrin is metabolized (broken down) to provide essential barrier components. On the skin surface, these components are further degraded to produce what is known as "natural moisturizing factor," which plays a role in keeping the epidermis hydrated and overall barrier function.

Maintaining the skin's surface at its natural, acidic pH level is critical for proper skin barrier function. When we strip away the acid mantle, the consequences include increased TEWL, chronic dry skin, various inflammatory conditions, and even an increased risk of skin cancer.

What else happens when the acid mantle is removed? First, the skin's pH rises, making it alkaline instead of acidic. In response, the stratum corneum releases inflammatory cytokines in an attempt to trigger more lipid production. Normally, this would be a good thing and would help return the whole system to a healthy state. However, if this cytokine cascade is continual, chronic inflammation sets in. The result is a very thin, leaky, and permeable skin barrier.

In other situations, increased skin pH may release serine proteases, which block lipid production. In this case, lipids stay trapped within the corneocytes instead of forming the permeability barrier. The result is complete failure of the skin barrier system.

Restoring the acid mantle (in other words, getting the skin back to an acidic pH) is the first step in restoring barrier function.

Raising the pH of the skin for sustained periods of time can bring on or heighten the symptoms of acne, atopic dermatitis, rosacea, photodamage, and other conditions—not only affecting the epidermis, but also the dermis. Keep the skin acidic!

Corneotherapy: Restoring the Skin Barrier

When the skin barrier has been compromised, simply using anti-inflammatory ingredients is not enough to restore it. We must pursue treatments that return the barrier to its natural state of balance. This area of skin care is known as corneotherapy or skin barrier therapy.

An important goal of corneotherapy is to generate the three lipids that form the permeability barrier. When we provide these to the skin in the correct ratio using topical corneotherapeutic products, the synthesized lipids make their way through the stratum corneum to be processed along with those that were generated within the skin, forming the lamellar membranes that make up the permeability barrier. The lipids in corneotherapeutic products must always be chemically identical to those within the stratum corneum.

Restoring the acid mantle (in other words, getting the skin back to an acidic pH) is the first step in restoring barrier function. This will:

- Turn off inflammatory processes within the epidermis.
- Allow the permeability barrier to start reforming.
- Improve the skin's antimicrobial defenses, decreasing the penetration of allergens and pathogens.

Do Barrier Repair Creams Work?

As the terms *barrier repair* and *corneotherapy* become more widely known, they have started to show up more often in product marketing. Many manufacturers who use these terms do not provide any supporting data that their products do what they claim. On closer inspection, many so-called barrier repair products do not contain the ingredients needed to get results. They may even cause more harm to the skin barrier.

Here are the most common reasons why a barrier repair product does not work:

- It does not contain all three of the necessary lipids: ceramides, cholesterol, and long-chain free fatty acids.
- It does not contain the correct ratio of those lipids.
- It has an incorrect pH.

Poor formulations often use silicones or other occlusive ingredients in an attempt to "block up the gaps" and prevent further TEWL. These substances impede the natural functionality of the skin barrier instead of restoring it. This means some products touted as barrier repair products actually have the opposite effect—a situation that should be of great concern to any skin care professional.

Getting it Right

With all this in mind, what are the basics you need to know in order to practice effective corneotherapy? Here are the key points:

- Respect the integrity of the epidermis, starting with the first lines of barrier defense.
- Keep the skin's surface pH acidic.
- Restore the antimicrobial barrier and natural UV-B filters.
- When looking for a barrier repair product, use only those that provide ceramides, cholesterol, and long-chain free fatty acids in the 1:1:1 or 3:1:1 ratio.

At the same time, these are the things to avoid:

- Any procedure or product that decreases hydration.
- Mineral oils and other petroleum-based products.
- Products that contain emulsifiers. These have the side effect of destroying the lipid structures within the permeability barrier.
- Products that contain fragrance.
- Products that contain preservatives.

With a better understanding of the structure and function of the skin barrier, estheticians will recognize the importance of treating it with the respect it deserves. Overexfoliating, harsh or incorrect modalities, and incorrect product formulations all work together to create an inflammatory situation for your client. The key to success in treating skin starts with a full assessment of the health of the skin barrier and the correct strategies to begin the repair process. Once the barrier is restored, wonderful and lasting results can be achieved for your client. S

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