ultimate understanding

Skin pH, the microbiome, & barrier function for skin health

Robert Manzo

The art and science of professional cosmetic chemistry formulation has advanced significantly in recent years with modern research, development techniques, and an understanding of the skin. The understanding of the synergies of the skin microbiome, barrier function of the skin, and the pH of the natural skin surface is very important to understand. If in an optimal state of balance, these three properties (continuum) of the skin can, in part, define good skin health.

Why is good skin health important? It seems like an easy answer, but most professionals and consumers do not understand it well. Excluding skin pathology or disease, good skin health is defined by continual maintenance and prevention processes. Fine lines, wrinkles, skin tone and texture, pore size, dry skin, dark spots, and other aesthetic issues contribute to the look of aging skin. A common root cause of these aesthetic issues is inflammation. How does skin barrier function, the microbiome, and the natural pH create a condition which degrades the functions of the skin?

SKIN pH

Most consumers have gone tone deaf to the phrase pH-balanced. Consumers have seen it used for 50 years in all kinds of contexts. If consumers and professionals were polled and asked, "What is the natural pH of the skin?" Most would say 5.0 to 6.5 – some will be a bit lower and some will be a bit higher.

In fact, the natural pH of the skin where it functions best is 4.5 to 5.2. Skin is much more acidic than people think. As skin pH drifts higher the barrier function of the skin and the skin microbiome changes to the point that it will eventually become poorly functioning. The higher the pH is, the easier it is for bacteria to grow and populate on the skin. Depending on the type of bacteria that grows out on the skin, this can lead to blemishing and acne. Since each person's microbiome is unique to them, the effects of high pH can be more dramatic on a case by case basis.

Low pH is less common. For people who undergo procedures like peels and even use peels in a home environment, low pH can be an issue. Low pH skin surfaces have the effect of breaking down the lipid structure of the stratum corneum (surface layer of the skin) which can lead to a variety of unpredictable conditions.

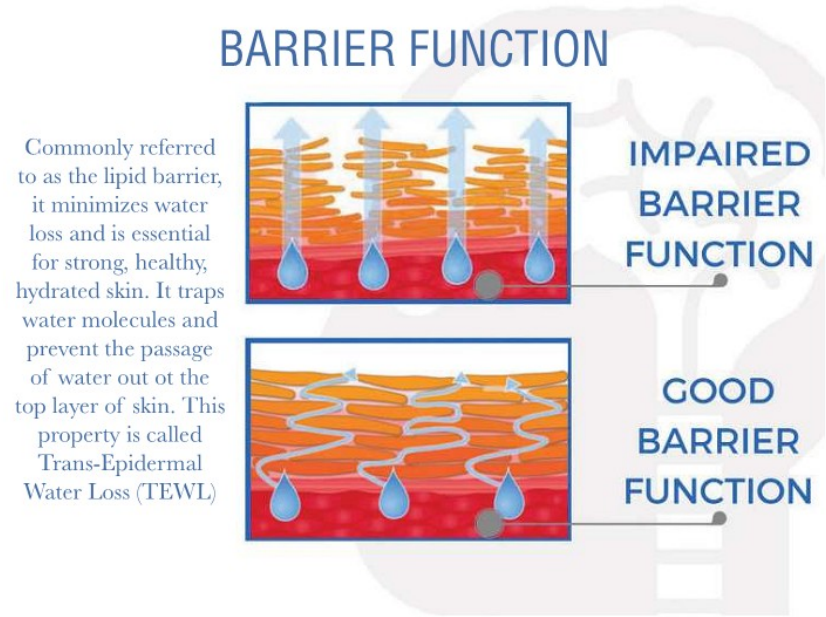
One of the leading influences on pH is household water. Household water can range up to and over a pH of 7. Using some types of bar soaps and depilatories can drive up skin pH to nine before if drops through naturally buffering.

BARRIER FUNCTION OF SKIN

What is it? In the most basic terms, barrier function of the skin is a measure of the overall health of the skin. The barrier function of skin is one of the most critical functions of skin. It protects the skin from outside influences including bacteria, toxins, and pollutants. The intact barrier also regulates the body's ability to hold water in and keep an adequate amount of hydration in the body. The primary constituents of the barrier function are the corneocytes and the lipids that lie between them.

The leading factor of skin lipid atrophy (natural loss of lipids) is simple aging. As the skin ages, the production of key lipids in the skin slows dramatically. The skin barrier function is then compromised, then toxins can enter, and water loss occurs.

This process can be seen in this basic diagram.



Impact on Acne

When using several different types of acne treatments, they often lead to barrier impairment due to the aggressive nature of the individual ingredients. These include benzoyl peroxide, salicylic acid, retinoids, antibiotics, and others. These chemicals can erode the lipids in the stratum corneum which can then lead to significant dehydration and then cause the skin to break out more. You then have the classic acne cycle set up in skin.

Sensitivity, Redness, & Inflammation

People often complain that their skin is so sensitive that water can make it sting. While this is rare, an impaired barrier can lead directly to skin inflammation and redness, due to a biochemical cascade which starts in the skin to protect it from external toxins. Lipid and barrier repair active ingredients must be used to repair the barrier or the skin will stay in this chronic state of impairment.

Excessive Sebum & Oil Production

When using alcoholic toners and other products or employing manual exfoliation techniques, be aware that if the client has a tendency to produce oil that these techniques will certainly impair barrier; which the skin will respond to by producing more oil in an attempt to repair barrier function. This is often called the rebound effect.

Skin Texture

When the barrier is impaired, the stratum corneum tends to build-up and thicken. This can lead to a rough surface texture on skin due to the corneocytes sticking to the skin surface.

Microbiome

In recent years, the microbiome of the skin has taken a more important role in understanding the natural flora of the skin surface. It is becoming one of the most highly researched areas of skin care. The microbiome works in conjunction with the skin barrier to provide a balance in the skin.

The microbiome is a blend of micro-organisms that is unique to everyone. The microbiome will be varied in different regions of the body. There are hundreds of different bacteria that co-exist beneficially on the surface of the skin. When the microbiome is disturbed, it most likely will affect the barrier function and attempt to correct back to its native balance.

There have been many products on the market which contain prebiotics, probiotics, postbiotics and synbiotics. Prebiotics for skin care are most important as they can help the natural microflora of the skin to rebalance. They often contain ferments which act as nutrients for the select bacteria to rebalance the microbiome. Probiotics are difficult to formulate with since they are live cultures and are sensitive to the preservation systems in most products so survival in these products is poor.

FUNCTIONAL SKIN RELATIONSHIPS

The important relationship of the skin barrier function, microbiome balance, and pH.

The close inter-relationship of these three functions of skin are very important to understand. If any or all these skin properties are out of balance, negative skin conditions can arise. Let's examine these more closely:

Skin Hydration

Primary skin hydration is regulated by barrier function. A skin care professional can add as much hyaluronic acid or glycerin to a formula and it will not overcome the loss of water in skin that is lost from an impaired barrier function. The professional must address the issue with either dimethicone or an occlusive ingredient to help skin recover. Added lipids to the skin or lip replacements or lipid stimulation ingredients will build-up the barrier slowing the

loss of water. As most professionals know, deeply hydrated skin is thicker and plumper, thereby showing less deep fine lines and wrinkles.

Blemishes & Acne

There are many considerations when treating blemishes and acne. Many people treat acne with benzoyl peroxide, retinoids, or salicylic acid.

When treating skin with these ingredients, the barrier becomes impaired almost immediately, the skin's microbiome can be wiped out and inflammations may result. It seems counter-intuitive to cause inflammation with treatment products when treating an inflammatory disease. This becomes the dilemma for most professionals when treating acne or blemish-prone skin.

Skin care professionals should baseline the skin when first treating a client presenting with acne or blemishes. That simply means putting the client on a base regimen of a sensitive skin cleanser, a serum intended to reduce barrier impairment, increase the microbiome function, and adjust the skin to the correct pH. This will start the client on the road to success through the normalization of skin.

Fine Lines & Wrinkles

Effective fine line and wrinkle reduction is one of the most sought-after improvements in skin in the aesthetic industry. There are a multitude of techniques employed from simple super hydration of an area in the skin to achieve plumping to facial plastic surgery. If a skin care professional understands the barrier, microbiome, and pH continuum, there is a common thread to all of these.

Using retinoids, microneedling, microneedling with radio frequency, lasers (ablative or non-ablative), or a multitude of other techniques either starts will some type of inflammation or ends with some type of inflammatory response. This happens sometimes intentionally to create an injury response and is a result of a procedure of some type. The common thread is barrier, microbiome, and pH continuum. The barrier is significantly impaired both before and after the procedure, whether it is a topical application or a procedure. The microbiome is disturbed, and the pH balance is altered.

The remedy to these situations is to apply a pre-skin conditioner and a post-skin conditioner that specifically focuses on that continuum. It will restore the barrier, microbiome, and pH rapidly and provide a better result.

The last point here is that often when treating skin or applying topicals to skin an inflammation is developed in an area and erythema and edema may occur. Once this happens cytokines flood the area. Once this response occurs it becomes very difficult for those topicals to create improvement in the skin. Often peptides are used to initiate collagen and elastin production, which can be neutralized in the interaction with cytokines.

Hyperpigmentation

There are many causes of dark spots and areas of pigmentation on the skin. It is a certainty that if the skin is treated with the barrier, microbiome, and pH relationship in mind, the client will have better results.

Post-inflammatory hyperpigmentation is an example of this. When treating skin for pigment reduction skin care professionals are looking to clear the skin. The challenge is also how to achieve clearance. There are many ways including, but not limited to, higher doses of hydroquinone application, IPL, laser, and other techniques.

When treatment occurs with any of these techniques, the barrier and microbiome is affected and often the pH of the skin is altered as well. Melanocytes product melanin in response and the skin darkens.

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"HOW DOES SKIN BARRIER FUNCTION, THE MICROBIOME, AND THE NATURAL PH CREATE A CONDITION WHICH DEGRADES THE FUNCTIONS OF THE SKIN?"

It is critical to pre-treat and post-treat the skin with respect to the barrier, microbiome, and pH continuum. The barrier must be repaired along with the microbiome as rapidly as possible to prevent the darkening of the skin.

This is a novel and effective approach to treating skin through the barrier, microbiome, and pH continuum. While there are many more processes happening in the skin at the same time, understanding this epidermal skin effect will help the professional understand how to treat skin more effectively. Measuring skin pH is quite easy and skin care professionals should be doing it often. Stay withing the 4.5 to 5.2 rage and even a 4.5 to 5.0 range for the most effective natural skin pH range.

Measuring the barrier of the skin is easy to perform if the spa has the correct equipment. The microbiome's efficiency is also difficult to measure, although there are key markers to observe. The key to all of this lies in understand the anatomy and physiology of the skin and how it behaves synergistically. Skin care professionals can then deliver optimal skin health to all.

Robert P. Manzo, president and chief formulation chemist of Skinprint, founded Skinprint in 2002 as a cosmeceutical company focused on personalized skin care solutions for providers. Manzo holds 15 patents in skin care and associated fields, including a patent on customized skin care processes. He continues to speak and train medical based skin care audiences internationally and publishes in trade journals and periodicals regularly.