

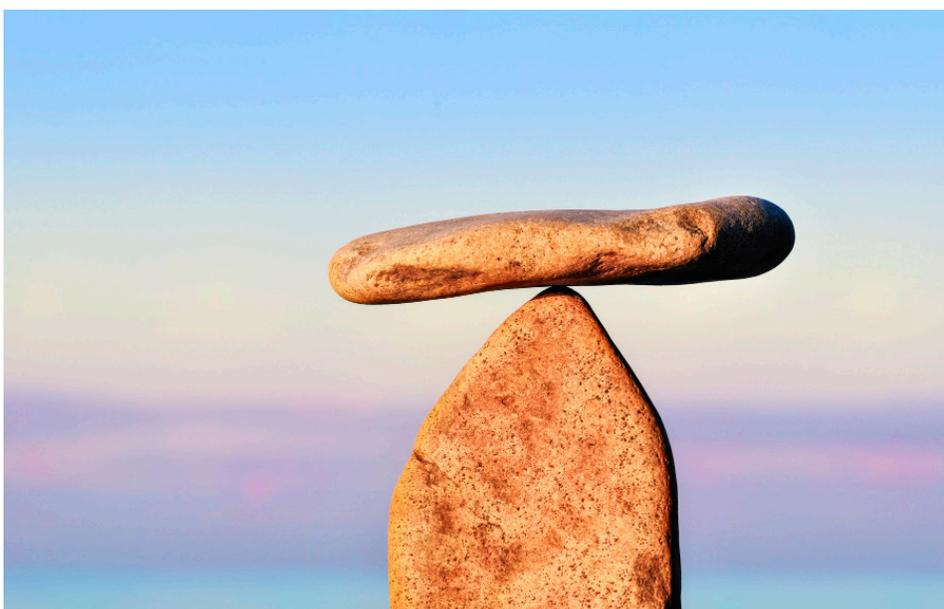


SMALL MOLECULE TECHNOLOGIES, INC.

# MOLECULES & HEALTH

HEALING THROUGH MODERN SCIENCE • A PUBLICATION BY SMALL MOLECULE TECHNOLOGIES, INC.

## Maintaining Skin Barrier Homeostasis



Skin protects us from harm such as injury, microbial pathogen invasion, and UV radiation. It also helps the body maintain homeostasis (balance or equilibrium) by aiding in the maintenance of body temperature and by helping preserve appropriate hydration and electrolyte levels. Having an optimal skin barrier is critical for the operation of these vital skin functions.

Many factors are important for a well functioning skin barrier including proper skin pH, balanced lipids and healthy microbial flora (microbiome). Factors that can disturb barrier function include: inflammation, stress (including

oxidative stress), high pH, lipid deficiencies and dysbiosis (a change in the relative compositions of microbes compared to normal skin). When the skin barrier is compromised, wounding and infection can occur more easily.

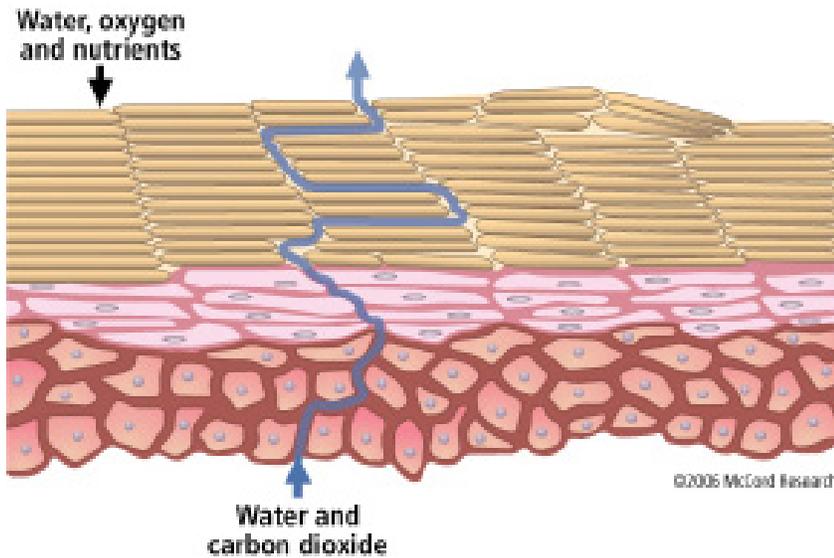
Small Molecule Technologies skin and wound care products contain potent small molecule ingredients that help counteract inflammation including the polyphenols oleuropein, resveratrol, and epigallocatechin-3-gallate (EGCG) from olives, grapes, and green tea, respectively, as well as the important small molecules, melatonin, and L-glutathione. In addition, dipotassium glycyrrhizate from

licorice, avenanthramides in oats, aloe vera and shea butter possess anti-inflammatory activities.

Small Molecule Technologies skin and wound care products including Renewal Moisturizer and the gentle cleansing lotion, Clean N Moist, are pH balanced to help skin maintain its proper pH and normal flora. Renewal Moisturizer and Clean N Moist include nutrients that strengthen the skin barrier. Renewal Moisturizer and Clean N Moist also contain an advanced silicone complex to provide a protective barrier to help keep skin hydrated. In addition, the gentleness of Clean N Moist assures that even the most fragile skin is cleansed without causing irritation.

### **Optimal Skin Barrier Function and pH**

Quantitating trans-epidermal water loss (TEWL) is a way to assess the quality of the skin barrier and how well it functions. Oleuropein has been shown to reduce TEWL indicating its ability to increase skin barrier function. Evidence also demonstrates that melatonin has a stimulatory role in building and maintaining the epidermal barrier. Moreover, the advanced



silicone complex in Renewal Moisturizer and Clean N Moist provides a breathable barrier to protect skin.

Skin pH is normally acidic, ranging in values from 4 to 5.5. Preserving this pH range is critical for the maintenance of a healthy skin microbiome. The normal skin microbiome is composed of a rich and complex flora or interacting microbes that live in harmony with skin, protecting it from potentially dangerous pathogens like *S. aureus* that thrive at neutral pH levels. In addition, antimicrobial peptides such as dermicidin, produced by skin, only have proper activity against pathogens at normal skin pH levels.

The extracellular space between corneocytes (differentiated keratinocytes) found in the upper layer of the epidermis (stratum corneum), is composed of highly ordered lamellar lipids that form membranes. These lipids that are critical for skin barrier functioning include ceramides, cholesterol and fatty acids. Key lipid-processing enzymes involved in the synthesis of ceramides have optimal

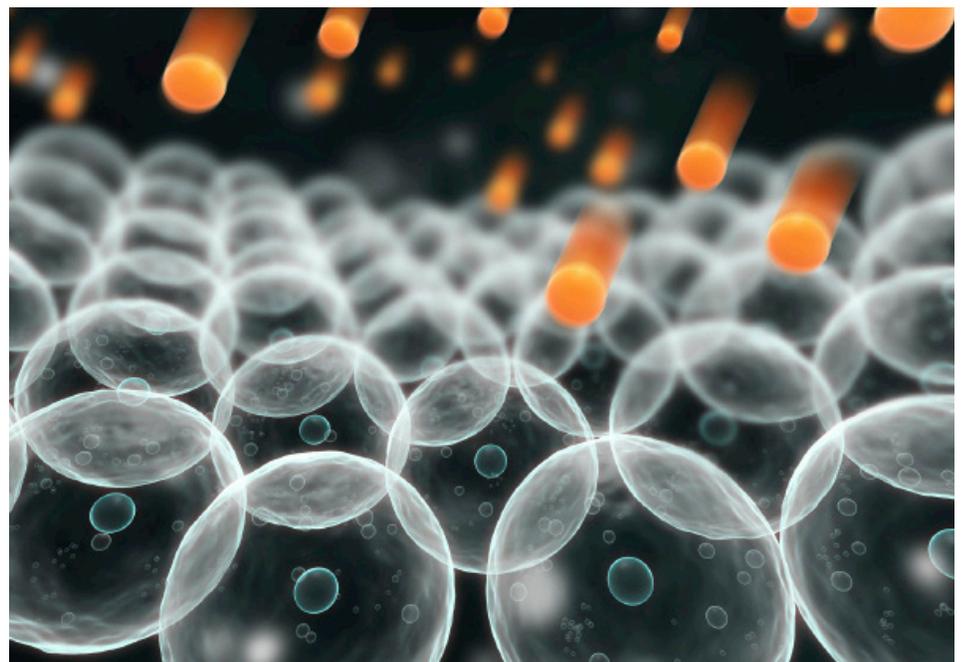
activity at acidic skin pH levels. In addition, the formation of lamellar structures requires an acidic environment. In fact, increased pH and low ceramide levels are associated with aging and may correlate with lower skin barrier functioning found in older individuals.

### **Increasing Skin Lipids and Reducing Oxidative Stress**

Scientific studies have also shown that nicotinamide, another name for niacinamide (found in Small Molecule Technologies skin and

wound care products) can increase the biosynthesis of ceramides as well as other stratum corneum lipids to improve the skin barrier. Ceramides can also stimulate antimicrobial peptide synthesis including cathelicidin (CAMP) production. In addition to ceramides and other lipids mentioned above, phospholipids (found in Small Molecule Technologies Clean N Moist) are capable of forming lamellar lipid phases, which makes them beneficial in skincare treatments.

Oxidative stress can compromise the skin barrier. When oxidative stress occurs the naturally protective antioxidants and oxidative defense enzymes including manganese superoxide dismutase (MnSOD) that are capable of neutralizing free radicals become overwhelmed. This can result in protein, lipid and cellular damage that can decrease skin barrier functioning. Small Molecule Technologies skin and wound care products like Renewal Moisturizer and Clean N Moist contain an-



tioxidants including oleuropein, resveratrol, and EGCG, as well as melatonin, and L-glutathione. Moreover, in a model where MnSOD was deactivated, oleuropein induced MnSOD activity; EGCG has been found to induce MnSOD expression, and resveratrol has been shown to upregulate MnSOD activity.

In addition to oxidative stress, psychological, emotional or psychosocial stress can cause skin barrier problems that can lead to conditions like acne or eczema. Evidence suggests that these problems are at least partially caused by hormones known as glucocorticoids resulting from stress. Glucocorticoids have been shown to increase skin barrier

permeability and altered skin homeostasis that may result in dysbiosis. In addition, disruptions in the microbiome due to harsh soaps or cleansers can decrease the protection provided by certain microbes. Small Molecule Technologies Clean N Moist gently cleanses skin to avoid disturbing skin homeostasis. Diligent skin care including mild cleansing and moisturizing has been shown to significantly improve skin hydration and overall skin health.

It's good to know that Small Molecule Technologies skin and wound care products can help maintain barrier homeostasis to help skin protect the body from injury. Small Molecule Technologies Renewal Moisturizer and

Clean N Moist are pH balanced to help maintain a healthy skin microbiome and the proper balance of skin lipids. In addition, Small Molecule Technologies skin care products include potent small molecule antioxidants and anti-inflammatory ingredients that help protect the skin barrier.

## References

1. J Lipids Res 2007; 48: 2531-2546.
2. J Invest Dermatol 2013; 133: 1925-1927.
3. Acta Derm Venereol 2013; 93: 261-267.
4. Nat Rev Microbiol 2011; 9: 244-253.
5. Int J Mol Sci 2014; 15: 18508-18524.
6. Diab Vasc Dis Res 2014; 11: 92-102.
7. Oxid Med Cell Longev 2012; ID 560682:1-8.
8. J Pineal Res 2013; 55: 325-356.
9. Int J Gen Med 2011; 4: 105-113.
10. Evid Based Complement Altern Med 2012; ID 650514:1-9.
11. Br J Gen Pract 1999; 49: 823-828.
12. Arch Derm Res 2008; 300: 569-574.
13. J Oleo Sci 2010; 59: 273-280.
14. Int J Cosmet Sci 2008; 30: 113-120.
15. FASEB J 2013; 27: 2742-2755.
16. Nursing Times 2012; 108: 20-22.
17. J Eur Acad Dermatol Venereol 2007; 21(Suppl2): 1-4.
18. Br J Dermatol 2014; 171(Suppl 3): 19-28.
19. Br J Dermatol 2000; 143: 524-531.
20. J Lipid Res 2009; 50: S417-S422.
21. J Soc Cosmet Chem 1996; 47: 27-39.
22. WAO J 2012; 5: 9-19.
23. J Biol Regul Homeost Agents 2014; 28: 105-116.
24. J Cosmet Sci 2013; 64: 35-44.
25. Hypertension 2013; 62: 359-366.
26. Exp Dermatol 2008; 17: 713-730.
27. PLOS One 2014; DOI: 10.1371/journal.pone.0113552.
28. Clin Exp Dermatol 2015; 40: 540-546.
29. Exp Dermatol 2014; 23: 807-808.
30. Adv Wound Care 2015; 4: 24-37.

**Disclaimer:** These statements have not been reviewed by the FDA. The decision to use these products should be discussed with a trusted healthcare provider. The authors and the publisher of this work have made every effort to use sources believed to be reliable to provide information that is accurate and compatible with the standards generally accepted at the time of publication. The authors and the publisher shall not be liable for any special, consequential, or exemplary damages resulting, in whole or in part, from the readers' use of, or reliance on, the information contained in this article. The publisher has no responsibility for the persistence or accuracy of URLs for external or third party Internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

**About the author:** Nancy Ray, PhD is the Science Officer at McCord Research. Dr. Ray received her PhD in Biochemistry and Biophysics and was a postdoctoral fellow at NIH, Harvard University and Dana-Farber Cancer Institute, and the University of Iowa. She also earned bachelor of science degrees in Chemistry and Microbiology.

Copyright 2016 McCord Research.  
All rights reserved