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# Using Remedy Nutrashield to Prevent Excessive Transepidermal Water Loss (e-TEWL)

Introduction and conclusion by Darlene McCord, Ph.D; Independent studies performed by Dow Corning.

## Introduction

### *Implications of Corneotherapy and Reduction of Excessive Transepidermal Water Loss*

Preventive corneotherapy, a term coined in the 1990s by Albert Kligman, M.D., Ph.D., is becoming one of the most important principles of treatment in advanced skin care. The object of corneotherapy, topical delivery of active concentrates through the skin, is skin barrier homeostasis.<sup>1</sup> The ultimate development in the quest for understanding the stratum corneum is corneotherapy, focusing therapy toward correcting the defective horny layers.<sup>2</sup>

Dr. Kligman, a corneobiologist, explains, "Whenever you see inflamed skin, regardless of cause, the stratum corneum is leaky and permeable. But, if you repair the stratum corneum that tells the underlying tissues that they don't have to keep reacting like there's danger in the environment." Peter Elias, M.D., the world's leading corneobiologist, has also endorsed this outside-in therapy, according to Kligman.

"Constant formation of the well-differentiated outermost layer of the epidermis and its orderly desquamation are necessary for correct barrier function as fulfilled by the stratum corneum," according to Marek Haftek, M.D., Ph.D. The primary function of the epidermis is the production of stratum corneum. The epidermis and the dermis both have immune systems.<sup>3</sup> The epidermis and its immune response to stratum corneum disruption are germane to barrier function and repair and the regulation of transepidermal water loss (TEWL).

TEWL is controlled by the stratum corneum and is a normal part of the cellular activity. The stratum corneum regulates TEWL and helps prevent dehydration, holding the average TEWL to 2 to 5g/hr/cm<sup>2</sup>.<sup>4</sup> Excessive TEWL (e-TEWL) activates an inflammatory response in the epidermis and the dermis and initiates the repair process.<sup>5</sup>

Many factors contribute to e-TEWL including humidity below 40%, changes in skin pH, normal aging and disruption of the barrier. Correcting e-TEWL can be achieved by application of occlusive and semipermeable treatments.

Occlusive products suppress barrier recovery and reduce the epidermal proliferative response to an abnormal stratum corneum barrier. Semipermeable or breathable barriers, like Nutrashield, do not slow barrier recovery and allow for normal cellular respiration.<sup>6</sup>

A fully occlusive therapy, like petrolatum or mineral oil, prevents TEWL. In doing so however, it slows epidermal maturation and reduces barrier repair. Further, occlusion of the skin increases the risk of infection and decreases the protection of the skin's normal pH mantle.<sup>6</sup> Decreased TEWL may be achieved with occlusion however, the side effects of occlusion appear to outweigh its benefits.

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Nutrashield is a semipermeable or breathable barrier which allows for normal epidermal proliferation and barrier repair. Nutrashield, when applied as part of a corneotherapy plan, reduces e-TEWL and allows for the normal repair process to take place.

The skin repair process is dependent upon proper skin hydration as accomplished with normal TEWL. Skin repair and reduced inflammation can be positively affected through the use of Nutrashield as a semi-permeable barrier to e-TEWL.

## **Wash Off Resistance Study**

Following is an in vivo study comparing wash-off resistance between Proshield Plus and Nutrashield. It is known that applying a semipermeable or breathable barrier do not slow barrier recovery and allow for normal cellular respiration. In order to provide this protection, it is also necessary that the product stays in place on the skin for a prolonged period of time, even after wash-offs (which could relate to incontinent episodes or contact with water and rubbing). Utilizing products that provides the proper protection against e-TEWL is critical to allow the proper repair process to take place.

### **Test methodology**

1. Thoroughly cleanse the under side of each forearm with Ivory bar soap.
2. Draw two 1.5 x 4" rectangles, one on each forearm.
3. Collect a baseline spectrum of the neat skin.
4. Apply 0.1g of product to be tested in the test area.
5. Rub the material into the skin for 30 seconds.
6. Allow the test area to air dry for 5 minutes.
7. Collect a spectrum of the product after initial application.
8. Wait 30 minutes under normal conditions (go about normal business ensuring no exposure of the test site to additional silicone).
9. First wash cycle: rinse test area with luke warm water for 5 seconds, lather hand and rub test area lightly 15 times, rinse test area for 5 seconds, pat dry with paper towel.
10. Collect a spectrum
11. Wait 30 minutes under normal conditions (go about normal business ensuring no exposure of the test site to additional silicone).
12. Second wash cycle: same procedure as above.
13. Collect a spectrum.
14. Wait 30 minutes under normal conditions.
15. Third wash cycle: same procedure as above.
16. Collect last spectrum.

### **Study Observations**

#### *For Proshield Plus:*

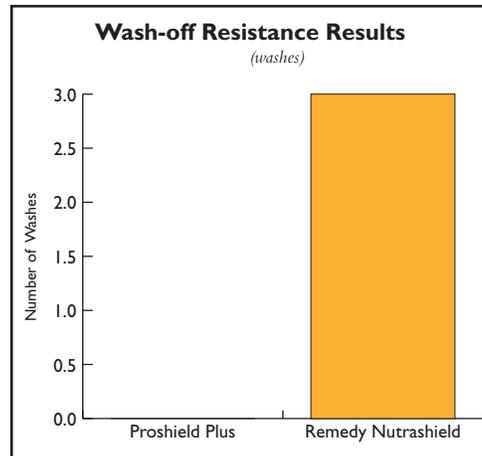
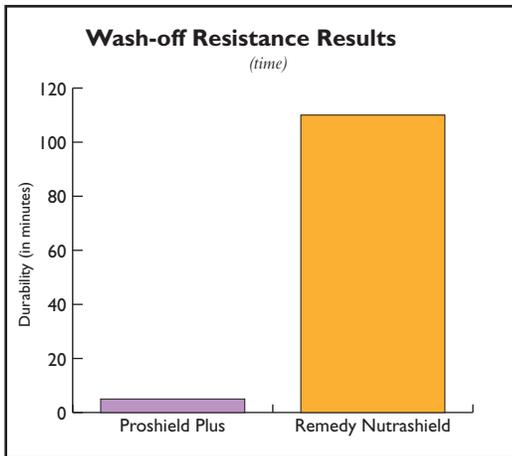
After initial IR reading the product was detectable on the skin however after 1 wash there was no product detected (silicone or organic). Water beaded on the surface of the test area after initial application but not after the 1st wash.

#### *For Remedy Nutrashield*

This material was very thick and easily spread upon the skin. A large portion was absorbed slowly but still some on the skin surface after initial application. Product was extremely durable through 3 washes and if peak intensity is qualitatively accessed, the material would probably last at least one additional wash cycle.

Hydration level in the skin was completely masked after initial application (an assumed increase in moisturization, less moisture from the skin is escaping).

Water beaded on the surface of the test area up through the third wash.



Independent Study by Dow Corning

## Moisture Vapor Transmission Rate Study

The following is an in vitro study using collagen to examine the ability of Remedy Nutrashield and Skin repair Cream to prevent against excessive Transepidermal Water Loss and moisturize the skin.

The collagen sheets represent a piece of human skin which stratum corneum has been removed.

### Test methodology

1. Obtain 12 clean and dry Fisher Payne Permeability Cups and a roll of collagen.
2. Cut collagen into 12 4" x 4" squares (one for each cup).
3. Coat 6 collagen squares with 0.1g of Skin Repair Cream, using finger to spread the cream evenly on square (rub in a clockwise direction for 20 seconds). This simulates actual use of the product and how it would be applied. Allow to dry for 5 minutes. *It is assumed that an equal amount of cream remains on the finger after application each time.*
4. Coat 3 new collagen squares and 3 of the previously coated squares with 0.1g of Nutrashield using same finger method described above. Allow to dry for 10 minutes. *same assumption applies to this step as well.*
5. Place 3g of water in each of the 12 Payne Permeability Cups.
6. Place the collagen squares on each of the 12 cups;
  - a. 3 samples of blank collagen
  - b. 3 samples coated with Skin Repair Cream only
  - c. 3 samples coated with Nutrashield only
  - d. 3 samples coated with both Skin Repair Cream and Nutrashield
7. Take initial weight of each sample and place samples in 37°C oven.
8. Remove samples and record weight every hour for first 4 hours.
9. After 24 hours, remove from oven and record final weight.
10. Calculate difference in beginning weight and final weight.

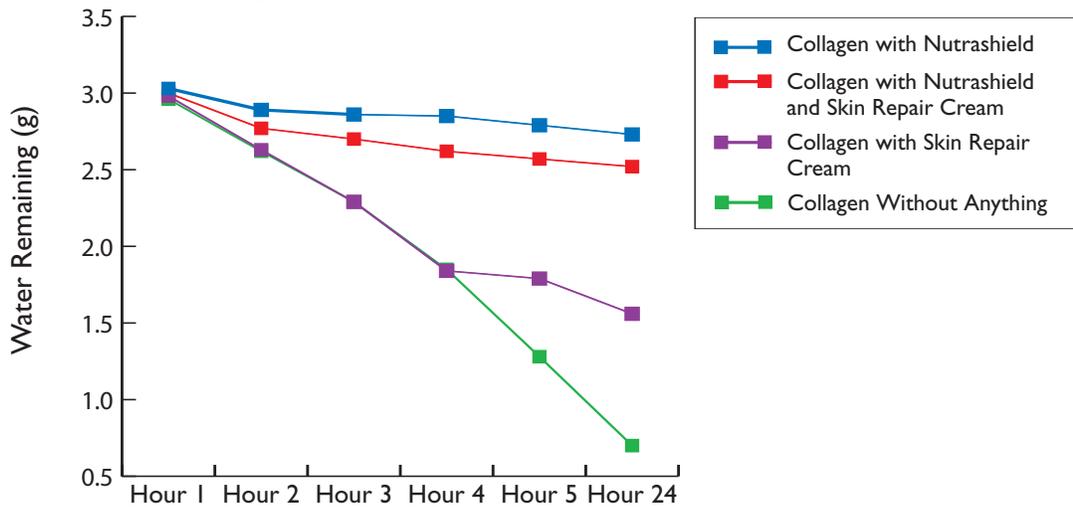
### Study Observations

When using Remedy products, more specifically Nutrashield, an artificial stratum corneum is laid down. This breathable barrier allows skin to start working on the repair process rather than concentrating time on fighting against inflammation and e-TEWL.

When applying Nutrashield on a collagen sheet, the moisture retention after 24 hours was over 90.1%, compared to just 23.6% retention of a sheet of collagen without protection. The sheet of collagen without protection lost 753% (or 7.53 times) more water than the one protected with Nutrashield.

## Moisture Vapor Transmission Rate

(protection against transepidermal water loss)



### Conclusion

The skin repair process and the intra communication between the stratum corneum and the epidermis are not fully understood. We do know however that the stratum corneum is metabolically active and when it is not intact the repair process cannot take place.

Nutrashield provides a two-pronged solution. First, it provides the epidermis with an advanced combination of silicones that form a semipermeable, temporary covering. This action is supplemented by Olivamine™, a blend of antioxidants, amino acids, their cofactors (vitamins B6 and B3) and MSM, to nourish the skin. This unique combination allows for the first corneotherapeutic product on the market. When used in conjunction with the complete line of Remedy corneotherapeutic products the objectives of corneotherapy, as part of a plan to reduce excessive Transepidermal Water Loss (e-TEWL), is realized.

### References

<sup>1</sup>Lautenschlaeger, H, Corneotherapy, Medica.de 24-27, 2004

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<sup>3</sup>Nickoloff B.J. Chapter 1 In: Nickoloff B J, ed. Dermal Immune System. Boca Ratan, FL: CRC Press 1993 1-6.

<sup>4</sup>Fore J, The Epidermal Skin Barrier: Implications for the Wound Care Practitioner, Part 1, Advances in Wound Care, Oct 1, 2004

<sup>5</sup>Grubauer, G, Elias, PM, Feingold ,R: Transepidermal water loss: the signal for recovery of barrier structure and function; Journal of Lipid Research, Vol 30, 1989 p 323-333

<sup>6</sup>Aly R, Shirley C, Cunico B, Maibach H, Effect of prolonged occlusion on the microbial flora, pH, carbon dioxide and transepidermal water loss on human skin, J Invest Dermatol 1978; 71: 378-381



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