

# Male skin and ingredients relevant to male skin care

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## Summary

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Male skin care needs are heavily influenced by the need to remove facial hair on a regular basis. Facial skin issues associated with poor hair removal approaches are common and include razor burn and irritation. This paper evaluates current research on shaving technology and how careful ingredient selection can contribute to male skin health. The importance of maintaining hair softness during the shave and restoring facial hydration post-shave is discussed. Data are presented on how post-shave moisturizers containing glycerine and emollients can create an environment for improved barrier function which can be further improved by incorporating specific ingredients such as niacinamide.

Male skin possesses unique attributes requiring careful attention when developing male skin care products for personal hygiene and grooming. Foremost among these unique needs is the presence of terminal facial hair accompanied by testosterone-driven increased sebaceous activity. Other physiological differences present on male body skin as compared with female body skin include increased sweat production, decreased sweat evaporation rate, warmer skin temperature, higher transepidermal water loss (TEWL) and decreased skin pH.<sup>1–4</sup> These considerations are important when developing optimal products for the maintenance of male skin. The need for increased sebum control, acne prevention, sweat control and odour prevention must be addressed.

However, male skin care needs go beyond basic hygiene to appearance issues associated with facial hair removal. Facial skin issues associated with poor hair removal approaches are common and include irritation, razor burn and pseudofolliculitis barbae. Trauma associated with poor shaving techniques, inferior products and lack of regular skin care conspire to diminish the skin barrier, which creates a further challenge to skin health. Male skin is generally more deeply pigmented than female skin, increasing the incidence of postinflammatory hyperpigmentation with trauma.

Shaving products designed to improve skin comfort and lower irritation rates must maintain hair softness during the shave and lubricate the razor for enhanced glide. Post-shave products must restore facial hydration and improve the skin barrier through the use of light-weight emollients. This paper evaluates the current research on shaving technology and how careful ingredient selection can contribute to male skin health.

## Properties of beard hair and shaving

Much of the hair targeted for removal by shaving is terminal hair (i.e. hair that is generally longer, thicker and more darkly pigmented than vellus hair). In prepubescent males this hair is found primarily on the head and eyebrow regions, but with the onset of puberty terminal hair begins to appear on areas of the body with androgen-sensitive skin, including the face, axillae and pubic region. Further, vellus hairs in the beard area may convert to terminal hairs under hormonal influence.

Most males begin shaving the face and the neck between the ages of 14 and 15 years. The average man shaves an area of ~300 cm<sup>2</sup> and, on average, the male face has 500 hair follicles per cm<sup>2</sup>.<sup>5</sup>

The structural properties of the hair impact shaving. The force required to cut a hair increases with increasing fibre cross-sectional area. Thus, it requires more force to cut a larger fibre. It requires almost three times the force to cut a beard hair than a scalp or leg hair.<sup>6,7</sup>

The human hair follicle and the surrounding skin are richly innervated. Moreover, the topography of the skin is highly variable and, combined with the presence of hairs, results in a very irregular terrain over which an extremely sharp blade traverses.

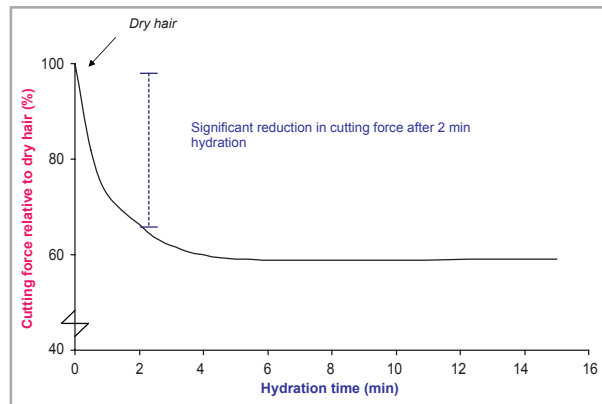
It is hypothesized that discomfort associated with shaving is a result of localized skin displacement and/or the rotation and extension of the beard fibre in its follicle. Shaving can also cause irritation by the removal of irregular elevations of the skin by the razor blade, particularly around the follicular openings.<sup>5</sup>

## Shaving and skin care

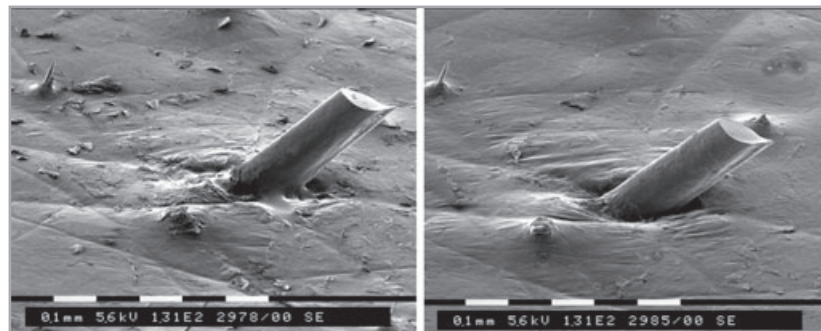
Shaving involves a complex interaction between the hair, skin and blade. This interaction can be affected by pre-shave, during-shave and post-shave activities. Pre-shave activities prepare the beard hair and the skin for the shaving process to reduce friction and optimize the closeness of the shave while simultaneously minimizing skin trauma. During the shave, the skin must be protected from blade trauma and continued lubrication must be provided to ease the blade–skin interface. Finally, post-shave, the skin must be soothed to minimize noxious sensory stimuli and restore the skin barrier through moisturization. These activities will be explored in greater detail.

### Pre-shave

Hair is actually a challenging biological material to cut, as dry hair can be compared with a copper wire of similar diameter, requiring equivalent force to cut.<sup>5</sup> The first step in pre-shave preparation is to reduce the beard hair cutting force, which directly translates in improved shaving comfort. Hair keratin has a high affinity for water and becomes significantly softer and easier to cut when hydrated. The force required to cut a hair decreases dramatically as hydration increases (Fig. 1).



**Fig 1.** Hydrated hair has a lower cutting force than dry hair. The most significant reduction in cutting force occurs after 2 min of water contact.



**Fig 2.** Scanning electron microscopy (SEM) images before (left) and after (right) use of a mild scrub demonstrating how pre-shave cleansing with a scrub prepares the skin and hair for the shave by removing sebum, desquamating corneocytes and environmental dirt. SEM images produced from silicone moulds from facial skin.

In addition to hair hydration, it is also optimal to clean and prepare the skin as part of the pre-shave process. Sebum and desquamating corneocytes on the skin surface and around the follicular ostia present obstacles to drawing the razor over the skin. This can be accomplished with a mild synthetic detergent cleanser or scrub (Fig. 2). Scrubs may actually be more effective in pre-shave cleansing because mild exfoliation of the skin surface can set up beard stubble that is emerging through the stratum corneum, minimizing ingrown hairs. Removing the retained corneocytes allows the hair to stand erect above the skin, facilitating razor transection of the hair at the skin surface (Fig. 3).

### During shaving

Once the skin and hair have been properly prepared, shaving can commence. Shaving gel, composed of water, surfactants and high molecular weight linear polymers, keeps the beard hair hydrated and provides friction-reducing lubrication between the skin and the razor. Reduction of friction is critical to minimizing skin trauma and preserving the skin barrier. If the razor grabs on to skin debris, poorly hydrated hairs or dry skin, the risk of razor burn and/or cutting the skin with concomitant skin barrier damage increases, accompanied by a feeling of stinging, burning and itching.

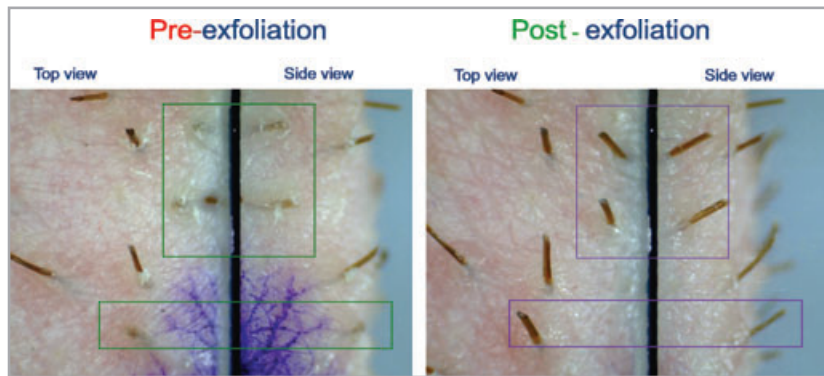
### After shaving

After-shave skin care products containing glycerine, to act as a humectant attracting water to razor-traumatized skin, and emollients, to leave the skin smooth and soft, can minimize razor-related skin problems. Barrier restoration must occur after the process of shaving is completed.

## Shaving regimen: clinical study

### Study design

A clinical research study was performed to validate the aforementioned concepts. Twenty subjects participated in a 5-day single-site randomized split-face investigator-blinded study to compare two different shave care regimens. Both sides of the face were shaved with the same shaving gel and razor; how-



**Fig 3.** Microscope images showing top view and side view of the same facial area demonstrate the effect of pre-shave exfoliation: trapped beard hairs (seen in green boxes; pre-exfoliation, left) are released (in corresponding purple boxes; post-exfoliation, right) and set up in a position to be cut more efficiently with less skin interaction.

ever, the skin preparation regimens differed. One side of the face was cleansed with bar soap followed by the application of shaving gel and shaving. The other side of the face was cleansed with a mild cleanser based on sodium trideceth sulphate, sodium lauroamphoacetate and sodium myristoyl sarcosinate. Following shaving, a glycerine-based moisturizer with fatty alcohol ester emollients was applied.

## Results

Sixty minutes following shaving a statistically significant increase in skin corneometry measurements and a statistically significant decrease in TEWL was noted on the test shaving regimen site as compared with the control bar soap site. On study day 5, 24 h after product application, the same statistically significant increase in skin corneometry measurements and statistically significant decrease in TEWL was noted with the test shaving regimen as compared with the control bar soap.

## Conclusion

The improvement in skin moisturization and barrier function occurred immediately after shaving and was sustained with continued use of the skin care regimen.

## Niacinamide

Post-shave moisturizers may also contain cosmetic ingredients designed to enhance skin functioning further. One such ingredient is niacinamide. Niacinamide, the amide derivative of vitamin B<sub>3</sub> necessary to prevent pellagra, is a precursor to NADPH, an important component in the electron transport chain.

Over the last decade, niacinamide has become established as an important skin care ingredient that can impact a range of skin structural and pigmentary features. For instance, it has been shown that topical niacinamide can improve the skin barrier, and *in vitro* data indicate this may be via increases in ceramide synthesis levels.<sup>8,9</sup>

Niacinamide 5% was studied in male post-shave moisturizers in a study involving 90 men (age range 18–45 years) with self-assessed moderate to heavy beard growth.

## Study design

A randomized double-blinded round robin split-face design was employed involving three treatments which were each applied to one side of the face:

- 1 Daily shave with a three-blade razor and commercial shave gel without post-shave moisturizer treatment;
- 2 Daily shave as in 1, followed by application of a post-shave placebo moisturizer containing emollients and high levels of glycerine;
- 3 Daily shave as in 1, followed by application of a post-shave 5% niacinamide moisturizer (5% niacinamide added to placebo moisturizer).

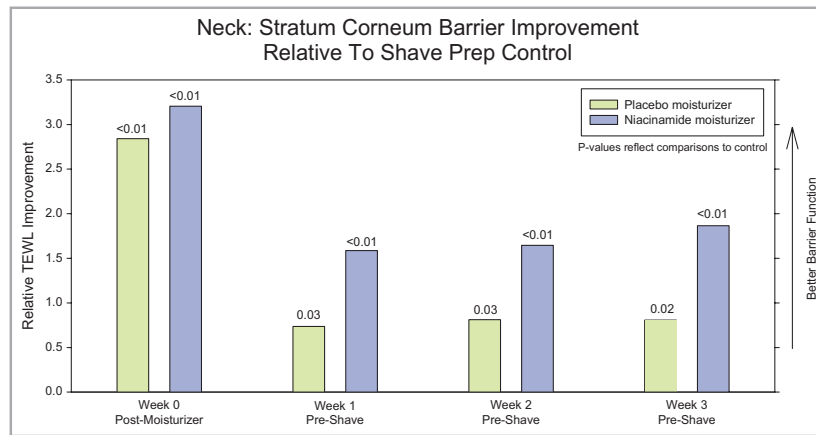
TEWL measurements were taken 1 h following application at week 0 and 24 h following application at weeks 1, 2 and 3 on both the face (cheek) and neck.

## Results

On the neck, both moisturizers provided TEWL benefits 1 h after the initial application of the moisturizer relative to the no-moisturizer control (at week 0). This change is likely to be due to a physical effect of the moisturizer on the skin, e.g. occlusion and/or a hygroscopic effect of glycerine. Later evaluations at weeks 1, 2 and 3 show how the moisturizer containing 5% niacinamide significantly reduced TEWL over the vehicle moisturizer (Fig. 4). Given that these evaluations are conducted after longer treatment periods and at a longer postapplication time (24 h), these changes are likely to reflect physiological improvement in the stratum corneum barrier. The same effect was observed on the cheek at weeks 0 and 1 with a reduced effect at week 2 and 3 (data not shown). This is likely to be a reflection of the cheek being a less challenging environment in the shaving process vs. the neck, as demonstrated elsewhere in this publication.

## Discussion and conclusions

The science of male facial shaving and ingredients relevant to male skin care is rapidly evolving as blade, razor and skin care product design advances. Proper skin care can minimize skin discomfort related to shaving and speed barrier repair. Pre-shave exfoliant cleansers can remove excess perifollicular scale



**Fig 4.** Transepidermal water loss (TEWL) reduction relative to the no-moisturizer control following the use of a 5% niacinamide-containing moisturizer on the neck vs. a placebo moisturizer. Both moisturizers provide a significant ( $P < 0.05$ ) TEWL benefit at all time points with a significant ( $P < 0.05$ ) additional benefit from adding niacinamide to the moisturizer base at weeks 1, 2 and 3.

and decrease razor burn. Post-shaving moisturizers containing sunscreen and emollients can prevent ultraviolet radiation damage while smoothing skin scale and reducing post-shave noxious sensory input. Further, moisturizers containing glycerine and emollients can create an environment for barrier repair that may be enhanced by incorporating specific cosmetic ingredients, such as 5% niacinamide. This new understanding of the importance of skin care in obtaining optimal shave results will aid the dermatologist in treating patients with shaving-related issues.

#### What's already known about this topic?

- The average man shaves an area of  $\sim 300 \text{ cm}^2$ .
- The male face has 500 hair follicles per  $\text{cm}^2$ .
- Shaving is a complex interaction between the blade, facial hair and skin, and poor shaving approaches can result in facial skin issues and barrier damage.
- Dermatological issues arise because the topography of the skin is highly variable and, combined with the presence of hairs, can lead to perifollicular skin damage.

#### What does this study add?

- Shave results and male skin health can be affected by pre-shave, during-shave and post-shave activities.
- Sixty minutes following shaving a statistically significant increase in skin corneometry and a decrease in transepidermal water loss was noted on the test shaving regimen site utilizing a synthetic detergent cleanser and glycer-

ine-based moisturizer with fatty acid emollients as compared with the control bar soap site.

- A moisturizer containing 5% niacinamide significantly reduced transepidermal water loss over the vehicle moisturizer after weeks 1, 2 and 3 of use.

#### References

- 1 Dao H Jr, Kazin RA. Gender differences in skin: a review of the literature. *Gen Med* 2007; **4**:308–28.
- 2 Giacomoni PU, Mammone T, Teri M. Gender-linked differences in human skin. *J Dermatol Sci* 2009; **55**:144–9.
- 3 Jacobi U, Gautier J, Sterry W, Lademann J. Gender-related differences in the physiology of the stratum corneum. *Dermatology* 2005; **211**:312–17.
- 4 Tur E. Physiology of the skin – differences between women and men. *Clin Dermatol* 1997; **15**:5–16.
- 5 Ertel K, McFeat G. Blade shaving. In: *Cosmetic Dermatology: Products and Procedures* (Draelos ZD, ed.). Oxford: Blackwell Publishing, 2010; 156–64.
- 6 Deem D, Rieger MM. Observations on the cutting of beard hair. *J Soc Cosmet Chem* 1976; **27**:579–92.
- 7 Thozhur SM, Crocombe AD, Smith AP et al. Cutting characteristics of beard hair. *J Mater Sci* 2007; **42**:8725–37.
- 8 Tanno O, Ota Y, Kitamura N et al. Nicotinamide increases biosynthesis of ceramides as well as other stratum corneum lipids to improve the epidermal permeability barrier. *Br J Dermatol* 2002; **143**:524–31.
- 9 Matts PJ, Oblong JE, Bissett DL. A review of the range of effects of niacinamide in human skin. *IFSCC Mag* 2002; **5**(4):285–90.