

# Enhancing the Care and Treatment of Skin of Color, Part 2: Understanding Skin Physiology

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*Cutaneous diseases in patients with skin of color frequently present differently than in individuals with white skin. Increased understanding of skin physiology including skin lipids and barrier function, as well as documentation of common issues such as ashy skin, has been the focus of researchers. New insights into the effects of UV radiation in skin of color and the increasing incidence of malignant melanoma heighten awareness of the need for new initiatives directed at education and further research, despite previous views about photoprotection for this population.*

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The most salient differences between skin of color and white skin are pigmentation and cutaneous responses. Findings with regard to physiological differences in cutaneous lipids, barrier function, and dermal matrix have been conflicting. Nevertheless, they serve as an important theoretical foundation for further research.

There are inconclusive findings regarding the differences in lipid content between ethnic skin types. One study found the lowest ceramide levels in black skin, followed by white, Hispanic, and Asian skin.<sup>1</sup> Kligman and Shelley<sup>2</sup> found that

blacks had higher sebum levels and much larger sebaceous glands than whites. Pochi and Strauss<sup>3</sup> found no consistent differences in sebum production between black and white subjects. In fact, their study indicated that the majority of black subjects had sebum production values within 2 standard deviations from the mean of whites.<sup>3</sup>

The stratum corneum of skin of color seems to contain more cell layers and is more compact compared with white skin.<sup>4,5</sup> A study by Weigand et al<sup>6</sup> found evidence of greater cell coherence and a greater number of cell layers in skin of color, which also may account for the greater density of the stratum corneum compared to white skin. Corcuff et al<sup>7</sup> found no difference in corneocyte surface area in black, white, or Asian skin. In this study, black skin demonstrated increased spontaneous desquamation.<sup>7</sup> These findings conflict with the study conducted by Weigand et al,<sup>6</sup> which measured cell layers and stratum corneum density by quantifying the number of tape strips needed to completely remove the stratum corneum. Black skin required a mean of 16.6 strips to remove the stratum corneum while white skin required a mean of 10.3 strips.<sup>6</sup> Therefore, black skin appears to be more compact and perhaps more cohesive.

## Ashy Skin

The controversy regarding whether there are clinically important differences in sebaceous gland activity, stratum corneum lipids, and barrier function between skin of color and white skin is illustrated by studies of a condition known as *ashy skin*.<sup>8-10</sup> Ashy skin can appear on the neck or body, though it is more prevalent in areas of friction and on extensor joints. It can be elicited by rubbing or scratching, even following application

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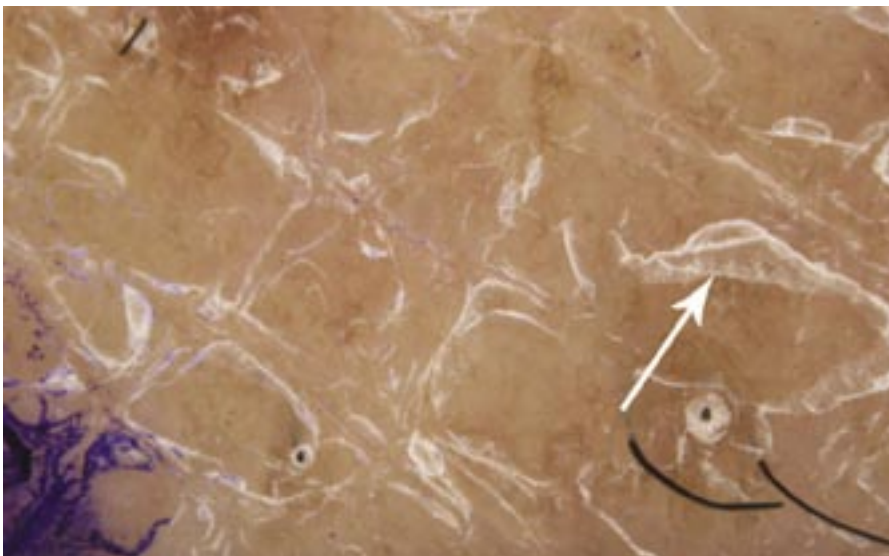
of emollients. Ashy skin frequently is identified with patients of darker skin; however, little is known about the pathogenesis of ashy skin.

Specific differences between the etiology of ashy skin and normal dry skin need to be clarified. With white skin, the type of dryness that causes ashiness likely is attributable to disrupted skin barrier function, which leads to abnormal stratum corneum water content and abnormal desquamation, reduced generation of natural moisturizing factor, and changes in stratum corneum lipids. Decreased epidermal hydration unrelated to seasonal changes in humidity typically is the result of exposure to chemicals, such as surfactants, that can strip the skin of lipids and disrupt the skin barrier.<sup>8</sup> In addition, dry skin is well documented as symptomatic of endogenous factors such as diabetes and chronic kidney disease. Psychological stress and aging also can affect skin barrier stability.<sup>11</sup>

Ashy skin is considered by some dermatologists simply to be normal dry skin that is more apparent in patients with skin of color because of differences in reflectance properties. A recent study of 37 African women suggested that ashiness on the legs during winter appeared to be caused by xerosis and skin textural changes, which led to an increase in diffuse light scattering and a reduction in Fresnel reflectance, an optical phenomenon responsible for skin surface glare. According to the study, the ashy appearance did not appear to be related to skin inflammation.<sup>9</sup> It also has been suggested that ashy skin is attributed to scaliness or retention of corneocytes, which are lighter in color and more apparent in darker skin (S.C.T., oral communication, June 2004).

New digital microimaging techniques have been used effectively to document the rate of ashy skin formation on the skin surface. In a 2004 study, video microscopy was used to compare black and white subjects with no obvious dry skin conditions.<sup>10</sup> In white subjects, an ashy appearance became visible approximately 2 minutes after washing with soap. In contrast, ashy skin in black subjects was evident within 1 minute, beginning as fine flakes that appeared coarser over time. By 5 minutes, dermatoglyphic patterns were strongly visible but became increasingly difficult to distinguish later. Using epiluminescence microscopy at a magnification of  $\times 80$ , sheets of corneocytes were visibly shedding (Figure 1).<sup>12</sup> In normal desquamation, corneocytes reportedly are removed as single cells or small aggregates of cells.<sup>13</sup>

Understanding of the pathophysiology of ashy skin has led to the development of moisturizers with ingredients that can normalize desquamation, enhance epidermal barrier function, and perhaps alter light reflectance to improve the appearance of the condition. A clinical study to evaluate the efficacy of an oatmeal-containing moisturizer in managing moderately ashy skin and improving its appearance was conducted on the lower legs of black women.<sup>14</sup> The moisturizer was applied twice daily for 2 weeks. After one day, dermatoglyphics were less apparent and skin texture and appearance were visibly improved and continued to improve throughout the 14-day study. Figure 2 shows a subject at baseline, and at days 1 and 14 following treatment; an improvement in dryness and flaking was noted. Also, subjects perceived significant relief from tightness and itching ( $P < .05$ ), as well as relief from the appearance of ashy and scaling skin.<sup>14,15</sup>



**Figure 1.** Ashy dry skin at  $\times 80$  magnification with arrow pointing to desquamation and flaking of surface skin. (Photograph courtesy of Johnson & Johnson Consumer Products Company. Data on file.<sup>12</sup>)

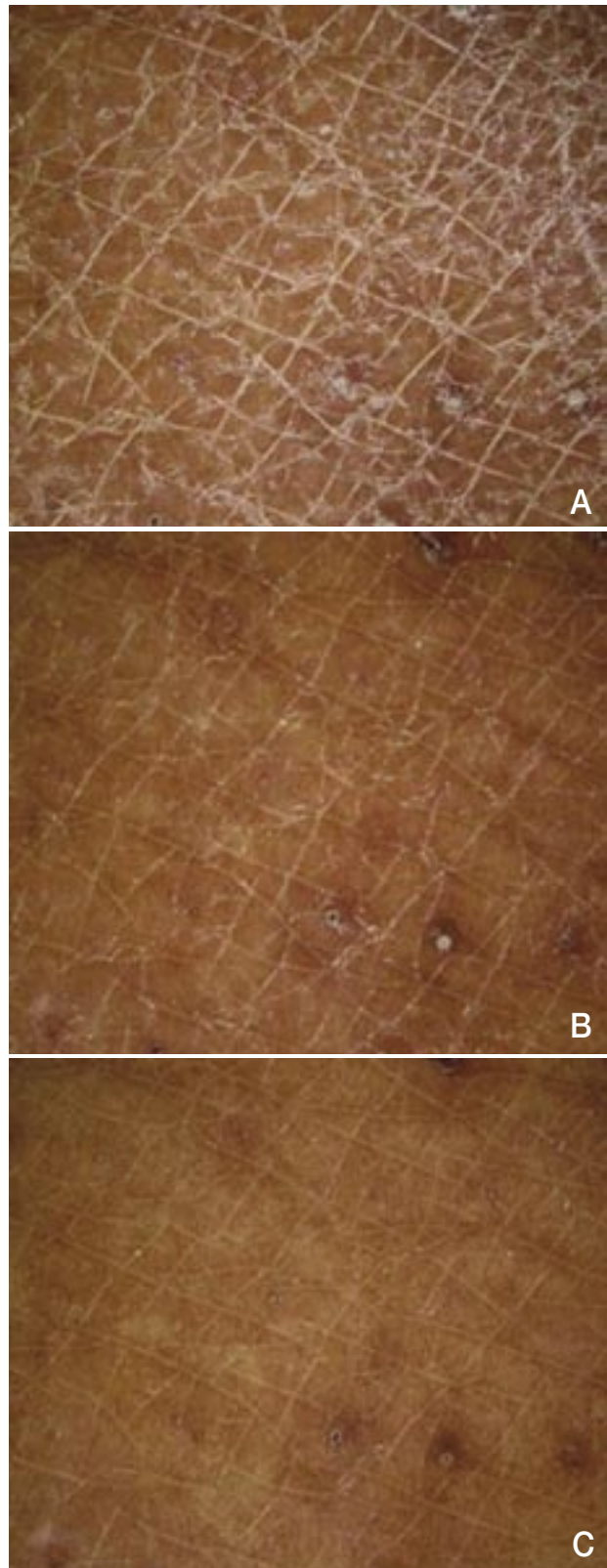
Increased understanding of the fundamental causes of ashy skin is needed. Discerning whether ashy skin is merely a form of dry skin that perhaps is coupled with changes in light reflectance properties or is the result of different underlying physiological causes requires additional research that will lead to the development of moisturizers with ingredients that target the needs of ashy skin.

### Photoprotection

UV radiation has been implicated in the development of skin cancers, photoaging, and immunosuppression due to depletion of Langerhans cells, as well as an increase in suppressor T lymphocytes and the release of proinflammatory cytokines. Certain visible signs of facial photoaging evident in white skin are less evident in the same age group of patients with skin of color, which suggests a role of skin pigment in photoprotection.

In 1979, an *in vitro* study by Kaidbey and colleagues<sup>16</sup> found that 5 times as much UV radiation reached the upper dermis of whites than the upper dermis of blacks. The researchers suggested that the larger and more melanized melanosomes in skin of color absorbed more energy than the smaller, less dense, and lightly melanized melanosomes of white skin. Additionally, they suggested that the epidermis of blacks has a sun protection factor (SPF) of 13.4, while the epidermis of lighter-skinned individuals has an SPF of 3.3.<sup>16</sup> Such data, in addition to evidence of a lower risk of photocarcinogenesis in skin of color, has led to the widespread view that melanin pigmentation is photoprotective; however, it is increasingly clear that the issue is more complex. It is likely that the skin's susceptibility to photodamage and carcinogenesis also is related to DNA repair capacity, the level of photoimmunosuppression, and the contribution of oxidative stress. It has been demonstrated that photoprotection in people with Fitzpatrick skin phototypes II and IV are comparable; they have an SPF of approximately 2 and their protection against DNA damage and erythema is independent of the degree of pigmentation. It has been suggested that tanning is a marker of inducible DNA repair.<sup>17</sup> It is DNA reparative ability, rather than the constitutive level of pigment, that accounts for the lower incidence of skin cancers in black skin.<sup>18</sup> However, DNA repair appears to be more rapid in Fitzpatrick skin phototype IV, which may account for the lower incidence of skin cancers in people with this skin type.<sup>18,19</sup>

There has been a widespread assumption that skin of color is less susceptible to burning and photodamage, less apt to develop skin cancers, and does not require photoprotection. Research has



**Figure 2.** Black patient at  $\times 20$  magnifications with ashy dry skin on the leg at baseline (A), 1 day after treatment with an oatmeal-containing moisturizer (B), and 14 days after the same treatment (C). (Photograph courtesy of Johnson & Johnson Consumer Products Company. Data on file.<sup>15</sup>)

questioned this assumption. Halder and Bridgeman-Shah<sup>20</sup> noted that if melanin conferred complete protection, there would be a linear relationship between skin color and the incidence of skin cancer. In addition to UV radiation, factors such as the depletion of the atmospheric ozone layer and an increase in outdoor recreational lifestyles may impact the increasing frequency of skin cancer in blacks.<sup>21</sup> A recent study using subjective and objective assessments sought to define more accurately the differences in photoaging and skin surface properties between African Americans and whites.<sup>22</sup> Visual photoaging assessments showed that African American skin had less severe fine lines, wrinkles, laxity, and overall photodamage than white skin. However, African American subjects had more hyperpigmentation and unevenness of skin tone, though it is possible that optical properties of darker skin tones may have accentuated them.<sup>22</sup>

A survey conducted by the Skin of Color Center in New York City showed that sunscreen use is low among blacks and Hispanics (S.C.T., unpublished data, 2004). A common response was that sun protection was not necessary to prevent skin cancer or photoaging. Nevertheless, skin of color is only partly protected against photoaging. Uneven pigmentation is a more common sign of photoaging in people of color than the wrinkling seen in whites. Postinflammatory hyperpigmentation and melasma occur more frequently in skin of color. Exacerbations and recurrences of these disorders may be prevented by sun protection and avoidance. Prevention of immunosuppression caused by UV radiation is important for all skin types. It has been shown that a single exposure to low-dose UV radiation causes disruptions in immune function in blacks.<sup>23</sup>

Skin cancer rates of Americans are increasing. One in 75 individuals will develop melanoma during their lifetime.<sup>17</sup> A chart review from the Washington Hospital Center in Washington, DC, for 1981 to 2000 revealed that the ratio of cases of melanoma in black versus white patients was 1:17.<sup>17</sup> In whites, 90% of melanomas were in sun-exposed sites versus 33% in blacks. The most common site of melanomas in blacks was the sole of the foot (38.9% vs 2.4% in whites), followed by palmar, subungual, and mucosal surfaces.<sup>24</sup> Also, black patients with melanoma presented at a later stage than white patients. Sixty percent of white patients presented with stage I melanoma, though only 39% of black patients presented this early; in contrast, 33% of black and 13% of whites presented at stage II or stage III. This late presentation in blacks has a profound impact on survival. The 5-year survival rate was 84.8% for whites and 58.8% for blacks.<sup>24</sup> The poorer

prognosis in blacks is believed to result from later detection due to the prevalence of acral melanoma, both the subungual and acral lentiginous subtypes, whose placement may make these melanomas easy to overlook or to mistake for normal pigmentary variations. It will be important for future research to determine why acral melanoma is so much more prevalent in skin of color. It has been suggested that this may be due to the relative lack of melanomas at other sites in blacks because there appears to be no significant difference in the incidence of plantar melanoma in white skin versus skin of color.<sup>25</sup> It also has been suggested that the disease is more aggressive in blacks for reasons still unclear.<sup>20</sup>

More research into the effects of UV radiation in skin of color, as well as in white skin, will be helpful to understand skin aging and skin cancers in all skin types. However, perhaps the most important issue is public education and the need for early detection of potential melanomas. Because of the greater incidence of acral melanomas in skin of color, the later stage at diagnosis, and the poorer prognosis, the need for patient and physician monitoring of pigmented lesions, particularly on the palms, soles, nail bed, and mucosal surfaces, is urgent. The widely held notion that skin of color does not need photoprotection is called into question by the alarming rates of melanoma in skin of color and its relatively poor prognosis in these patients. Although the preponderance of melanomas in individuals of color occur on areas not exposed to UV radiation, exposure to UV radiation, blistering sunburns, and albinism have been implicated in the pathogenesis of cutaneous malignancies in blacks. Although UV radiation appears to be a less important pathogenetic factor in skin cancers in skin of color, questions have been raised regarding the implications of the combined effect of depletion of the ozone layer and an increased outdoor recreational lifestyle.<sup>20</sup> It is encouraging that new research into melanin and photoprotection, as well as increased awareness of melanoma, will contribute to public education and awareness.

## Conclusion

New clinical and fundamental research, in addition to the application of new technology, such as digital microimaging, provides a greater understanding of skin of color. As the population of people of color continues to grow globally, a broad initiative is called for to build on earlier investigations into the basic physiology of skin of color and to better understand the similarities and differences between skin of color and white skin.

Advances in clinical research and technologies are leading to new, improved treatments and products for promoting a healthy skin barrier and addressing issues such as ashy, dry skin. The effects of UV radiation on darker skin emphasize the critical importance of photoprotection for all skin types. There is a need for effective sun protection products that emphasize the aesthetic needs of individuals of color. Existing products often are cosmetically unappealing to individuals with darker skin types, which may contribute to their low level of use among these patients. Further research, technology, and understanding of the physiology and treatment of skin of color present researchers and clinicians with opportunities to positively affect the health, appearance, and quality of life of an increasingly large number of people.

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