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natural considerations FOR SKIN OF COLOR

The Science of Natural Ingredients

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Natural Considerations for Skin of Color

Leslie Baumann, MD; David Rodriguez, MD; Susan C. Taylor, MD; Jessica Wu, MD

Changing US demographics indicate that dermatologists will treat an increasing number of individuals of color. Early research on cutaneous anatomy and physiology was performed mostly in white populations. However, new research is elucidating similarities and differences in skin of color and white skin with regard to skin barrier, pigmentation, and sensitivity. Two of the most important issues are skin lightening and brightening. Products for use on skin of color typically should be gentle because of the proclivity of more deeply pigmented skin to develop pigmentary abnormalities in response to skin irritation or trauma.

Increasing patient interest in natural remedies has been matched by research on the use of natural ingredients in dermatology. The relative gentleness of many of these products, coupled with excellent efficacy, makes natural ingredients such as soy and licorice excellent choices in the treatment of disorders such as postinflammatory hyperpigmentation (PIH) and melasma. For daily skin care, ingredients such as oatmeal and feverfew are good choices for gentle cleansing and moisturizing of dry, sensitive, or ashy skin. Sun protection is an increasing concern due to rising rates of melanoma. Several botanical products are useful in augmenting photoprotection with conventional sunscreens.

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The population of individuals of color in the United States is rapidly growing. The US Census Bureau reports that approximately half of the US resident population will be individuals of color by 2050.[1] Individuals of color represent a wide range of ethnic groups, including black, Asian, Hispanic, American Indian, and Pacific Islander individuals.[2] Although in many instances skin of color is similar to white skin with regard to its care and management, there are some important differences. New research initiatives and increasing clinical experience are adding to the understanding of skin of color and enhancing its care.

In addition to understanding skin of color and its similarities and differences with white skin, dermatologists increasingly will need to appreciate the cultural differences that influence their patients' perceptions of skin diseases, selection of skin care products, self-image, and appearance. Cultural sensitivity will be an increasing concern when managing patients of different ethnic backgrounds and can greatly aid in increasing patient compliance and satisfaction. For many cultures, the use of natural ingredients in healthcare is traditional and still important, even after immigration to the United States. Because of the strong interest in complementary and alternative medicine among all Americans, there is increasing high-quality research that demonstrates the safety of many active natural ingredients in dermatology. Many of these active natural ingredients are particularly well-suited for treating patients with skin of color, not only because of cultural preferences but also because they offer gentle and effective depigmenting, barrier-enhancing, and anti-inflammatory activities. It is important for physicians to become familiar with active natural products for common skin conditions and daily skin care so they can make appropriate recommendations for patients who request these products.

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Drs. Baumann and Rodriguez report no conflict of interest. Dr. Taylor is an advisory board member for Johnson & Johnson Consumer Products, Inc. Dr. Wu is founder and president of Dr. Jessica Wu Cosmeceuticals. She also is an advisory board member and consultant for Johnson & Johnson Consumer Products, Inc.

DEFINING SKIN OF COLOR

There is no standardized definition or classification system for skin of color, but several systems commonly are used. Perhaps the most useful method for defining skin of color relies on using a combination of typing systems until a new or better system is devised.

One of the most commonly used methods is the Fitzpatrick skin type classification system.[3] Skin of color generally is classified in the range of Fitzpatrick skin types IV through VI. However, this system was

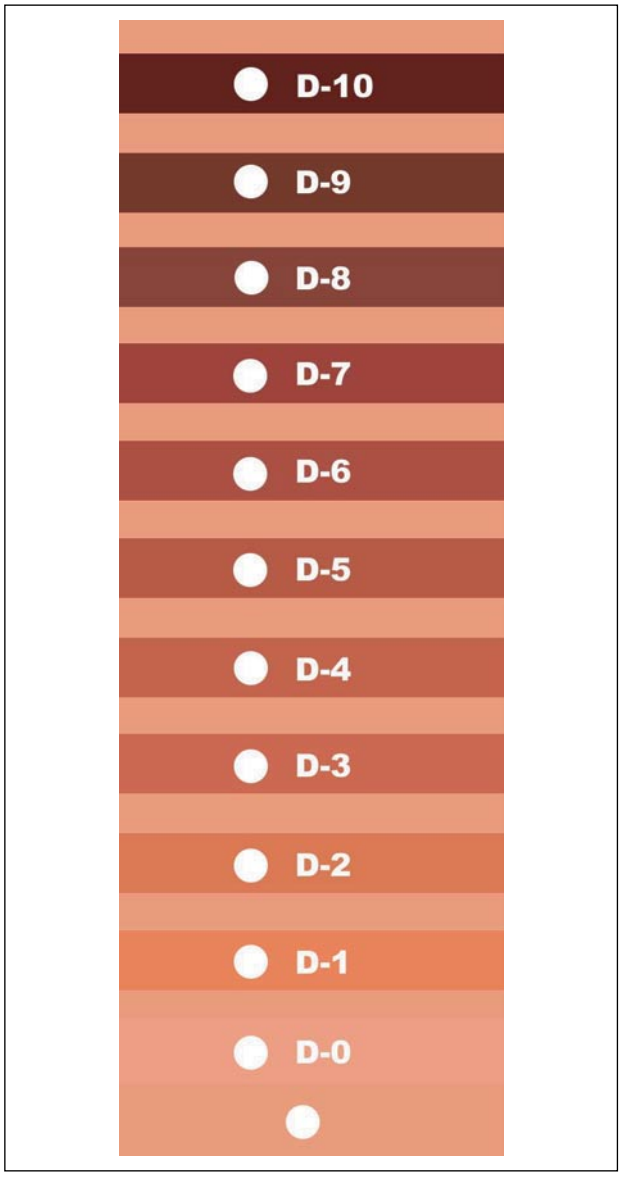


Figure 1. One of the 15 skin hue cards in the Taylor Hyperpigmentation Scale. The uniquely colored plastic cards span the full range of skin hues and are applicable to individuals with Fitzpatrick skin types I through VI. Reprinted with permission from *Cutis.* 2005;76:270-274. ©2005, Quadrant HealthCom, Inc.[4]

never intended to define ethnicity. Rather, it was developed to define the response of different skin types to UV light used in phototherapy.[3]

A new method for assessing skin color is the Taylor Hyperpigmentation Scale.[4] This scale has been validated and may be used to monitor the treatment of hyperpigmentation in both research and clinical settings. The scale consists of 15 laminated plastic cards representing various skin hues. Each card features 10 bands of increasingly darker gradations of the skin hue, representing progressive levels of pigmentation that also may be present. The individual's skin color first is matched as closely as possible to 1 of the 15 skin hue cards, and then the area of hyperpigmentation is matched to one of the 10 bands (Figure 1).[4]

Another skin classification method is the Baumann Skin Typing System, which is not used to define ethnicity or skin color per se but to assist the physician and patient in determining appropriate skin treatment and skin care products.[5] Useful across all ethnic and age groups, and for both males and females, the system consists of 4 skin parameters: dry/oily, sensitive/resistant, pigmented/nonpigmented, and wrinkled/tight. These parameters can be combined into 16 different skin types as determined by answers to a 64-item questionnaire. In general, individuals of color will fall into the pigmented/tight type.[5]

SKIN OF COLOR STRUCTURE AND FUNCTION: CONTROVERSIES AND NEW FINDINGS

Much of the seminal research on skin structure, function, and treatment was conducted in white individuals, and the extent to which this research can be generalized to other groups is unclear. Some early data suggested differences between skin of color and white skin.[6-9] Although many of these studies served as an important foundation, they were based on small study populations. Fortunately, new technologies such as diffuse reflectance spectroscopy,[10] and new research such as the elucidation of the protease-activated receptor 2 (PAR-2) pathway and its role in pigmentation and hair growth,[11] are helping to augment our understanding of skin of color.[2]

The skin barrier is one area of study lacking consensus. The skin barrier is composed of terminally differentiated keratinocytes (corneocytes) in a lipid matrix that is predominantly comprised of ceramides, fatty acids, and cholesterols in an equimolar concentration. This bricks-and-mortar construction restricts the movement of water and natural moisturizing factor through the stratum corneum (SC).[12] Skin barrier integrity is partly dependent on adequate levels of the correct types of lipids.

Findings relating to the lipid content of the skin barrier in individuals with skin of color are conflicting. One study compared transepidermal water loss (TEWL) and water content with SC lipids in 4 races.[13] TEWL measurements were noted in decreasing order in black, white, Latino, and Asian populations. SC lipids, particularly

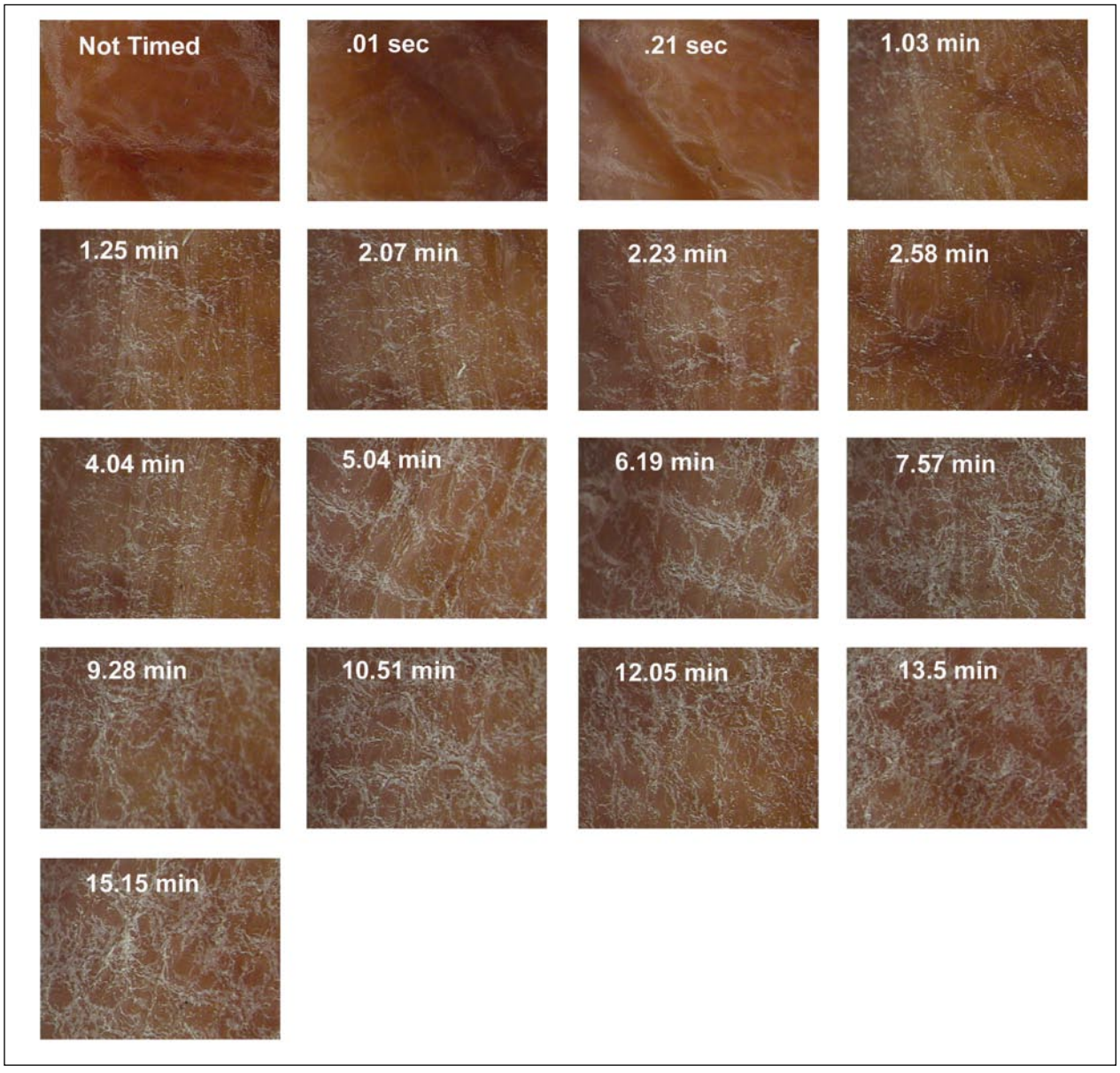


Figure 2. Buildup of ashy skin in a black patient after washing. Reprinted with permission from Smith.[21]

ceramides, were significantly lower ($P<.05$) in black individuals compared with other races, correlating with the lowest water content, which also was found in black individuals. Sugino et al[13] suggested that differences in SC vulnerability among races are associated with ceramide dynamics. However, a trial by Grimes et al[14] noted no differences in either TEWL or skin hydration as measured by corneometry.

The comparative vulnerability of the skin barrier to irritants in black and white individuals also is controversial. In 1919, Marshall et al[15] demonstrated decreased susceptibility to cutaneous irritants in black skin, suggesting that the skin barrier of black skin is stronger. Weigand et al[16] also demonstrated decreased susceptibility to cutaneous irritants in black skin. Using tape stripping, they found no detectable differences in irritant susceptibility following SC removal, suggesting superior SC function in black skin. This study also found evidence of a greater number of cell layers in black skin and possibly greater cell cohesiveness.[16]

Kaidbey and Kligman[17] noted striking differences in the reactions of black and white skin to topical coal tar. While white skin was seen to develop inflammatory papules and pustules and follicular disintegration, black skin deveoped a hyperkeratotic response, suggesting a greater resistance to irritants. Reed et al[18] found superior barrier integrity and recovery following exposure to

Table 1.

Reasons to Use Photoprotection in Skin of Color[5,12,20,26,27]

Prevents immunosuppression
Prevents pigmented lesions (eg, melasma)
Prevents skin barrier disruption and dry skin
Prevents skin cancer, especially melanoma
Prevents sunburn
Prevents wrinkles and other signs of photoaging and uneven skin tone

irritants in individuals with Fitzpatrick skin types V and VI but no differences in baseline TEWL.

CLINICAL CONTROVERSIES REGARDING SKIN OF COLOR

The controversies of the physiology of skin of color are mirrored in clinical practice, including the incidence of atopic dermatitis, the basis of the ashy skin frequently seen in black individuals, and the relative oiliness of different skin types.

Atopic Dermatitis

The data with regard to barrier differences among individuals of different ethnicities are conflicting.[13,19] A study of 400 subjects at a general dermatology practice sought to determine if atopic dermatitis was more or less common in black skin (L.B., unpublished data, 2005). The study found that 47 of 63 black subjects (75%) had never been diagnosed with atopic dermatitis, eczema, or contact dermatitis, and 30 black subjects (48%) had never had a rash underneath their rings, where trapped surfactants frequently cause rashes in Hispanic and white individuals. These findings suggest a lower than expected incidence of eczema and contact dermatitis in black individuals. However, 43 black subjects (68%) stated they had experienced break outs, dryness, or itching when using fragranced oils, lotions, or bubble bath, suggesting an impaired barrier and a greater irritant reaction in black skin. (L.B., unpublished data, 2005).

Ashy Skin

In the same study, 28 black subjects (44%) stated that soaps provided in hotels resulted in dry ashy skin. (L.B., unpublished data, 2005). Ashy skin is common in individuals of color, particularly in areas of friction and on extensor joints. Little is known about the pathogenesis of ashy skin, though it appears to be somewhat different from usual dry skin.[20] Figure 2 shows the buildup of skin ash beginning one minute after washing.[21]

Corcuff et al[22] found that there were no differences in corneocyte surface area in black, white, or Asian skin. While Weigand et al[16] found greater cohesiveness in black skin, Corcuff et al[22] found increased spontaneous desquamation in black skin. Thus, ashiness in skin of color may represent dry desquamating skin that has not completely exfoliated. It also has been suggested that retained corneocytes are lighter in color and more apparent in darker skin, adding to the ashy appearance.[20]

Skin Oiliness

Although it frequently is assumed that darker skin is oilier than white skin, published findings conflict. A 1958 study by Kligman and Shelley[23] asserted that black skin is oilier than white skin and features greater sebum levels and larger sebaceous glands, though a later study by Pochi and Strauss[24] found that sebum production was not significantly different in black and white skin. In the Baumann survey of 400 subjects, 60% had oily skin and 40% had dry skin (L.B., unpublished data, 2005).

MELANIN PHYSIOLOGY IN SKIN OF COLOR

Epidermal melanin content is the most visually evident difference between skin of color and white skin. There are no interracial differences in the number of melanocytes, but there are variations in the numbers, sizes, and aggregations of melanosomes. In black skin, melanosomes are large and singly dispersed in keratinocytes.[7,25] In white and Asian skin, melanosomes are aggregated within a surrounding membrane.[6] In skin of color, the epidermal melanin unit contains more

melanin overall and may undergo slower degradation.[7] The transfer of melanosomes to keratinocytes is regulated by PAR-2. Pivotal research has demonstrated that this pathway can be regulated and pigmentation influenced by fresh soy extracts.[11]

SUN PROTECTION FOR SKIN OF COLOR

For many years, the higher melanin content of skin of color was thought to confer nearly total photoprotection. A seminal in vitro study by Kaidbey et al[8] in 1979 found that, on average, 5 times as much UV light reaches the upper dermis of white skin versus black skin. Using cadaveric skin samples and a solar simulator to measure UV transmission, the authors concluded that black skin had a sun protection factor (SPF) of 13.4 versus 3.3 for white skin.[8] This study, coupled with a seemingly low risk of skin cancer among individuals of color, led to the assumption that sunscreens are unnecessary in this population.[20]

During its development, the Baumann Skin Typing System questionnaire was administered to several thousand patients with varying skin tones. Only one black individual, a dermatologist, reported using sunscreen daily (L.B., unpublished data, 2005). Although melanin may confer some protection against UV damage, this protection is incomplete.[26] More recently, it has been reported that Fitzpatrick skin types II and IV have similar levels of photoprotection, with an SPF of approximately 2, and the degree of pigmentation is not correlated with protection against DNA damage and erythema.[20] Individuals of color require photoprotection for several reasons, as noted in Table 1.

Prevention of UVB-induced photoimmunosuppression is as important an issue in skin of color as it is in white skin. UVB impairs the induction of contact sensitivity in approximately 40% of white individuals via Langerhans cell depletion. A single exposure to UV radiation can cause immune disruption in black skin, just as it does in white skin.[27]

Although melanoma is most common in white skin, its prevalence has increased in all Americans. The current lifetime risk for invasive melanoma in Americans is 1 in 87.[28] A retrospective chart review of 649 patients treated for melanoma in a Washington, DC, hospital between 1981 and 2000 found that although melanoma was less prevalent among black patients (36 cases), they were more likely to present with advanced disease and consequently have a worse prognosis.[29] Atypical locations such as the palmar and plantar surfaces were more common in black patients. Among white patients, the 5-year survival rate was 84.8% versus 58.8% in black patients.[29] Clearly, individuals of color require education on the effects of UV radiation and the need for daily sunscreen use, routine self-examination, and annual dermatologic assessments. Likewise, physicians must increase their index of suspicion for skin cancers in patients of color.

Several botanical products have been used to augment the photoprotection conferred by physical and chemical sunscreens. One product that appears to be particularly effective in a research setting is green tea polyphenols. In one study, green tea extracts topically applied to the forearms of volunteers prior to exposure to solar-simulated radiation resulted in a dose-dependent inhibition of erythema, a 66% reduction in sunburn cells, and a 58% reconstitution of Langerhans cells.[30]

SKIN ISSUES AND CONCERNS OF INDIVIDUALS WITH SKIN OF COLOR: PIGMENTARY DISORDERS

The melanin physiology of individuals of color results in unique needs and concerns with which the dermatologist should be familiar. A 1983 survey of 2000 black patients seen in private dermatologic practices in Washington, DC, found that pigmentary disorders were the third most common dermatoses.[9] In a 1987 magazine survey of the cosmetic needs of 2000 black women (published in 2000), 37% of women complained of uneven skin tone.[31] A later survey of the cosmetic concerns of 100 women of color (81 black, 16 Latino, 3 Asian) found that 86% were concerned about dark spots and 49% complained of sensitive or very sensitive skin.[31]

Clearly, the ability of melanosomes in black skin to produce larger quantities of melanin is one factor contributing to the higher prevalence of pigmentary disorders in patients of color. An additional and widely accepted explanation is that the melanocytes in black skin show an exaggerated response to cutaneous stimulation and damage.[32] Inflammatory mediators in the prostaglandin family also may be involved in cases of acquired hyperpigmentation.[33]

Hyperpigmenting disorders include postinflammatory hyperpigmentation (PIH), melasma, and photoinduced pigmentation. PIH is common in individuals with Fitzpatrick skin types IV through VI. It is a frequent sequel to many types of inflammatory sequelae. Causes of PIH include cosmetic procedures and mechanical trauma to the skin.[2] PIH frequently occurs in resolving acne lesions and presents as a hyperpigmented macule that may persist for months. It often is the presenting complaint of patients of color with acne, and both the acne and PIH should be treated.

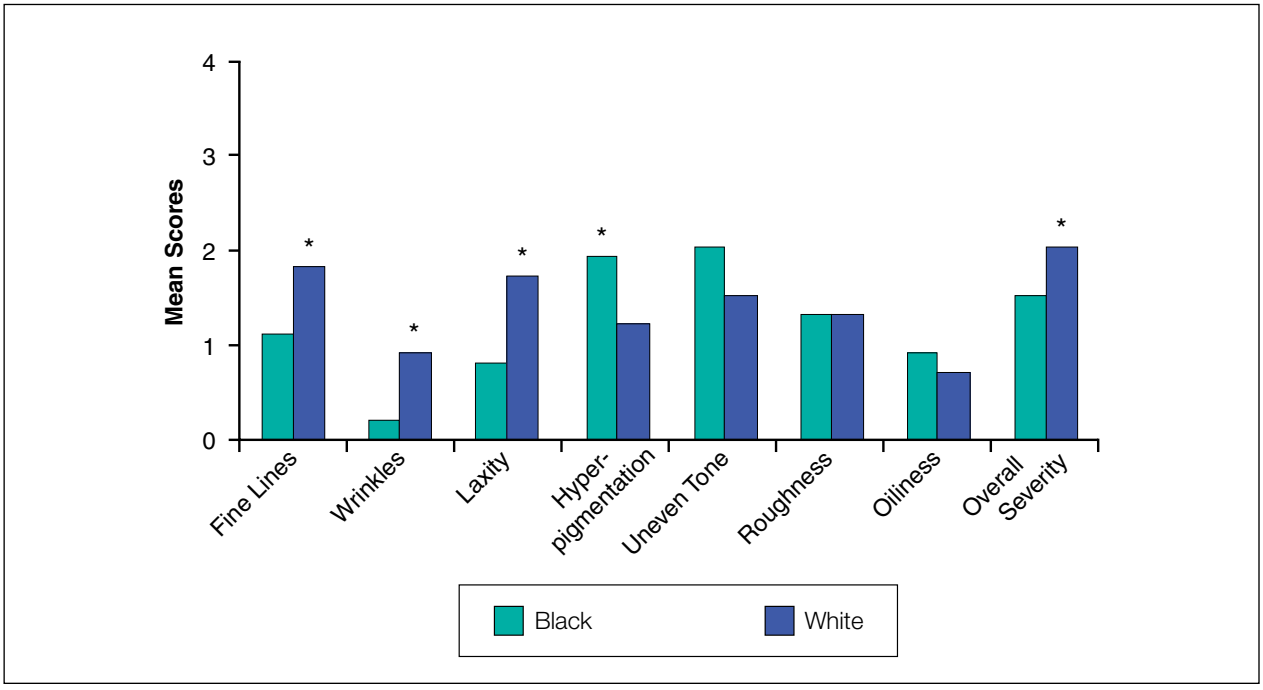


Figure 3. Evaluation of age-related skin conditions in black versus white skin. Asterisk indicates significantly more severe condition ($P \leq .05$). Mean scores are based on a 5-point scale: 0=none, 1=mild, 2=moderate, 3=marked, 4=severe. Reprinted with permission from *Cutis.* 2004;73:392-396. ©2004, Quadrant HealthCom, Inc.[14]

PIH also may occur secondary to pseudofolliculitis barbae (PFB), a common inflammatory disorder in men and women of black and Hispanic decent with tightly coiled hair. PFB is believed to be caused by either extrafollicular penetration,[34] whereby a shaved hair grows back through the skin, or transfollicular penetration, whereby the hair pierces the follicular wall and grows into the dermis.[35] With either cause of PFB, irritation and inflammation ensue, frequently leading to PIH. Although there is no cure for PFB, various shaving techniques or refraining from shaving may be helpful.[2] In addition, feverfew (*Tanacetum parthenium*), a plant from the Compositae family, which also includes chamomile and marigold, may be helpful in reducing the redness, razor bumps, and itching associated with shaving. In a 2-week controlled study, a topical cream containing feverfew was shown to prevent erythema associated with shaving and also to relieve shaving-induced itch.[36]

Melasma is the most common cause of acquired hyperpigmentation. Melasma is generally agreed to be most prevalent among the Hispanic population and individuals with Fitzpatrick skin types IV through VI, but it also occurs in white individuals. It is most common in females of childbearing potential, but it does occur infrequently in males.[37,38]

Photoinduced pigmentation, including solar lentigines and seborrheic keratoses, is a common sign of photodamage in Asian patients.[39]

COSMETIC CONCERNS OF PATIENTS WITH RICHLY PIGMENTED SKIN: LIGHTENING AND BRIGHTENING

In some parts of the world, individuals with lighter skin tones are considered to be of a higher class and/or socioeconomic status. In Asia, 60% of Japanese women and 75% of Chinese women desire a lighter skin tone,[40] as is the case in many African countries. In the United States, patients of color tend to want to address uneven skin tone, rather than lightening their natural skin color. A study by Grimes et al[14] compared dermatologic issues relating to aging in black and white individuals. Figure 3 shows differences in age-related skin conditions in black versus white skin.[14]

The skin of white subjects in the study had significantly more severe fine lines, wrinkles, laxity, and overall photodamage ($P \leq .05$). The black subjects had more severe pigmentary-related problems, including significantly greater hyperpigmentation ($P \leq .05$) and a trend toward greater severity of uneven skin tone.[14] Accordingly, products to gently lighten, brighten, or tone skin are eagerly sought by patients of color.

Skin Lightening

By definition, skin lightening products are sold by prescription, and brighteners, whiteners, and toners are sold over-the-counter (OTC). The most commonly used skin lightening product is hydroquinone (HQ).

Table 2.

Natural Ingredients for Skin Lightening and Whitening and Their Mechanisms of Action[11,40,42-46]

Melanosome Transfer Inhibition
Fresh soy extracts
Niacinamide
Tyrosinase Inhibition
Licorice extracts
Azelaic acid
Kojic acid
Arbutin

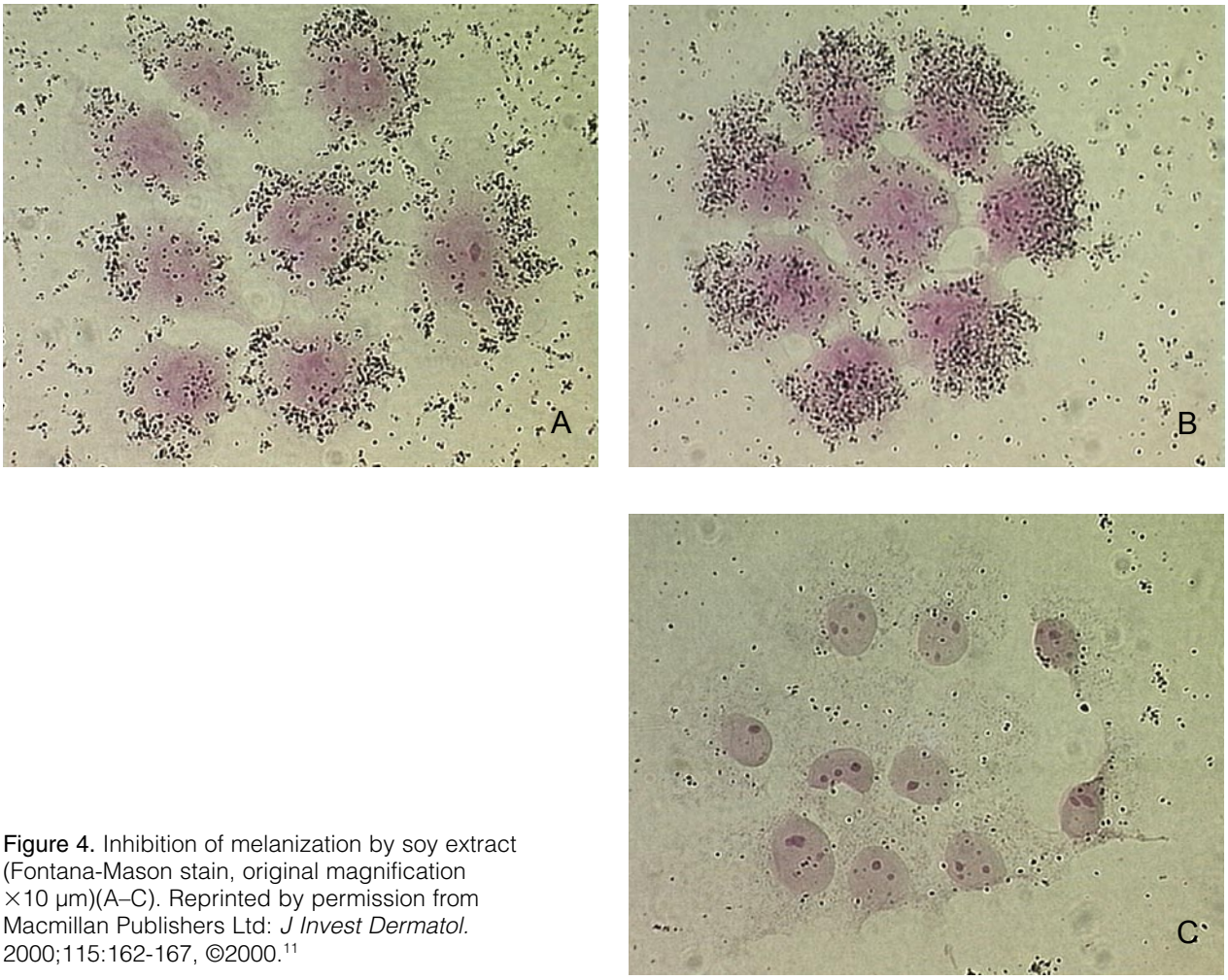


Figure 4. Inhibition of melanization by soy extract (Fontana-Mason stain, original magnification ×10 µm)(A–C). Reprinted by permission from Macmillan Publishers Ltd: *J Invest Dermatol.* 2000;115:162-167, ©2000.[11]

OTC HQ is banned in many countries. However, it has been a safe and effective depigmenting agent in the United States, with products containing 2% HQ or less sold without a prescription. Some products originating in other countries and illegally imported to the United States may contain high HQ concentrations as well as high-potency topical corticosteroids and even ingredients such as mercury. Although illegal, these products can be found in beauty supply stores.[41] The US Food and Drug Administration currently is reviewing the status of OTC HQ products. If a patient of color presents with atrophy or lesions resembling steroid-induced acne, it is important to ascertain whether corticosteroid-containing lightening products have been used.

Natural Ingredients for Skin Lightening and Whitening

Because of a cultural shift in favor of "natural" products and their perceived safety, many patients are now asking about natural sources for skin lightening. This shift partly may be attributed to increased patient appreciation of the risks involved with the use of HQ and high-potency topical corticosteroids for skin lightening. A variety of natural ingredients that are effective in lightening and whitening the skin are listed in Table 2. In general, these ingredients either inhibit the transfer of melanosomes to keratinocytes or inhibit tyrosinase, which is necessary for melanin synthesis. Depending on the etiology and severity of hyperpigmentation, these ingredients may be used as monotherapy or as adjuncts to conventional therapies for the treatment of PIH, melasma, and photodamage.

Soy—It is important to distinguish between fresh soy and fermented soy products such as tofu because their compositions differ, as do their effects on skin and other organ systems. Specific components in total fresh soy, such as soy proteins and amino acids, have shown applications in skin care and have been clinically proven to improve the tone and texture of skin, improve photoaging, and minimize the appearance of unwanted facial and body hair. Fermented soy products contain isoflavones such as genistein that may have estrogenlike effects. Fresh soy products contain the soy proteins that have application in the management of dyschromia.

Two soybean proteins, soybean trypsin inhibitor and Bowman-Birk inhibitor, act through PAR-2, a phagocytic receptor expressed on keratinocytes. Inhibition of the PAR-2 pathway decreases the transfer of melanosomes to keratinocytes, thus lightening the skin.[47] Figure 4 shows the pigmentation changes that are achievable with soy.[11] The control panel (Figure 4, A) shows keratinocytes in culture with melanosomes. A PAR-2 activator is added (Figure 4, B); phagocytosis of the melanosomes is enhanced and pigmentation is more obvious. A PAR-2 inhibitor made from fresh soy milk is added to the keratinocytes in culture with melanosomes (Figure 4, C), inhibiting melanosome phagocytosis, which results in reduced melanin transfer and reduced pigment production.[11]

Because PIH can develop in areas of skin inflammation, particularly in skin of color, it is important that formulations designed to treat hyperpigmentation in Fitzpatrick skin types IV through VI have a low irritation potential so that the treatment itself does not exacerbate the PIH. Higher concentrations of HQ have the potential to be irritating and also have been reported to cause halo hypopigmentation of healthy skin. Hence, in some patients, other skin lightening preparations may be more desirable. In a study of 60 females with Fitzpatrick skin type VI and acne-related PIH, 45 subjects (75%) noted improvement in their PIH lesions after using a total soy product for 4 months.[48] In a study of a topical salicylic acid acne treatment formulated with retinol and soy, PIH lesions in patients with acne and Fitzpatrick skin types III through V showed marked improvement after 16 weeks of treatment.[49]

In addition to its role in the regulation of pigmentation, the PAR-2 pathway also has been shown to affect hair growth and dimensions. In a guinea pig model, treatment with fresh soy milk for 5 weeks resulted in reduced hair shaft thickness and pigment deposition.[50] It would be interesting to study whether treatment with soy could reduce the coarseness of facial hair in such a way that it was rendered less likely to curve back and reenter the skin. Moreover, reduced beard growth also might result in the reduced need for shaving, which has been demonstrated to benefit patients with PFB.[34] Lastly, the ability of soy to improve hyperpigmentation also might be valuable in this setting.

Niacinamide—Niacinamide is a precursor to niacin. Niacinamide demonstrated inhibition of melanosome transfer in a keratinocyte/melanocyte coculture model and reduced cutaneous pigmentation in a pigmented-reconstructed epidermis model. Niacinamide showed no effect on melanin production in the mushroom tyrosinase assay nor on melanogenesis in cultured melanocytes.[40] In a double-blinded right-left randomization study of 18 Japanese women aged 25 to 60 years with pigmented spots, image analysis for pigmentation benefit showed a significant decrease ($P<.05$) in total hyperpigmented area for treatment with niacinamide 5% versus placebo at both 4 and 8 weeks.[40]

Licorice Extracts—Several different species of licorice have been studied and found to be active. Licorice extracts contained in natural depigmenting products around the world are derived from the root of

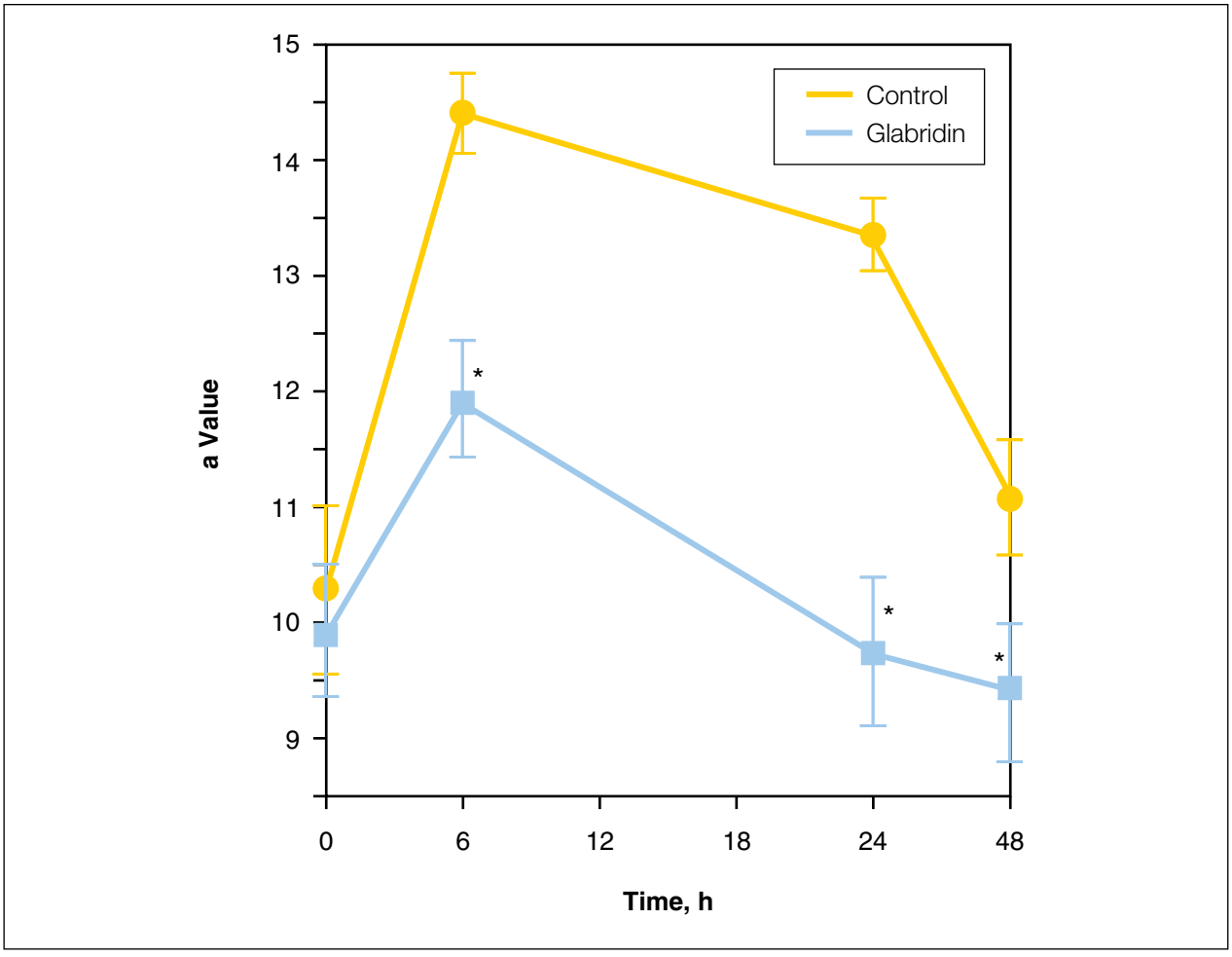


Figure 5. Effect of glabridin on erythema. Asterisk indicates $P<.01$. Reprinted with permission from Yokota et al.[43]

Glycyrrhiza glabra.[43] The active ingredient in licorice is glabridin in a 10% to 40% concentration. Glabridin depigmenting activity is caused by the inhibition of tyrosinase activity. Licorice also has anti-inflammatory effects via inhibition of superoxide anion production and cyclooxygenase activity. Although clinical studies of licorice are scarce, topical application of glabridin 0.5% to the backs of brownish guinea pigs for 3 weeks following UVB irradiation (UVB 250 mJ/cm^2 daily for 4 successive days) inhibited the development of pigmentation in all animals tested. In a separate study by the same authors, glabridin also reduced erythema and inflammation following UVB irradiation. Figure 5 shows a* (erythema) by colorimetry at various time points after a single exposure to UVB 150 mJ/cm^2 and treatment with either glabridin or vehicle.[43]

In a study of patients with melasma, glabridin applied once daily provided satisfactory results in about 20% of patients. However, the addition of betamethasone 0.05% and retinoic acid 0.05% with a chemical peel resulted in a good response in 70% of patients, which underscores the fact that melasma is difficult to treat and natural therapies may be best used as adjuncts to conventional therapies in the management of melasma.[45]

Azelaic Acid—Azelaic acid (AzA) is a naturally occurring saturated dicarboxylic acid produced by yeasts. A randomized double-blinded study of AzA cream 20% versus HQ cream 2% in 132 Filipino women with a median melasma duration of 4 years showed that AzA was more effective than HQ in lightening pigmented macules and reducing lesion size.[51] A 24-week, multicenter, double-blinded comparison of AzA cream 20% versus HQ cream 4% in 329 women with melasma showed good to excellent responses in 73% of the HQ group versus 65% of the AzA group, as measured by lightening of pigmented macules and reduction in lesion size.[44] Sarkar et al[52] compared the results achieved in treating 30 Indian patients with melasma with AzA cream 20% monotherapy versus a sequential therapy that included a potent topical corticosteroid. This prospective, single-blinded, right-left comparison study involved the following treatments: (1) twice-daily

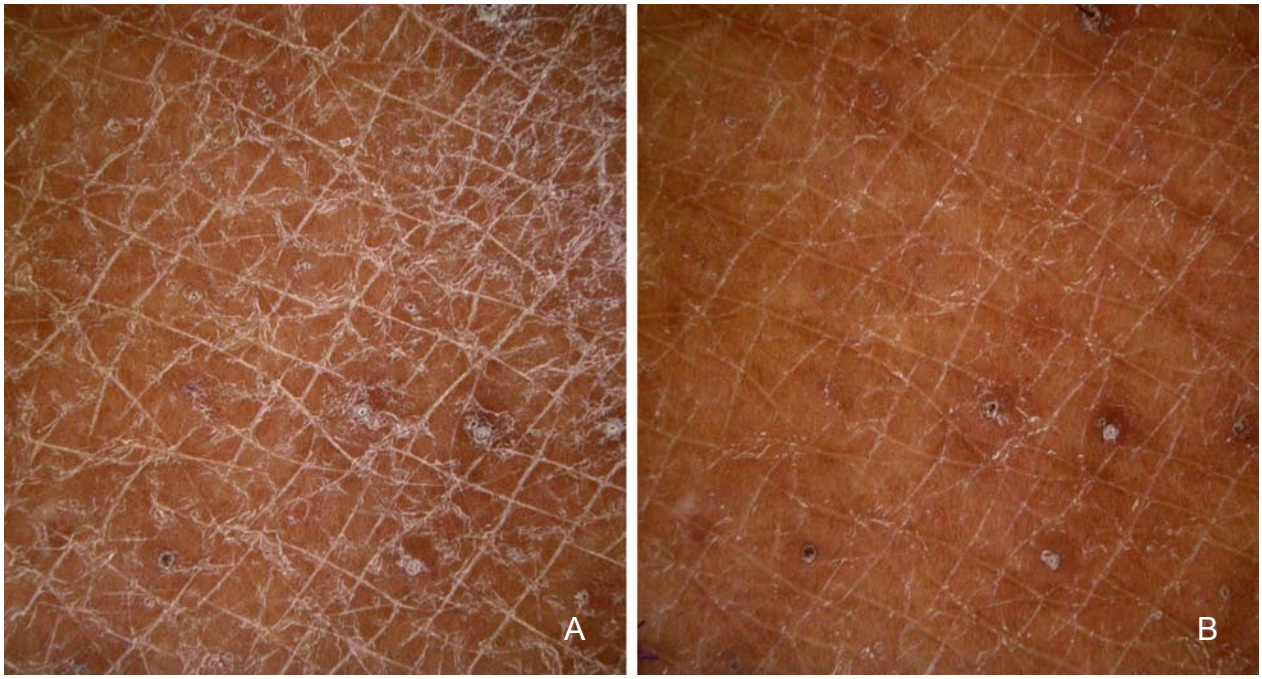


Figure 6. Treatment of ashy skin with colloidal oatmeal. Patient's lower leg at baseline (A) and day 1 following use of an oatmeal-containing moisturizer (B). Reprinted with permission from Nebus et al.[60]

application of AzA cream 20% to one half of the face for 24 weeks and (2) application of clobetasol propionate cream 0.05% for only 8 weeks followed by AzA cream 20% only for the next 16 weeks to the other half of the face. Concomitant use of a broad-spectrum sunscreen also was required. At week 24, 27 patients (90.0%) experienced good to excellent results with AzA monotherapy versus 29 patients (96.7%) with sequential therapy.[52]

Kojic Acid—Kojic acid is a fungal metabolic product of various fungi including *Aspergillus* and *Penicillium*. The depigmenting activity of kojic acid is attributed to its ability to inactivate tyrosinase by chelating copper.[45,53] Kojic acid also acts as a free radical scavenger (S.C.T., unpublished data, 2006). A randomized, double-blinded, split-face trial compared kojic acid cream 2% with HQ cream 4%, both with glycolic acid 10%, in the treatment of 22 patients with melasma. Mean Mexameter® readings at 6 weeks showed comparable pigmentation and erythema reduction with both treatments.[54]

Arbutin—Arbutin is a glycosylated HQ that is derived from the leaves of plants such as cranberry, blueberry, and pear. A randomized, double-blinded, split-face, controlled trial compared arbutin cream 4% with HQ cream 4%, both with glycolic acid 10% and SPF 45 sunscreen. Mean Mexameter readings at 6 months showed better results with HQ, but clinical evaluators and subjects perceived comparable results for both treatments.[46]

Skin Brightening

In addition to uneven skin tone, many individuals of color complain of dull, rough, or ashy skin and request products to brighten their skin. Skin brightening can be achieved with the use of products containing moisturizers that prevent ash buildup and gentle exfoliants that remove retained corneocytes that may dull the skin's appearance. Oatmeal has been used for skin care since the time of ancient Egyptians.[55] Colloidal oatmeal (hulled oat kernels ground to a fine powder) is readily dispersed in water and forms a viscous hydrocolloid and humectant gel on the skin surface.[56,57] Oat proteins also have high hydration and fat-binding properties and can buffer acids and bases, thus promoting skin barrier integrity.[58] The major oat lipids are triglycerides and phospholipids, as well as oleic, linolenic, and linolenic acids and sterols, all active in the SC.[59]

The use of natural colloidal oatmeal in patients with Fitzpatrick skin types IV through VI was studied in a 2-week investigator-blinded trial.[60] Subjects discontinued use of a moisturizer for one week prior to study initiation and then cleansed with a surfactant bar for 3 days. On day 4, the subjects began using an oatmeal-containing moisturizer twice daily for 2 weeks. Improvement in moisturization and skin brightness was visible as early as day 1 after colloidal oatmeal was initiated (Figure 6).[60]

Additional clinical evaluations revealed significant improvements ($P<.05$) in the appearance of skin ash, flaking, and dryness on day 1 of treatment

with the oatmeal-containing moisturizer.[60] Subjects perceived significant reductions ($P<.05$) in skin tightness and itching, as well as in ash and scale, as early as day 1 compared with the baseline value. The subjects also noted improvements in the texture, smoothness, and overall look and feel of their skin at day 1. These improvements were maintained over the course of the study. Adhesive tape stripping was performed and the number and size of corneocytes removed from the SC were analyzed; the desquamation index score was calculated to determine the severity of the dry skin. At baseline, large numbers of corneocytes were removed (high desquamation index score). After one day of using the oatmeal product, the desquamation index score was significantly lower ($P<.05$), indicating improved moisturization. Results continued to improve at days 7 and 14. High-resolution digital photographs showed visible improvements in skin ash, scale, and textural lines as early as day 1. Skin ash continued to improve visibly throughout the course of the 2-week study.[60]

In addition to the ability to lighten skin, soy also moisturizes and protects the skin barrier. A 12-week controlled clinical study of women aged 30 to 49 years with moderate skin roughness, dullness, and hyperpigmentation showed significant improvements ($P<.05$) in skin tone, texture, and radiance, beginning as early as 4 weeks after initiation of a soy-containing moisturizer with sunscreen. Colorimetry showed a significant decrease ($P<.05$) in red and yellow color coordinates, indicating reductions in redness and sallowness.[61]

Rough dull skin also requires gentle exfoliation to brighten its appearance. Retinol, the naturally-occurring form of vitamin A, enhances desquamation similar to other retinoids but with less likelihood of irritation.[62] In one study, a retinol cream produced improvements in skin sallowness, texture, and clarity, as well as mottled hyperpigmentation, compared with baseline and vehicle.[63]

SKIN SENSITIVITY IN SKIN OF COLOR

Similar to other controversies regarding the understanding of skin of color, assessments of racial differences in skin sensitivity and risk of irritation have been numerous and conflicting. Taylor[41] reported that early studies relied on investigator observations of erythema, which can be more difficult to detect in deeply pigmented skin, as the primary marker of irritability. Approximately 40% of the population, regardless of age or skin type, color, or dryness/oiliness level, claims to have sensitive skin[64,65]; to date, there is no existing standard for defining sensitive skin. Objective measurements of skin sensitivity include the lactic acid (facial sting) test; TEWL (evaporimetry); and dimethyl sulfoxide, methyl nicotinate, and sodium lauryl sulfate irritancy tests. Skin sensitivity is defined foremost on the basis of subjective perceptions following environmental stimuli, including perceptions such as stinging, burning, pruritus, scaling, tightness,

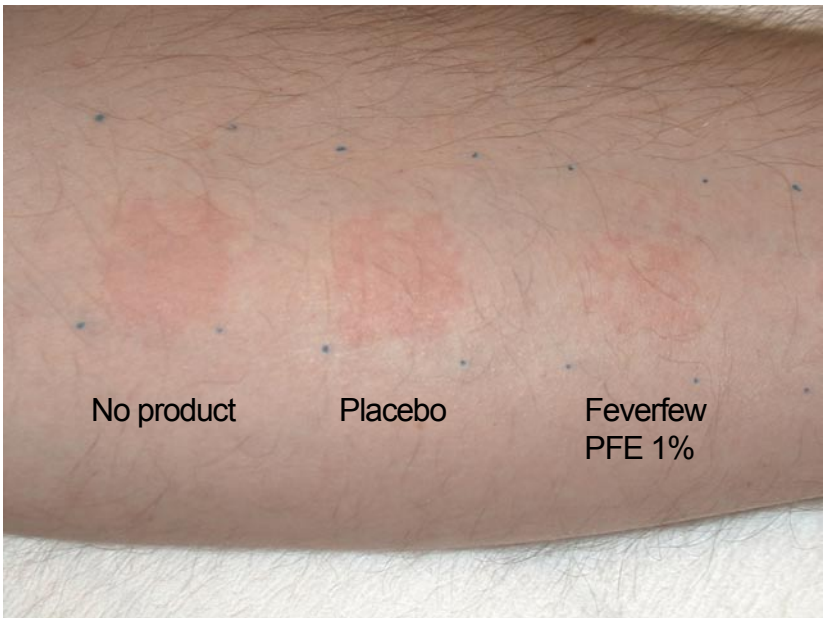
Table 3.

Anti-inflammatory Activity of Feverfew Parthenolide-Free Extract™*

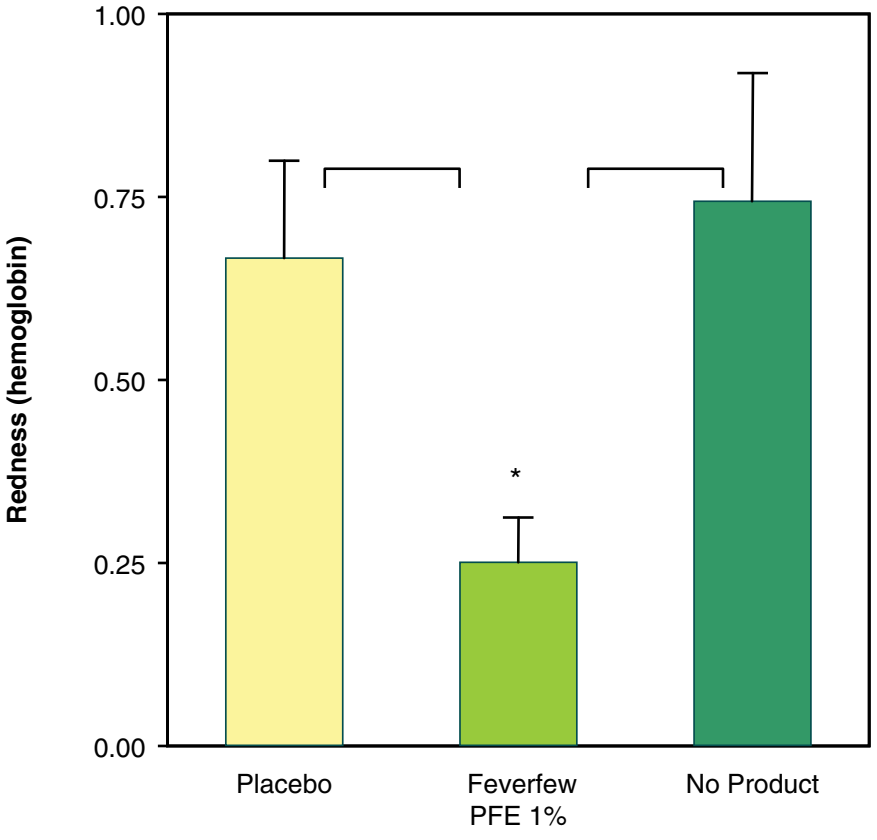
Potent activity against 5-lipoxygenase, phosphodiesterase 3 and 4, human leukocyte elastase
Inhibits TNF-α from stimulated murine macrophages
Inhibits TNF-α, IL-2, IL-4, and IFN-γ
Releases from activated human lymphocytes
Reduces neutrophil chemotaxis
Inhibits adhesion molecule expression and cytokine release
Decreases NF-κB–dependent gene transcription

*TNF indicates tumor necrosis factor; IL, interleukin; IFN, interferon; NF, nuclear factor.

Data from Martin et al.[73]



A



B

Figure 7. Reduction of histamine-induced erythema following application of feverfew parthenolide-free extract™ (PFE) 1% (A and B). Asterisk indicates $P<.05$. Reprinted with permision from Liebel et al.[74]

and pimples.[65] Patients may experience these symptoms with no accompanying clinical signs of redness or irritation.[66]

Whether or not patients with more melanized skin complain of subjective sensory symptoms of skin sensitivity, it has been clearly established that darker skin is more prone to PIH if irritated or traumatized.[32] A small study of Japanese and white women suggested that the acute irritant response, particularly to stronger irritants, is greater in Japanese subjects versus white subjects.[67]

Recommendations for Patients of Color With Sensitive Skin

Many products labeled as safe for skin of color have not been specifically tested on this skin type.[68] For daily skin care, gentle cleansers are recommended. Patients should be advised to avoid scrubs and detergent bars, which can be irritating to their skin. Gentle moisturizers should be used that do not contain known irritants such as isopropyl alcohol or propylene glycol. Products with barrier-enhancing lipids are helpful for all skin types.[68]

Anti-inflammatory agents are important in sensitive skin of color to prevent or treat eczema/atopic dermatitis, reduce the risk of PIH, decrease vascular reactivity, and suppress inflammatory pathways. They should be incorporated into daily skin care as cleansers and moisturizers.

A variety of natural ingredients make good choices for sensitive skin. Some of the more widely available and well-studied natural ingredients for use in calming sensitive skin include oatmeal, feverfew, licorice, chamomile, and aloe vera.

Oatmeal—Oatmeal contains saponins that absorb oil and sebum. Oat flour contains small amounts of free fatty acids that help reduce the amount of free alkali in soap.[55] Oatmeal is composed of 8.5% lipids, including oleic, linoleic, and palmitic acids, that help restore barrier function.[69] Oatmeal extracts have been shown to inhibit sodium lauryl sulfate–induced skin irritation and inflammation through their barrier protective effects and their effects on cutaneous blood flow.[69] In another study, a suspension of powdered oats inhibited prostaglandin synthesis to a degree comparable with indomethacin.[70]

A recent study demonstrated the inhibitory effect of an oatmeal extract on cytosolic phospholipase A_2–dependent mobilization of arachidonic acid from phospholipids, eicosanoid formation, and cytosolic phospholipase A_2 expression.[71] In another study, oatmeal extract oligomer decreased vasodilation in human skin fragments after stimulation with vasoactive intestinal peptide, which has been implicated in sensitive skin disorders. Mean dilated blood vessel surface and edema were significantly decreased ($P<.05$) after application of oatmeal extract oligomer; additionally, treatment decreased levels of tumor necrosis factor α.[72]

Feverfew—Recently, a feverfew extract depleted of parthenolides, which can cause skin sensitization, was found to have a broad range of anti-inflammatory activities (Table 3).[73] Figure 7 shows the reduction of histamine-induced erythema following application of feverfew parthenolide-free extract™ 1%. Feverfew parthenolide-free extract reduced redness by 72% ($P<.05$) compared with placebo.[74]

In another study, 31 females with Fitzpatrick skin types I through IV and self-perceived or clinically defined sensitive skin used a moisturizer containing feverfew parthenolide-free extract with UVA/UVB SPF 15 sunscreen in the morning and without sunscreen in the evening for 3 weeks.[75] The dermatologist evaluations noted a significant improvement ($P\leq.05$) in facial redness, tactile roughness, and overall irritation beginning at week 1 and continuing through to study end at week 3. Subjects also noted significant improvements ($P\leq.05$) in overall skin redness, blotchiness, dryness, tightness, and texture as early as week 1 and continuing to the week 3 follow-up.

Licorice—Licochalcone A (LicA), derived from *Glycyrrhiza inflata*, has been shown to possess anti-inflammatory activity, possibly mediated via dual inhibition of cyclooxygenase and lipoxygenase. In one recent study, a differentiated full-thickness epidermal model was incubated with LicA 10 μg/mL.[76] Cells with no addition of the cyclooxygenase inhibitor diclofenac 50 ng/mL served as controls. Some cultures were irradiated with UVB (90 mJ/cm^2). Both baseline and UV-stimulated prostaglandin E2 expression were inhibited by LicA. Although its anti-inflammatory effect was not as significant as that achieved with diclofenac, LicA appears to be safe and useful to treat skin inflammation.[76]

Chamomile—Chamomile has a long history of systemic and topical use to relieve gastrointestinal tract symptoms and skin inflammation. Chamomile extracts have been shown to inhibit both cyclooxygenase and lipoxygenase in vitro.[77] In one human trial, topically applied chamomile cream achieved 69% of the anti-inflammatory effect of hydrocortisone ointment 0.25% following tape stripping as measured by densitometric readings of erythema.[78]

Aloe Vera—Many patients are familiar with the use of aloe vera gel either in a commercial preparation or directly from the plant to relieve the pain of minor burns. One component of aloe vera is salicylic acid, which prevents the biosynthesis of prostaglandins. In one study, aloe vera gel was used as a vehicle for hydrocortisone acetate.[79] Aloe vera gel 1% and 5%, when administered topically, resulted in 18% and 29% inhibition, respectively, of ear swelling following croton oil application. However, the combination of aloe 1% and topical hydrocortisone acetate 0.1% resulted in an 86% inhibition of swelling compared with the 73% inhibition obtained with the hydrocortisone alone. The researchers suggested that aloe vera may enhance topical corticosteroids because of both its additive anti-inflammatory effect and its potential to increase corticosteroid penetration through the SC.[79]

IMPROVING COMMUNICATION, IMPROVING OUTCOMES: THE MELASMA MODEL

Many individuals of color in the United States may have emigrated from another country, and it is important for physicians to understand the cultural, religious, and social customs and practices that may influence patient attitudes toward health, disease, and treatment. The Spanish-speaking population, particularly Latin Americans (who generally prefer the term *Latino*), is the largest growing segment of the population.[1] Thus, although studies in the medical literature regarding the role of cultural sensitivity in medical practice typically have been conducted in Spanish-speaking populations, they nevertheless provide an excellent model for physicians who want to understand some of the ways in which culture and language can enhance or detract from the therapeutic alliance and outcomes.

The diagnosis and treatment of melasma is an example of how the successful interplay of medical skill and cultural competence can aid in the diagnosis and treatment of skin disease.[38] For many years, there were few effective treatments for melasma; many physicians dismissed the condition as a nuisance to be treated only if the patient asked. However, in the beauty-conscious Latino community, abnormalities of pigmentation are considered disfiguring and may negatively impact lifestyle. This thinking is evident even in the names for melasma used in the Latino community—*manchas* (stains) and *paño* (piece of cloth). However, many Latino patients consider it disrespectful to question their physicians and thus may not receive treatment for their melasma. Moreover, many Latinos believe in *fatalismo*—that is, health problems are God's will—which may lead them to not seek medical help or to not practice preventive care. Frequently, Latinos will seek the help of folk healers, known as *curanderas* or *botanicas*, who may prescribe herbal medicines that actually may be harmful. Therefore, physicians should take the lead in suggesting treatment for melasma.[37] However, it is important for the physician to communicate respectfully, realizing that part of the assimilation process will involve decreasing reliance on folk remedies.

Because herbal medicine is so widely used in the Latino community, active natural products may be particularly appealing to Latino patients. A recent survey conducted in 200 Hispanic individuals in South Florida revealed that 75% of subjects had used at least one herbal remedy in the past year. According to the study, women aged 25 to 34 years, a target melasma population, were most likely to use herbs.[80] The efficacy of soy for lightening melasma lesions was studied in 16 Mexican women.[81] Subjects were treated once daily with a stabilized extract of fresh soy containing specific serine protease inhibitors plus sunscreen. The mean reduction in hyperpigmentation was 12% after 12 weeks of treatment, assessed using the Visual Analogue Scale.[81] Melasma also has been treated with oral pycnogenol, a standardized extract of French maritime pine bark.[82] After a 30-day regimen of pycnogenol 75 mg (25 mg 3 times daily), the average melasma area of 30 patients decreased by 25.8 ± 20.39 mm^2 ($P < .001$) and the average pigmentary intensity decreased by 0.47 ± 0.51 U ($P < .001$).[82]

Even with the best intentions, physicians who are unacquainted with their patient's culture may not be able to communicate effectively. Relevant communication also occurs nonverbally, and attitudes may vary from country to country, even among Spanish-speaking patients. For example, Cuban patients may be more comfortable discussing health issues, while many Central American patients, especially of Indian decent, may be more reticent. The use of photographs to introduce various skin diseases is useful. Nevertheless, language issues are important. One study found that not knowing Spanish or assuming false fluency may lead to disastrous clinical impacts.[83] Healthcare practices with a large number of patients who speak Spanish (or other languages) should have at least one staff member who speaks the language. Bilingual consent forms, as well as waiting room and take-home materials, are essential.

Cultural competence and practical maneuvers to overcome language barriers can improve medical outcomes. Although it is unrealistic to learn about all cultures, physicians should learn about the predominant cultures in their patient population and be able to adapt their medical services to optimize patient care.

COMMENT

The ethnic makeup of the United States is changing, which will impact dermatologic practice. More research is needed to understand skin of color and to deliver improved treatments and skin care products designed to meet the special needs of patients of color.

In addition to increased scientific understanding of skin of color, there is a need for increased cultural understanding among all healthcare providers. This understanding may take the form of becoming knowledgeable of the religious, cultural, and dietary practices and norms of patients, as well as becoming competent in foreign languages.

Physician and patient interest in the use of natural ingredients for skin care, as well as the treatment of skin diseases, is increasing in parallel with the rise in well-controlled studies of these ingredients. Pigmentary disorders are an important issue for most patients of color. Emerging evidence suggests patients of color may be amenable to management with natural ingredients such as soy, licorice, and arbutin. Although there is controversy as to whether or not skin of color is more sensitive than white skin, it is clear that inflammation from the use of harsh products can lead to pigmentary issues in skin of color. Evidence suggests that natural ingredients, including oatmeal, feverfew, and licorice extracts, may be effective in preventing and treating inflammation and providing gentle barrier-enhancing daily skin care.

The influx of new populations to the United States is a time of opportunity and change for dermatologists in both the clinical and research setting. There is a need for more basic research on the anatomy and physiology of skin of color, particularly with regard to melanin and its role in skin of color versus white skin. Using emerging findings in the areas of skin of color and active natural ingredients to treat changing patient populations will be an ongoing challenge and a source of satisfaction for dermatologists.

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