

International Consensus on Anti-Aging Dermocosmetics and Skin Care for Clinical Practice Using the RAND/UCLA Appropriateness Method

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ABSTRACT

Background: The objective was to provide international recommendations on anti-aging dermocosmetics for clinical practice starting with essential ingredients for protection and repair before working up to advanced products for specific concerns.

Methods: Seven international experts reviewed 8 hypothetical case scenarios covering different ages, skin issues (eg, sensitivity, acne, melasma), and exposure to exposome factors for both sexes and all Fitzpatrick skin types (FST). The RAND/UCLA appropriateness method was used to obtain consensus. Seventeen key ingredients were rated on a scale from 1 (totally inappropriate) to 9 (totally appropriate). Statistical analysis, 2 meetings, and email discussions refined the recommendations.

Results: High-factor broad-spectrum sunscreen (ie, protects against ultraviolet [UV] A and B rays), niacinamide, and other topical antioxidants were recommended for all scenarios. Further discussions were required for other ingredients. Tinted sunscreen/iron oxide were recommended for all FST, although compliance may be sub-optimal for darker skin phototypes (IV-VI), if not cosmetically acceptable. Combining a facial foundation with broad-spectrum sunscreen was recommended for darker phototypes to obtain visible light protection closely matching diverse color tones. Retinols were not recommended as a first-line treatment for sensitive skin, especially FST V and VI, due to the risk of irritation. After ablative laser treatment, alpha hydroxy acids should be avoided or used with caution in FST IV to VI due to the risk of post-inflammatory hyperpigmentation.

Conclusion: We describe a simple, practical tool for use in daily dermatology consultations for providing recommendations on anti-aging dermocosmetics to cover diverse and inclusive populations of patients, addressing all skin types and international needs.

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INTRODUCTION

Dermocosmetics are topical cosmetic products that penetrate the stratum corneum to provide medicinal or drug-like benefits.¹ Among the multitude of dermocosmetics available, consumers often seek professional guidance during dermatology visits for recommendations on the best options for their specific skin aging concerns, and it can be challenging for dermatologists to recommend the best products taking into account every patient's specificities.² Furthermore, there may be little scientific evidence on the effectiveness of some dermocosmetics (and the active ingredients) to guide the selection of products.³

The use of appropriate dermocosmetics to decrease visible signs of skin aging should be started early from around 20 years onwards. Multiple active ingredients may be required depending on the patient's specific concerns. The optimal skincare regimen for a given patient will depend on their age, gender, skin type, and skin conditions, as well as their exposure to exposome factors that influence skin aging: encompassing external environmental factors (sun exposure, pollution, temperature, microbiome alterations); lifestyle factors (lack of sleep, stress, poor nutrition, smoking); and internal factors (hormonal variations).^{4,5}

The skin health and beauty pyramid concept was developed based on extensive scientific literature on ingredients, formulations, and technologies, and a robust understanding of the mechanisms of skin aging.^{6,7} The pyramid simplifies product recommendations into 3 categories: pyramid base for protection and repair (photoprotection, antioxidants, DNA repair enzymes) against exposome factors, (eg, sun exposure, pollution, hormonal changes, lifestyle factors); pyramid middle for renewal by moisturization, exfoliation, and cell turnover (retinoids and alpha hydroxy acids [AHA]); and pyramid top for stimulation (peptides, bioidentical growth factors, stem cells, circadian rhythm modifiers).^{6,7} Using this tool, dermatologists can start at the initial visit by recommending essential products for protection and repair and then work up in later visits to more advanced products that may be appropriate for specific concerns.

The objective of this study was to expand the pyramid concept to provide a scientifically validated practical tool to develop a rational approach to selecting the best antiaging dermocosmetic ingredients for diverse and inclusive patient populations, covering different ages, both sexes, Fitzpatrick skin types (FST), as well as skin issues (eg, sensitivity, acne, melasma) and exposure to exposome factors.

MATERIALS AND METHODS

Expert Panel Voting

A panel of 7 international dermatologists with experience in cosmeceuticals reviewed 8 hypothetical case scenarios as representative examples of the many diverse populations seen in dermatological consultations.

Method

The RAND/UCLA appropriateness method (RAM) was initially developed so that, even when robust randomized controlled trials are lacking, physicians can make decisions by combining evidence from scientific literature and collective expert opinion on the appropriateness of performing a procedure at the level of patient-specific symptoms, medical history, and test results.⁸ The RAM is a modified Delphi method but differs by providing panelists the opportunity to discuss their judgments. This method was thus considered to be a good tool for reaching a consensus on the use of dermocosmetic products. The concept of appropriateness refers to the relative weight of the benefits and harms, where a dermocosmetic was considered appropriate and worth using (not considering cost) if the expected health benefit exceeded the expected negative consequences by a sufficiently wide margin.

TABLE 1.

Questionnaire to Evaluate Ingredients for Topical Dermocosmetics									
Topical Treatments	Appropriateness Scale								
Wide Spectrum SPF + UVAPF	1	2	3	4	5	6	7	8	9
Tinted Sunscreen / Iron Oxide	1	2	3	4	5	6	7	8	9
Niacinamide	1	2	3	4	5	6	7	8	9
Tranexamic Acid	1	2	3	4	5	6	7	8	9
Vitamin C	1	2	3	4	5	6	7	8	9
Vitamin E	1	2	3	4	5	6	7	8	9
Other Topical Aox	1	2	3	4	5	6	7	8	9
Hyaluronic Acid Low Molecular Weight	1	2	3	4	5	6	7	8	9
Hyaluronic Acid High Molecular Weight	1	2	3	4	5	6	7	8	9
Alpha Hydroxy Acid	1	2	3	4	5	6	7	8	9
Salicylic Acid	1	2	3	4	5	6	7	8	9
Glycolic Acid	1	2	3	4	5	6	7	8	9
Peptides	1	2	3	4	5	6	7	8	9
Retinol	1	2	3	4	5	6	7	8	9
Cassia Extract	1	2	3	4	5	6	7	8	9
Proxylane™ (C-Xyloside)	1	2	3	4	5	6	7	8	9
Omegas	1	2	3	4	5	6	7	8	9
Other Topical Treatments	1	2	3	4	5	6	7	8	9

Appropriateness scale from 1 (totally inappropriate: therapeutic never used) to 9 (totally appropriate: choice therapeutic)
Abbreviations: SPF, sun protection factor; UVA, ultraviolet A; Aox, antioxidant

A questionnaire was sent to the experts in October 2022. For each case scenario, the panel of experts rated the benefit-to-harm ratio of 17 ingredients for topical dermocosmetics (Table 1) on a scale from 1 (totally inappropriate: therapeutic never used; the expected harms greatly outweigh the expected benefits), through 5 (uncertain), to 9 (totally appropriate: choice therapeutic; the expected benefits greatly outweigh the expected harms).

Dermocosmetic ingredients for which a consensus had not been reached in the first round were discussed in a virtual meeting and further statistical analysis was performed. After consensus was reached, a second meeting and email discussions reviewed/validated the decisions.

Hypothetical Case Scenarios

Eight hypothetical case scenarios were prepared (by ZD and SLM) as representative examples of the many diverse populations seen in daily dermatological consultations:

Scenario 1

A 30-year-old female with FST IV has a 3-month-old son and recently noticed upper lip, bilateral jawline, and lateral forehead pigmentation. The presence of the dyspigmentation is emotionally distressing and is contributing to her post-partum depression. She has been avoiding public situations for the past months due to her appearance. She has tried several over-the-counter products without results. She is concerned that the melasma pigmentation continues to darken despite her avoidance of the outdoors and wonders why this is happening. She does not wear photoprotection as she is dissatisfied with the sunscreen appearance on her skin.

Scenario 2

A 25-year-old female with FST III is noticing the first signs of aging with fine lines around the eyes. She also has post-inflammatory hyperpigmentation (PIH) from acne scarring that is both recent and old. She uses only bar soap on her face and frequently goes to sleep without removing her cosmetics. She desires recommendations for a good acne prevention skin care regimen. She has been reading about the baby-botox trend and wonders if this is an option for wrinkle prevention; however, she is needle phobic and not sure she wants to put a toxin into her body.

Scenario 3

A 30-year-old FST II female with sensitive skin who works outdoors as a landscape architect desires to initiate anti-aging cosmetic solutions as she has lentigines on her face along with fine glabellar lines and facial dryness. She has a 6-month-old daughter and has noticed the difference between her skin texture and that of her daughter. She frequently gets fewer than 5 hours of sleep nightly, in between her work responsibilities and her daughter not sleeping through the night.

Scenario 4

A 35-year-old FST III male is recently divorced and wishes to renew his interest in dating. He has frequently consulted a dermatologist for treating his cystic acne. He completed a course of oral isotretinoin 3 months ago and is noticing a few isolated papules and pustules and xerosis. He wishes to resume sky diving but has not jumped for the past 6 months due to photosensitivity created by the oral retinoid. He also wants to both improve his appearance and prevent photoaging.

Scenario 5

A 40-year-old female with FST I has always used sunscreen and taken care of her health, but she works in a youth-oriented fashion environment and feels pressure to do more for her appearance. She has initiated botulinum toxin treatment for her glabellar lines and had hyaluronic acid injected into her nasolabial folds. She is satisfied with her anti-aging procedures but wants to improve her skincare regimen to address her suboptimal skin texture. She lives and works in New York City and is concerned about the effect of pollution on her skin.

Scenario 6

A 45-year-old perimenopausal female with FST II and pigmentation wishes to improve her skin performance. She has tried various dermocosmetics without the rapid results she desires; therefore, she elected to have a carbon dioxide laser resurfacing procedure and wants recommendations for both pre- and post-procedure skin care. She exercises infrequently and is about 40 pounds/18 kilos overweight but has recently started dietary counseling. Her goal is to re-enter the workforce with a revitalized appearance.

Scenario 7

A 45-year-old menopausal female with FST IV has just started a successful career as a live on-location television reporter. With the increased outdoor activities and sun exposure, she is noticing actinic pigmentation on her bilateral cheeks. She desires counseling on sunscreen selection that will not appear white and pasty on her skin, yet will provide excellent sun protection. Additionally, she has started noticing that, accompanying the occurrence of hot flashes, her skin aspect is changing, and she no longer tolerates her usual cosmetic routine. She is wondering if there is a problem with her skin and seeks advice on why this could be happening.

Scenario 8

A 60-year-old menopausal female with FST I desires suggestions to improve her appearance. Until her recent retirement, she was a heavy smoker (half a pack of cigarettes daily) due to the stress of her job. She notes upper lip and jawline dyspigmentation that has worsened considerably since she began estrogen replacement therapy.

RESULTS

Results of the consensus reached by the 7 international experts between November 2022 and April 2023 on the appropriate dermocosmetics for each scenario are shown in Figures 1 and 2. Broad-spectrum high sun protection factor (SPF) and high ultraviolet (UVA) photoprotection with PF at the base of the pyramid was universally considered appropriate for all scenarios, all FST, and both sexes. Topics that were discussed in more detail to reach a consensus concerned the use of tinted sunscreen with iron oxide particles with dark skin, the use of antioxidants, exfoliating ingredients and retinols with sensitive skin, dermocosmetics for men, and other antioxidants.

In scenario 1 with melasma, tinted sunscreen/iron oxide are recommended for lighter Fitzpatrick skin types I-III, especially for women. Protection against visible light (VL; specifically high-energy visible or blue light) is especially important for darker skin types (III-VI) as they are more sensitive to pigmentary disorders from blue light, therefore, tinted sunscreens/iron oxide are recommended if cosmetically acceptable. However, compliance may be sub-optimal for darker phototypes (FST IV-VI) as the

range of colors of tinted sunscreens are limited and may not match the patient's constitutive skin tone, leaving a greyish/whitish aspect. The experts, therefore, recommend combining a facial foundation that perfectly matches the patient's skin tone with tinted broad-spectrum sunscreen containing iron oxides (UVA, UVB, VL) or non-tinted mineral sunscreen, as a solution to obtain VL protection for darker phototypes that closely color matches diverse color tones, including dark phototypes.

In scenario 1, antioxidants are recommended for all FST.

In cases of sensitive skin (scenario 3), retinols (present in numerous antiaging products) can be irritating for all phototypes, especially FST V and VI (risk of paradoxical worsening), so they should not be recommended as a first-line treatment. However, suitability will depend on the retinol formulation, concentration, and effectiveness. Additionally, retinoids should be avoided if breastfeeding.

AHA including glycolic acid should also be avoided as they enhance photodamage by UV light.

FIGURE 1. Expert consensus results of appropriate dermocosmetics for clinical scenarios 1-4 illustrated using the skin health and beauty pyramid concept.

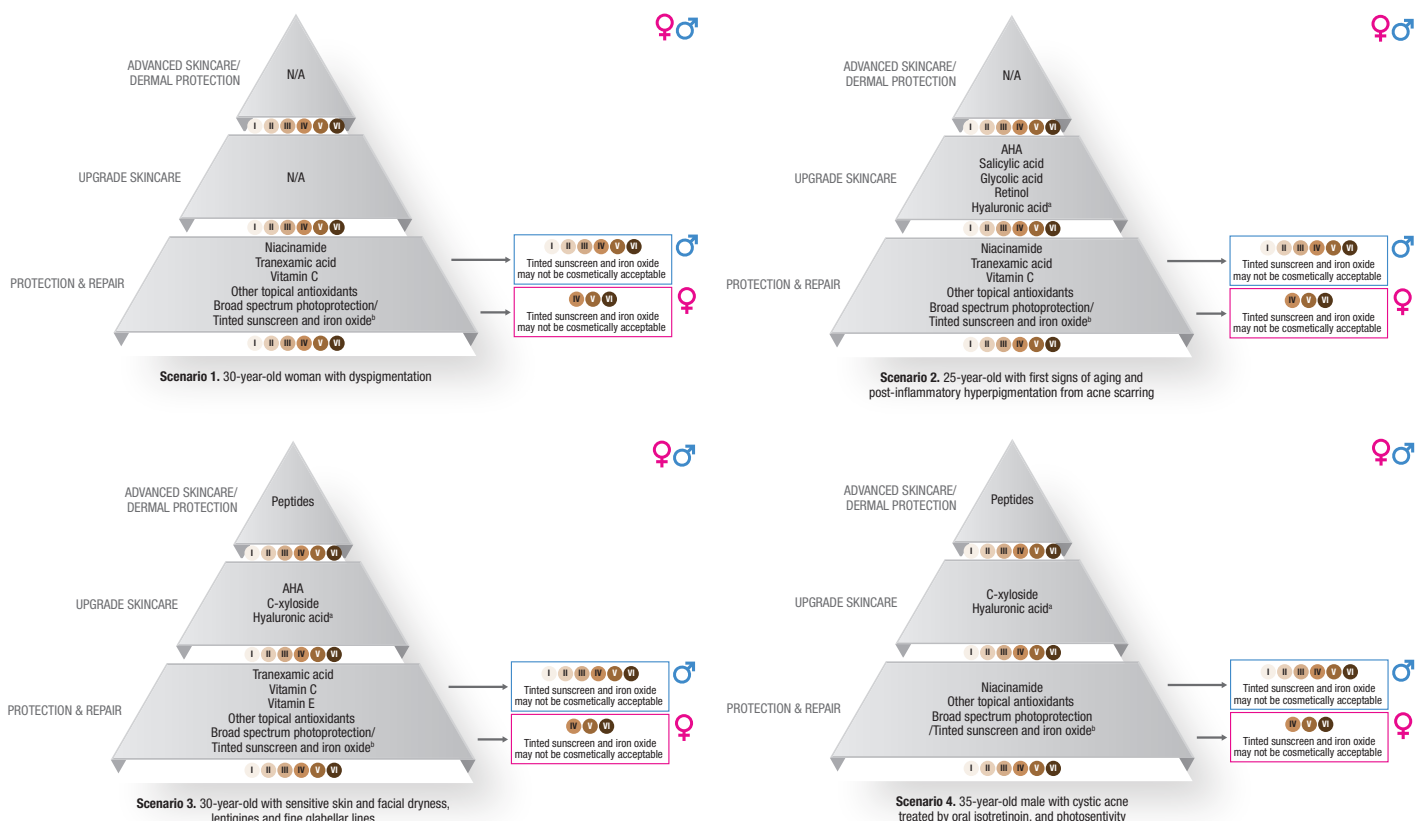
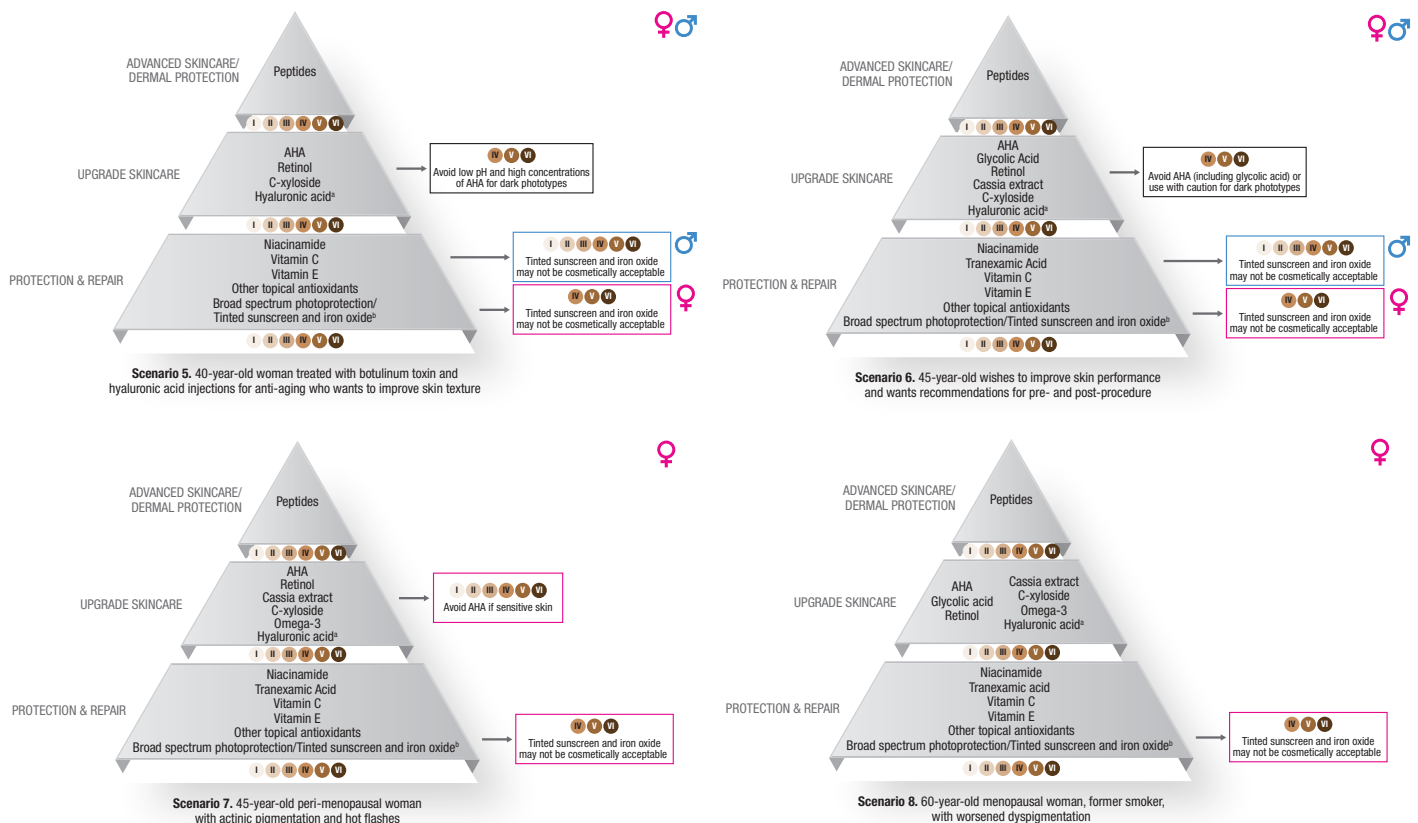


FIGURE 2. Expert consensus results of appropriate dermocosmetics for clinical scenarios 5-8 illustrated using the skin health and beauty pyramid concept.

^aHyaluronic acid low/high molecular weight; ^bTinted sunscreen/iron oxide/broad-spectrum photoprotection with high SPF and high UVA PF

In scenario 4, as men have more facial hair and are more prone to folliculitis, they are likely to find the appearance of tinted sunscreen/iron oxide inappropriate and not cosmetically acceptable. Antioxidants, C-xyloside, and peptides are all appropriate for men and women as both sexes need to protect and repair their skin from exposome factors and are affected by decreased synthesis of collagen and extracellular matrix compounds as they age.

In scenario 4, with the risk of sun exposure, vitamin C and tranexamic acid are not recommended as they make skin more photosensitive. AHA should also be avoided before sun exposure as it could cause stinging and burning, especially when receiving isotretinoin treatment as this makes the skin very dry.

In scenario 5, low pH and high concentrations (up to 5%) of AHA should be avoided for darker FST IV to VI in both sexes due to the risk of PIH. A progressive application starting at low concentrations, with moisturizers to reduce irritation, is advised for thick skin to improve the complexion.

In scenario 5, a daily cleanser is recommended after exposure to pollution during the day and other antioxidants may also be recommended to combat pollution.

For scenario 6, the experts did not reach a consensus after 2 rounds of discussions on whether AHA should be avoided for dark phototypes after ablative laser treatment. Glycolic acid has low molecular weight and can penetrate the dermis, causing irritation and risk of hyperpigmentation for phototypes IV to VI, in both men and women. Four out of 7 experts would avoid AHA (including glycolic acid) in FST IV to VI after ablative laser treatment due to the elevated risk of PIH. Two experts indicated that it would not be the most appropriate first option, but they would use it with caution, while one expert uses it regularly in FST IV to VI with caution, avoiding high concentrations and low pH. Salicylic acid, which is a beta hydroxy acid, has a larger molecular weight and may be less irritating as it does not penetrate the dermis, but was not considered to be appropriate after ablative laser treatment.

In scenario 7, AHA should be avoided at perimenopause when the skin has become more sensitive, especially if working outside.

In scenarios 7 and 8 for perimenopausal and menopausal women, botanical extracts with antioxidant effects may be recommended, but it will depend on the properties of the specific botanical extract. Cassia extract is an appropriate ingredient to combat the effects of the increase in cortisol in the skin at perimenopause.

DISCUSSION

As may be expected for young patients, such as in case scenarios 1 and 2, the pyramid base includes broad-spectrum sunscreen, antioxidants, and DNA repair, but no topical treatment for the top of the pyramid. In older patients, a consensus was rapidly reached that multiple ingredients are appropriate for perimenopausal and menopausal women, from protection and repair of the stratum corneum to epidermal correction and dermal protection advanced skin care. However, a consensus was not reached on whether AHA should be avoided after ablative laser treatment for dark phototypes at risk of PIH.

Photoprotection is fundamental for all scenarios and is the base of the pyramid. Broad-spectrum photoprotection with high SPF and high UVA PF are essential for all patients and should be adapted to skin phototypes and dermatoses, as previously described.⁹ Protection against long UVA1 wavelengths is important as they penetrate more deeply and contribute to hyperpigmentation, photoimmunosuppression, photoaging, and photocancers.¹⁰ Similarly, high-energy VL protection with tinted sunscreens containing iron oxides and/or pigmentary titanium dioxide is especially important for dark-skinned individuals as they are more sensitive to VL-induced pigmentary disorders.¹¹⁻¹³ Sunscreen technology differs by country with fewer sunscreen options in the US.¹² Generally, photoprotection is not always well adapted to darker phototypes as there is a large variation in constitutive skin tones between FST IV to VI, making it more difficult to find a good color match for tinted/iron oxide sunscreens to protect against VL. As an alternative for individuals (for example men) who find pigmented products cosmetically unacceptable, newer organic filters may offer some protection in the near visible region,¹⁴ but tinted products containing pigments are still required to provide high protection against high energy VL to prevent pigmentary disorders.¹³ Furthermore, although makeup has been found to offer no photoprotection,¹⁵ a broad-spectrum sunscreen camouflage foundation containing a high concentration of iron oxides may offer high-energy VL protection.¹⁶ For melasma, sunscreens should be broad-spectrum with high SPF, and provide high protection against UVA and VL. If the skin tone is not exactly matched, tinted pigmented sunscreens (containing iron oxides) in combination with camouflage foundation in a wider variety of

colors can help match the skin tone of every patient while also masking pigmentary disorders and improving quality of life.¹⁷

Natural substances have been used in skin care for centuries and antioxidant botanical extracts are increasingly becoming alternatives to conventional, synthetic dermocosmetics.¹⁸ Cassia extract is derived from a traditional medicinal plant and has antioxidant, antimicrobial, and anticancer effects.¹⁹ Cassia extract has been reported to reduce the impact of cortisol, which increases in the skin at menopause, on collagen and hyaluronic acid synthesis to stimulate extracellular matrix synthesis.^{19,20} C-xyloside is a cosmetic active ingredient derived from plants that has been shown to stimulate the synthesis of mucopolysaccharides in the dermis and epidermis to improve skin elasticity and tonicity.²¹ As dermatologists are not always widely familiar with specific lesser-known extracts, there is a need for high-quality randomized controlled trials for dermocosmetics (and the active ingredients they contain) to make evidence-based recommendations.

Finally, a knowledge gap is the development of future recommendations on dermocosmetics as adjuncts for aesthetic procedures.

LIMITATIONS

The main limitation and bias of this study is the restricted panel size of international experts for the RAND/UCLA method. Other limitations of the method are the lack of ranking, resulting in variable scoring if a dermocosmetic was considered appropriate but not the first choice, or if appropriate but likely to be cosmetically unacceptable to the patient. Despite these limitations, the advantage of this simple approach is that it ensures only appropriate topicals are recommended for each specific patient type.

CONCLUSION

We describe a simple, practical tool for use in daily dermatology consultations that is adapted to specific patient needs, depending on age, sex, and skin phototype, and covers a diverse range of common skin issues. This work provides recommendations on anti-aging dermocosmetics with a worldwide consensus from experts to cover diverse and inclusive populations of patients, addressing all skin types and international needs. Appropriate dermocosmetics combined with complementary aesthetic procedures for each clinical scenario warrants further study to obtain optimal outcomes.

DISCLOSURES

ZD is a researcher and consultant for L'Oréal. LW, MS, BSFB, VV, MJ, and MK have received honoraria from L'Oréal. CD has no potential conflicts of interest to disclose. SLM is an employee of L'Oréal Group.

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