Anti-aging cosmetics: Facts and controversies
Marcia Ramos-e-Silva, MD, PhD⁎, Livia Ribeiro Celem, MD, Stella Ramos-e-Silva, MD, Ana Paula Fucci-da-Costa, MD

Sector of Dermatology and Post-Graduation Course, University Hospital and School of Medicine, Federal University of Rio de Janeiro, Rio de Janeiro, 22280-020 Rio de Janeiro, Brazil

Abstract The authors review ageing in its extrinsic and intrinsic mechanisms, as well as the therapies available for improving its effects, and present some of the facts and controversies related to anti-aging cosmetics.
© 2013 Elsevier Inc. All rights reserved.

Introduction

In modern society, there is a great increase in the search for eternal youth and an insatiable appetite for methods which could turn back the clock. This has triggered an explosion in the cosmeceutical industry. The term "cosmeceutical" was coined by Albert Kligman at the national scientific meeting of the Society of Cosmetic Chemists in 1984, referring to topically applied products capable of making changes to the skin status that are not considered drugs nor cosmetics that are applied to the skin.1,2 The term remains controversial, especially among European authors.2 In the United States and Europe, cosmeceuticals are commercialized as cosmetics, although in Japan "a novel category of quasi-drugs exists that encompasses these biologically active formulations sold directly to consumers."3

In addition, technological advances in medicine for the prevention and treatment of deadly diseases help to increase life expectancy. The elderly population has increased significantly in recent years, both in developing and developed countries.4 As an example, the baby boomers, the 40 million Americans born between 1946 and 1963, are approaching that stage of life where youthful good looks are becoming more of a memory than a reality. Skin aging will come no matter what, and this population obviously cannot remain young forever, but a youthful appearance and good health are essential.4,5

These days, many cosmetic innovations come about through scientific investigations. A wide range of skin-care products and their uses have become so extensive and complex that physicians and consumers alike are often confused about their indications and effectiveness. In the cosmetic field, many materials are commercially used and claim to provide certain skin effects when used topically. In general, although the effects may be small, they are significant and can improve skin feeling and appearance with their continued use. It is difficult to compare and quantify the degree of the effects among the various materials, because there are so many variables: measurement of different specific end points; variation in equipment; sensitivity of methods and formulation types, which can affect material delivery into skin; and studies with different body sites.

Facial remodeling with the skin aging process

Ageing produces a number of changes to the face, starting from childhood, which transforms the rounded contours of a child’s angelic face into a more angular face with defined features, which will characterize the individual from the teenage years through adult life. These changes occur in the
structures responsible for the formation of the facial anatomy: skin, soft tissues, and bones.\textsuperscript{5,6}

In childhood, the face, due to the great skin elasticity and distribution pattern of fat, presents a round format. The nose and ear cartilage provide subtle and delicate contours, while the bones are still in development.

In adolescence, bones and cartilage reach the expected growth and then define facial contours.

From the third decade onwards, eyebrows start dropping, causing the eyes to appear smaller. With the progression of aging, in the fourth decade, the eyelids become more flaccid, leading to a pseudo-herniation of the retro-orbital fat and the formation of rhytidosis. The nasolabial groove is more prominent, and the eyebrows continue to drop.

In the fifth decade, deep wrinkles appear in the forehead, and sagging eyelids result from the excess of skin. The jaws’ arch loses regularity, and vertical wrinkles form around the perioral region.

In the sixth decade, wrinkles become more pronounced and evident, even at rest. The dropping of the nasal tip and mid-face structures is observed, which leads to the growth of the nasogenian groove and loss of the jaw contour. The presence of excess of chin fat and platysmas sagging also contributes to the modification of the jaw.

In the seventh decade, the skin becomes thinner, the eyelid opening gets further reduced, and facial fat resorption occurs.

In the eighth decade, all prior changes are much more evident. Thinning of skin and fat resorption continue progressing.\textsuperscript{7}

**Intrinsic and extrinsic aging**

The two types of skin aging have distinct sources: the intrinsic and extrinsic; however, their results become synergistic, leading to the aged look of the skin.\textsuperscript{8,9}

**Intrinsic aging**

Intrinsic aging, also called true or chronological aging, inevitably occurs as a natural consequence of physiological changes over time. In this case, individual genetics are responsible for the interference, among other factors that are also present but with less effect.\textsuperscript{10} Currently, telomeres, small DNA sequences present at the ends of chromosomes, are considered as essential elements in the intrinsic aging process. These structures, when intact, tend to extend the life of cells. With aging, due to a continuous replication, a shortening of these structures occurs, which can be repaired by telomerase. The maintenance of telomeres by the action of telomerase would lock the aging process, but this action can lead to carcinogenesis.\textsuperscript{11} There are still no systemic or topical treatments based on this theory, and more studies are necessary.\textsuperscript{12}

**Factors related to intrinsic aging**

**Ethnicity.** The main effect of ethnicity on aging relates to the difference in pigmentation. High levels of melanin pigmentation protect from the cumulative effects of photoaging. Black skin is more compact and has a greater amount of lipids, also considered a factor that influences the increased resistance to aging.\textsuperscript{13} Asian subjects were observed to develop wrinkles later and to a lesser degree of intensity as compared to Caucasians.\textsuperscript{14}

**Anatomic variations.** Some areas of the skin are thinner than others and, in those thinner skin regions, aging becomes more evident. This is especially noted on the eyelids, the thinnest area of skin in the human body. There is also variability in both the composition and the distribution of lipids in the skin.\textsuperscript{15}

**Hormonal changes.** Estrogens influence the synthesis of collagen by fibroblasts, lead to the increased synthesis of hyaluronic acid, promote water retention, and increase the extracellular matrix. Conditions of hypoestrogenism, such as occur in the menopause, can have a deep effect on the skin, because it becomes thinner and less hydrated. The replacement of estrogens provides benefits in the skin rejuvenation of women during menopause.\textsuperscript{16}

**Extrinsic aging.** Extrinsic aging is due to controllable factors and occurs at different degrees of intensity, due to solar exposure, smoking, and gravity, as well as other general lifestyle factors, such as diet, sleep, and overall health.\textsuperscript{10}

**Extrinsic aging related factors**

**Ambient conditions.** High temperatures lead to increased water evaporation, while low temperatures provide a hardening and reduced water loss through the same mechanism, even with abundant air moisture. The appropriate formation of structural proteins and lipids in the skin depends on the environmental temperature.\textsuperscript{17}

**Drugs.** Hypocholesterolemic agents can induce xeroderma and desquamation.\textsuperscript{18}

**Smoking.** Smoking has been identified as an important contribution to facial wrinkles, even more than solar exposure. There is a parallel between the smoking load and the emergence and intensity of wrinkles.\textsuperscript{19} Smoking induces several harmful modifications: elastosis, telangiectasias, and decrease of blood flow in the capillary vessels, leading to the deprivation of nutrients in cutaneous tissues.\textsuperscript{20} Additionally, there is a reduction of collagen fibers and elastin in the dermis and in the lung, plus an increase of free radicals. There is also an increase of keratinocytic dysplasia and skin roughness.\textsuperscript{21} Hormone replacement therapy does not bring cutaneous benefits to patients who have been long-time smokers.\textsuperscript{22}

**Sunlight exposure.** Photo-exposure induces an avalanche of molecular and cellular changes that trigger a fast and dynamic disorder in the skin, unlike intrinsic changes, which occur slowly, producing a generalized atrophy and few structural changes until age 50. The effects of sunlight on the skin are deep and represent up to 90% of the visible aging of
the face’s skin, mainly in patients with light skin. The changes induced by exposure to sunlight will be cited and compared in the table below.

These two forms of aging are responsible for different skin changes accountable for generating the senile face in a synergistic manner (Table 1).

### Current treatments for aging skin

Rabe et al. proposed the creation of 3 groups of strategies for planning the treatment and prevention of aging skin (Table 2). They are listed below:

1. The first approach aims at preventing photoaging through the use of sunscreens with chemical or physical broad-spectrum filters. Gaining a more conscious behavior in relation to photo-exposure must also be stimulated in patients, in an attempt to prevent solar damage.

2. The second strategy uses formulations with active substances to try to postpone or even reduce the signs and symptoms of aging. Retinoic acid, alphahydroxy acids, antioxidants, estrogens, and growth factors have been deployed in this sense.

3. The third strategy is employed when a more serious form of aging presentation is already manifested, requiring more invasive mechanisms, such as chemical peeling with a higher acid concentration, use of lasers, injection of fillers and botulinum toxin, and so forth.

4. The next sections will focus on what we have now for cosmetic treatment, including retinoids, alpha hydroxy acids, antioxidants

### Retinoids

In the epidermis, retinoids normalize the life cycle of keratinocytes, reduce keratinocytic atypia, and normalize the

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Photoaging</th>
<th>Intrinsic aging</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolic processes</td>
<td>Pronouncedly increased</td>
<td>Slowed down</td>
<td>Soter</td>
</tr>
<tr>
<td>Clinical appearance</td>
<td>Nodular, leathery, blotchy</td>
<td>Smooth, unblemished</td>
<td>Glogau</td>
</tr>
<tr>
<td>Skin color</td>
<td>Irregular pigmentation</td>
<td>Pigment diminishes to pallor</td>
<td>Rees</td>
</tr>
<tr>
<td>Onset</td>
<td>As early as late teens</td>
<td>Typically 50s-60s (women earlier than men)</td>
<td>Gilchrest</td>
</tr>
<tr>
<td>Severity</td>
<td>Strongly associated to degree of pigmentation</td>
<td>Only slightly associated to degree of pigmentation</td>
<td>Rees</td>
</tr>
<tr>
<td>Epidermis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>Acanthropic in early stages, atrophy in later stages</td>
<td>Thins with aging</td>
<td>Takema</td>
</tr>
<tr>
<td>Proliferation rate</td>
<td>Higher than normal</td>
<td>Lower than normal</td>
<td>Lavker</td>
</tr>
<tr>
<td>Keratinocytes</td>
<td>Atopic and polarity loss, numerous dyskeratoses</td>
<td>Modest cellular irregularity</td>
<td>Kligman</td>
</tr>
<tr>
<td>Dermo-epidermal junction</td>
<td>Extensive reduplication of lamina dense</td>
<td>Modest reduplication of lamina densa</td>
<td>Gilchrest</td>
</tr>
<tr>
<td>Vitamin A content</td>
<td>Destroyed by the sun exposure</td>
<td>Plasma content of retinol increases</td>
<td>Seité</td>
</tr>
<tr>
<td>Dermis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elastin</td>
<td>Marked elastogenesis followed by massive degeneration, dense accumulation on fibers</td>
<td>Elastogenesis followed by elastolysis – ‘moth-eaten fibers’</td>
<td>Kligman</td>
</tr>
<tr>
<td>Elastin matrix</td>
<td>Massive increase in elastic fibers, replacing the collagenated dermal matrix</td>
<td>Gradual decline in production of dermal matrix, only modest increase in the number and thickness of elastic fibers in the reticular dermis</td>
<td>Hanson</td>
</tr>
<tr>
<td>Lysosyme deposition on elastic fibers</td>
<td>Increased</td>
<td>Modest</td>
<td>Gilchrest</td>
</tr>
<tr>
<td>Collagen production</td>
<td>Decrease in amounts of mature collagen</td>
<td>Mature collagen more stable in degradation</td>
<td>Lavker</td>
</tr>
<tr>
<td>Grenz zone</td>
<td>Prominent</td>
<td>Absent</td>
<td>Lavker</td>
</tr>
<tr>
<td>Microvasculature</td>
<td>Abnormal deposition of basement membrane-like material</td>
<td>Normal</td>
<td>Gilchrest</td>
</tr>
<tr>
<td>Microcirculation</td>
<td>Vessels become dilated, deranged</td>
<td>Microvessels decrease; remaining vessels do not change</td>
<td>Gilchrest</td>
</tr>
<tr>
<td>Inflammatory response</td>
<td>Pronounced inflammation, perivenular histiocytic-lymphocytic infiltrate</td>
<td>No inflammatory response observed</td>
<td>Gilchrest</td>
</tr>
</tbody>
</table>
and retinol esters are better tolerated than retinol.14 Irritation retinaldehyde has an irritation potential similar to retinol,19 changes.28,36,37

Histopathologically, these changes are expressed by structural changes in solar elastosis and collagen degeneration, Langerhans cell restoration, and correction of dysplastic changes.28,36,37 Retinoidal acid (tretinoin) is considered one of the most powerful compounds to treat the signs of aging, including fine lines and stains, but it should be used cautiously to avoid producing undesirable effects, such as stinging and burning. Neuer delivery systems may diminish the unwanted effects.58

Retinol (vitamin A), the biologically active form of vitamin A, presents topically only a small retinoid-like action when compared to the topical retinaldehyde and retinoid acid in vivo studies.39 It also has antioxidant action.

Retinaldehyde, an intermediate formed during the conversion of retinol into retinoic acid, also shows benefits in reducing wrinkles.40

Much of the published literature on the use of retinoids to improve skin wrinkle appearance is focused on topical retinoic acid, but there is also information on the cosmetic vitamin A compounds, such as retinol and retinyl propionate.14 In general, retinoids are very potent, so topical doses of less than 1% are typically sufficient to obtain significant effects. At low doses, in double-blind, split-face, placebo-controlled facial testing lasting 12 weeks, retinol and retinyl propionate were both significantly effective in reducing the appearance of facial wrinkles and hyperpigmentation. Clinical studies have also been published on other retinoids. Retinaldehyde, typically at a dose of 0.05%,15–17 is clinically effective. Retinylpalmitate has low irritation potential but also weaker efficacy, even with a very high concentration of 2% required to observe an effect.18

The choice of retinoid may reduce skin irritation. Retinol is better tolerated than skin than trans-retinoic acid,5 retinaldehyde has an irritation potential similar to retinol,19 and retinol esters are better tolerated than retinol.14 Irritation may also be mitigated to some extent by formulation to control skin delivery or inclusion of other ingredients such as anti-inflammatory agents. The second main concern is instability, especially in the presence of oxygen and light. To increase retinoid stability in the finished product, formulation and packaging should ideally be done in an environment with minimal exposure to oxygen and light. The primary package of the final product should also be impermeable to oxygen and opaque. Other strategies can also be used, such as retinoid encapsulation and inclusion of stabilizing antioxidants.41

The use of retinoid in relation to its safety for women of child-bearing age is still controversial. During the past 20 years, no long-term side effects have been observed in young adults using tretinoin, but there may be a problem for women who want to become pregnant. Oral retinoid is a known teratogenic drug, and this creates a dilemma for prescribing topical tretinoin. There is a need for studies that could establish beyond doubt whether it is absorbed and at what percentage. Some studies have demonstrated that less than 2% of topical tretinoin is absorbed, and the quantity that can be detected in blood after many applications is much less than blood levels of vitamin A. Researchers reported a case of ear malformation in a baby born to a woman using tretinoin cream.42 In a study of 215 women exposed to topical tretinoin early in pregnancy, topical tretinoin was not associated with an increased risk for major congenital defects.43 At present, it is best to advise young women not to use topical retinoids during pregnancy or when they are trying to become pregnant.44

Another question to be considered is the use of retinoids in sun protection. Topical retinoids have been used in sunscreens as antioxidants, but this use is controversial. Retinoids do not offer any ultraviolet blocking or protection, although they may offer some beneficial effect on free radical scavenging. Retinylpalmitate is an ester of retinol and is also believed to have antioxidant properties. It is included in some sunscreens to reduce the risk of skin cancer. It is also used as a vitamin supplement and sometimes added to low-fat milk. It is neither an active sunscreen nor a sunscreen preservative.45

Because topical retinoids may cause a reaction with erythema, desquamation, pruritus, and a burning sensation (“retinoid reaction”) in a high percentage of patients, some people may think that retinoic acid improves photoaging, because it irritates the skin. Some patients end up not adhering to the treatment, although many patients show improvement without any retinoid reaction. For this reason, each treatment must be individualized, and the dermatologist needs to explain very carefully what the patient can obtain, as well as the possibility of side effects. The dermatologist must be sure that there are no contraindications, such as the existence of photosensitivity and pregnancy. Tolerance will depend on skin type, race, age, and the extent of photodamage.

Alpha hydroxy acids (AHA)

AHA were introduced by Eugene Van Scott in 1984.46 There are several types of AHA, with the most used being glycolic, citric, lactic, malic, pyruvic, and tartaric acids. They

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photoprotection</td>
<td>Photoprotection</td>
<td>Chemical peels</td>
</tr>
<tr>
<td>Retinoic acid</td>
<td>Retinoic acid</td>
<td>Microdermabrasion/microcrystalline</td>
</tr>
<tr>
<td>Antioxidants</td>
<td>Antioxidants</td>
<td>Laser</td>
</tr>
<tr>
<td>Estrogens</td>
<td>Estrogens</td>
<td>Botulinum toxin</td>
</tr>
<tr>
<td>Growth factors/cytokines</td>
<td>Growth factors/cytokines</td>
<td>Fillers</td>
</tr>
</tbody>
</table>
Antioxidants

Antioxidants are responsible for reducing the damage caused by free radicals, thus avoiding damage at the cellular level. They also help to inhibit inflammation and offer protection against photo-damage and skin cancer. Antioxidants include alpha-lipoic acid (ALA), L-ascorbic acid (vitamin C), niacinamide (B3 vitamin), α-tocopherol, and ubiquinone.

Because the topical application of sunscreens does not offer complete protection against UV damage, antioxidants play a major role in the prevention and therapy of UV-induced skin aging and are being added to the formulations for sun protection.51

A new concept, such nutricosmetics are also known as “beauty pills,” “beauty from within,” and even “oral cosmetics.” This product category is formed by the intersection of cosmeceuticals and nutraceuticals. The term nutraceutical was defined by DeFelice as “any substance that is a food or part of a food that provides medical or health benefits, including the prevention and treatment of disease. The major claim is the antiaging effect, reducing wrinkles by fighting free radicals generated by solar radiation. Among the ingredients used in nutricosmetics, antioxidants are the most crucial.1 The concept of nutricosmetics is new and has recently been a frequent subject of scientific research; however, they deserve greater attention in relation to clinical studies and regulation.

Alpha-lipoic acid (ALA)

Alpha-lipoic acid has anti-inflammatory properties and acts as an exfoliant, possibly helping in reducing roughness, wrinkles, and lentigines, but it is unable to protect against induced erythema or UV damage.52

L-Ascorbic acid (vitamin C)

Vitamin C is routinely used in topical formulations, due to its stimulating effect on the synthesis of collagen and antioxidant property. It inhibits tyrosinase, reducing areas with hyperpigmentation, and provides some protection against UV radiation by its antioxidant properties.53 Some authors report that there is no consistent clinical data supporting the use of topical C vitamin for improving fine lines and reducing pigmentation and inflammation.54 Others who share the same view state that these formulations are not effective on the skin due to a very low concentration of L-ascorbic acid or because the product is affected by exposure to air and light, compromising its stability. Additional studies report that the L-ascorbic acid molecule (in the form of an ester or a mixture of isomers) could not be effectively absorbed or metabolized through the skin.49,54

One concern about the addition of ascorbic acid to cosmeceuticals is that it is innately unstable in formulation; it is unclear how much, if any, intact molecule remains on the skin. This problem has been partially overcome by chemically modifying ascorbic acid through esterification of the hydroxyl group, but for the skin to use the supplied ascorbic acid, it must convert it to L-ascorbic acid. Many of the stabilized commercially available forms have not been examined to determine whether this conversion is possible or if they penetrate cutaneous tissues to the same extent as L-ascorbic acid. One study revealed that optimal delivery of stable L-ascorbic acid into the skin occurred at a pH of less than 3.5 and at a concentration less than 20%. This same study showed that magnesium ascorbyl phosphate, ascorbyl-6-palmitate, and dehydro ascorbic acid (other ascorbic acid derivatives) on a daily application did not increase levels of L-ascorbic acid in the skin, calling into question their ability to improve the aged skin. Not all formulations containing ascorbic acid should be considered equal; it is essential to determine which specific modified form is included and to examine whether that particular form has been tested for clinical efficacy. Presently, it seems prudent to recommend the use of L-ascorbic acid for the treatment of photoaging, because there are promising clinical results and no major side effects, but there is not sufficient evidence in the form of clinically controlled trials to support the use of the more stable derivatives of ascorbic acid, which are most commonly found in today’s cosmeceuticals.55

Vitamin E

Vitamin E has an antioxidant and moisturizing property. Some studies have demonstrated that it has topical action in the protection against UVB radiation damage.56 Other actions are the acute reduction of erythema in sunburns, tanning, and photoaging. Its association with vitamin C
demonstrates synergistic effects, in particular, because it is capable of regenerating oxidized vitamin E.57

Unlike oral vitamin E, the application of topical vitamin E has been recognized as a safe substance with adverse reactions generally limited to a slight irritation.56; however, there are no data to support any effect of vitamin E in topical therapies purporting improvements in skin wrinkling, discoloration, or texture, although there is a plethora of products available on the market that contain various forms of vitamin E. Scientific data also has not shown which, if any, commercial form of the vitamin might have the best penetration and bioavailability. What this means clinically with respect to photoaging remains a question requiring further investigation.55

Ubiquinone or idebenone (CoQ10)

Derived from co-enzyme Q10, idebenone is a powerful antioxidant able to stimulate collagen production, to inhibit the oxidative stress generated by UVA and UVB,59 and to protect the dermal matrix, both in intrinsic and extrinsic aging.60 So far, only one study showed wrinkle improvement, using 1% CoQ10 cream for 5 months.51

Niacinamide (vitamin B3)

Niacinamide is a powerful and well-tolerated antioxidant. It promotes improvement in the lipid compound of the epidermal barrier, reducing transepidermal water loss. It also acts as a melanosome transfer inhibitor, improving hyperpigmentation. Studies have shown a significant reduction of fine lines, wrinkles, and hyperpigmentation, as well as improvement in skin elasticity.61,62

Several reports have documented the range of cosmetic effects of topical niacinamide. These data emerged from several double-blind, placebo-controlled, left-right randomized, split-face studies. Topical niacinamide has significantly improved skin color, for example, including the reduction of hyperpigmented spots and red blotchiness. The latter effect, in particular, may be related to the skin barrier improvement, reducing skin sensitivity and responsiveness to environmental insult, such as from surfactant exposure. Fairly high doses (2% to 5%) of vitamin B3 have been used to achieve these desired effects. Because the skin has a very high tolerance to niacinamide even with long-term usage, high doses can be used acceptably. Some clinical data on myristoyl-nicotinate have also been presented34 to suggest that a similar broad array of effects occurs with this agent when used topically at doses of 1% to 5%.

The most important challenge of working with niacinamide and nicotinate esters is avoiding hydrolysis to nicotinic acid. Nicotinic acid, even at low doses, can induce an intense skin reddening (flushing response).63 Formulating in the pH range of 4 to 7 is preferred to avoid hydrolysis. For this reason, formulations containing both niacinamide and acids, such as salicylic acid, or bases, such as zinc oxide, are problematic. Many commercial options are available for the nicotinate esters.

Moisturizers

Moisturizing agents are responsible for keeping water in the epidermis; besides promoting a protective film against water loss, they help maintain the barrier. They should be used in support of the use of home formulations for skin rejuvenation.49

Peptides

Peptides are part of a group of agents that seem to act as cellular messengers. They are formed from amino acids that mimic fragments of endogenous peptides with biological activity.64

There are three categories of peptides: carrier peptides (matrixyl), neuro-transmitters (argyreline), and enzyme modulators (rice and soy proteins).3 Opinions are still conflicting, and some people state that there is no significant evidence that they work better than moisturizers, although investigators claim that it could be a group of substances with future potential.65

Peptides are already found in a large number of cosmetic products,3 but because there are plausible severe consequences of introducing materials into cells and modulating transcription factors and because there is very little information in the literature concerning adverse events after the use of topical peptides, peptides should be used with extreme caution.66

Hormone replacement therapy

Hypoestrogenism affects the skin, producing less hydration and thinning the skin; therefore, its replacement, when well prescribed, including hormones in topical formulations, is effective in rehydration, collagen increase, and dermal thickness.16

Long-term prospective, randomized, double-blind, placebo-controlled studies on hormone replacement therapy in women have shown that skin aging signs were reversed and skin elasticity, hydration, and thickness were significantly increased.67

Enhancing collagen production with topical estradiol seems to be restricted to intrinsically aged skin51; however, long-term studies to evaluate the safety of systemic HRT for skin anti-aging purposes are necessary because contraindication to HRT includes a history of breast cancer or endometrial cancer, recent undiagnosed genital bleeding, active severe liver disease, and a history of thromboembolism. On the other hand, topical therapy with estradiol preparations was reported to have significant anti-aging effects and may therefore provide an alternative to systemic therapy.68
Sun blockers

Sun blockers are essential for skin health and rejuvenation, given that they provide protection against the most important factor for skin aging: exposure to sunlight.

They must be of broad spectrum, that is, they must protect from both UVA and UVB. The photo-protection is physical when the sun blockers contain reflective agents such as zinc oxide or titanium dioxide. These substances are inert and present a lower possibility of causing allergic reactions. Chemical blockers absorb and react to sunlight to make it nondamaging. Some blockers are an association of both. Their use on the face and other photo-exposed areas must become a daily habit.69

Controversies as to the daily use of sun blockers remain. Concerns have been raised about the safety of micronized titanium dioxide, topical oxybenzone, and the sunscreen additive retinylpalmitate. The FDA and consumer groups are conducting studies about the localized effects, such as carcinogenesis, and potential side effects of systemic absorption.70 Many discussions are arising daily regarding use of sunscreens versus vitamin D and calcium metabolism. In theory, correct usage of sunscreens should significantly reduce vitamin D levels, but this is not the case in practice.

Several studies have demonstrated that sunscreens are rarely applied correctly, in the right dosages, and with appropriate frequency. In real-world conditions, it is likely that the improper use of sunscreen and/or increased exposure time results in production of vitamin D among sunscreen users.71 The FDA standard for application of sunscreen is 2 mg/2 cm. Actually, 25% to 50% of that amount is applied. This results in a protection factor of 8 to 15 when using a sunscreen labeled 30 FPS.72

Dimetilaminoetanol

Dimetilaminoetanol (DMAE) is an analog of choline and a precursor of acetylcholine. It can be used orally or topically, its natural source being from salmon. Some studies have shown its capacity in promoting thickening of dermal and collagen fibers;73,74 however, its use remains controversial.

Conclusions

With the increasing longevity of the population worldwide, good health is essential for a better quality of life, even in advanced age, with more independence and sometimes with intense professional and social activity. Good health includes the improvement of the appearance of aged skin, with the possibility of using safer and more effective products and procedures to diminish unaesthetic aspects. The dermatologist needs to know the mechanisms of the cosmetics therapies available and the controversies related to their efficacy.

Before trusting the promises of each cosmetic product, one should analyze the hormonal and genetic factors, as well as anatomical variants, considering that they, alone, generate limits to the success of the cosmetic product to each type of skin. The dermatologist must remember that many of these products are still controversial.

Factors related to intrinsic aging have their value, when we think about choosing the best cosmetic for each type of skin. The selected site for treatment greatly influences the result, because there some areas of skin are thinner and others thicker. Patients with more melanin due to ethnicity will present with different results from the same product. Similarly, we should consider sun exposure and smoking, among other extrinsic factors, because they can modify the skin and reduce the effectiveness of treatments that give good results in people who systematically avoid exposure to the environment.

To avoid all existing controversies related to the efficacy of specific cosmetic treatments, it is advised that we know exactly what we, as physicians, and our patients are looking for with a specific treatment and with what type of skin we are dealing, so we can choose the ideal product or products.

References

13. Robinson MK. Population differences in skin structure and physiology and the susceptibility to irritant and allergic contact dermatitis.

