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Cosmetic use of alpha-hydroxy acids

■ KEY POINTS:

Alpha-hydroxy acids exfoliate dead skin cells, moisturize the skin, and possibly rejuvenate skin damaged by photoaging.

AHA absorption, efficacy, and toxicity depend more on the pH than on the concentration: the more acidic the preparation, the greater the effect.

The acidity of AHA products can cause transient, mild burning sensations. Clinical skin inflammation or irritation is not expected from cosmetic or skin-care products that contain AHAs.

■ **ABSTRACT:** Frequent and daily use of cosmetic and skin-care products that contain alpha-hydroxy acids (AHAs) moisturizes the skin and produces smoother, less-wrinkled skin surfaces. The cosmetic products developed as astringents and exfoliants diminish skin scales and remove excess skin oil. New studies suggest that photodamaged skin improves with AHA treatment.

A number of cosmetic and over-the-counter skin care products now contain alpha-hydroxy acids (AHAs), once available only by prescription. These products are proving popular: according to a recent *Wall Street Journal* article, two of them alone totalled \$300 million in sales in 1 year.¹

Why all this interest? The naturally occurring AHAs possess three useful actions: they exfoliate dead skin cells, moisturize the skin, and possibly, rejuvenate the skin and repair damage caused by sunlight. In short: smoother, younger skin.

Although anyone hoping for a fountain of youth in a jar is likely to be disappointed, these products appear to work reasonably well and cause few side effects, notably minor skin irritation and burning. As for photodamaged skin, however, the best approach is to protect oneself from sun exposure in the first place.

■ WHAT ARE AHAs?

The AHAs are naturally occurring organic carboxylic acids. Glycolic (hydroxyacetic) acid, the most common, is derived from sugar cane. Lactic (hydroxypropanoic) acid, the second most common, is derived from sour milk, molasses, apples, fruits, beer, and wine.

Salts and esters of these acids have similar beneficial skin effects; the most commonly used are ammonium glycolate and sodium and myristyl lactate.

■ ARE AHAs EFFECTIVE?

Well-documented studies confirm the exfoliative and moisturizing effects of the AHAs, first noted by Van Scott and Yu in 1974,² when



they used them to treat severe ichthyosis (dry skin) and, later, actinic keratosis and precancerous skin lesions.

The claims of photodamage reversal and reduction of wrinkles, brown spots, and roughness are more controversial, and are currently being reviewed by the Cosmetic, Toiletry, and Fragrance Association (CTFA), the Food and Drug Administration (FDA), and the Federal Trade Commission (FTC).

In 1992, Lavker, Kaidbey, and Leyden³ reported that lactic acid and ammonium lactate caused an increase in skin thickness and decreased dermal glycosaminoglycans.

In 1996, Ditre et al⁴ showed that a 6-month application of 25% glycolic acid (pH 3.5) significantly increased skin thickness, increased dermal acid mucopolysaccharides, improved melanin pigment distribution, improved quality of dermal elastic fibers, and increased the density of dermal collagen.

In another study in 1996, Stiller et al⁵ found that the use of 8% lactic acid or 8% glycolic acid (pH unstated) reversed photoaging as graded by improvement in wrinkles, color, smoothness of skin, and age spots.

These studies suggest that photodamaged skin can be improved by application of AHA products. An unanswered question is whether any AHA product is more beneficial than tretinoin 0.5% (Renova), the only FDA-approved drug for treatment of photoaging.⁶⁻⁸

■ ADVERSE EFFECTS

Because AHAs are acids, they can cause mild to moderate irritation unless they are neutralized in the final product. By 1996 a limited number of adverse effects had been reported to the FDA, all of them concerning skin irritation. In 1996 the FDA reported that glycolic acid moisturizer creams caused 8 adverse events per million uses, compared with 3 per million for traditional moisturizers and 14 per million for lactic acid.

For the last 3 years, the Cosmetic Ingredient Review (CIR), a self-regulatory committee of the CTFA, has been reviewing the safety of AHAs. In 1996, an expert panel

of the CIR concluded that glycolic acid, lactic acid, their common salts, and their simple esters are safe in cosmetic products at concentrations of 10% or less, at a pH of 3.5 or greater, and formulated to avoid increasing the skin's sensitivity to the sun or accompanied by directions to use sun protection daily.⁹

The CIR also concluded that stronger formulations (with concentrations of up to 30% and a pH as low as 3.0) are safe if applied by trained professionals. Such use should be brief, discontinuous, and followed by thorough rinsing or accompanied by directions to use sun protection daily.⁹

■ AHA PREPARATIONS

The first prescription AHA preparation contained 12% lactic acid and ammonium lactate (Lac-Hydrin lotion). It is still the only prescription AHA; all other preparations are available over-the-counter.

Cosmetic and skin-care products that contain AHAs differ from prescription AHA products only in being less acidic. Nonprescription skin-care products contain AHAs at a pH of 2 to 8, most commonly 3 to 4. The concentration of AHA in these products varies from 2% to 20%, but concentration appears to have a minor effect on efficacy. AHA absorption primarily depends on the pH: the more acidic the preparation, the greater the absorption—and the exfoliative, toxic, and corrosive action.

Cosmetics contain AHAs at a pH of 3.4 to 3.8 and concentrations ranging from 4% to 20%. Transepidermal water loss appears to be comparable at the common cosmetic pH levels.

Preparations intended for salon use for skin peels have a similar pH of 2 to 8, but vary more in concentration—from 4% to 50%. Products for physician use for skin peels have a pH of 2 or less and concentrations of 4% to 67%. Depending on the desired effect, the physician can choose a product with a pH that is higher (weaker) or lower (stronger), or vary the duration of application. The glycolic acid peels have nearly replaced other chemical peels such as trichloroacetic acid and phenolic acid.

Anyone hoping for a fountain of youth in a jar will be disappointed

The difference in efficacy between products is unknown. Cost ranges from a few dollars to \$100.

RECOMMENDATIONS

Dermatologists advocate that all persons practice sun safety behavior: avoiding prolonged direct sunlight, wearing hats and light-colored clothing, and using sunscreens.^{10,11} AHA moisturizing creams for the face and body can be added to enhance skin texture and moisture. Partial reversal of photodamage may be an added benefit.

Although over-the-counter products are available, I recommend that physicians stick with Lac-Hydrin lotion for dry skin and possibly for photoaging, simply because its concentration (12%) and pH (4.5 to 5.5) are known precisely, whereas others can vary widely. It should be applied twice daily to affected areas and rubbed in thoroughly. ■

REFERENCES

1. Hwan JS. Acid based wrinkle creams: fountain of youth or snake oil? Wall Street Journal 1994 Apr 13;Sect B:1 (col 4).
2. Van Scott EJ, Yu RJ. Control of keratinization with alpha hydroxy acids and related compounds. I. Topical treatment of ichthyotic disorders. Arch Dermatol 1974; 100:586-590.
3. Lavker RM, Kaidbey J, Leyden JJ. Effects of topical ammonium lactate on cutaneous atrophy from a potent topical steroid. J Am Acad Dermatol 1992; 25:525-544.
4. Ditre MD, Griffin TD, Murphy GF, et al. Effects of L-hydroxy acids on photoaged skin: a pilot clinical, histologic, and ultrastructural study. J Am Acad Dermatol 1996; 34:187-195.
5. Stiller MT, Bartolone J, Stern R, et al. Topical 8% glycolic acid and 8% L-lactic acid creams for the treatment of photodamaged skin. Arch Dermatol 1996; 132:631-636.
6. Kligman AM, Grove GL, Hirose R, et al. Topical tretinoin for photoaged skin. J Am Acad Dermatol 1986; 15:836-839.
7. Weinstein GD, Nigra TP, Pochi PE, et al. Topical tretinoin for treatment of photodamaged skin: a multicenter study. Arch Dermatol 1991; 127:659-665.
8. Weiss JS, Ellis CN, Headington JT, et al. Treatment of photodamaged facial skin with topical tretinoin. JAMA 1988; 259:527-532.
9. Bergfeld WF, Belsito DV, et al. Final report on glycolic acid and lactic acid. Cosmetic Ingredient Review (CIR), 1101 17th St. NW, Suite 310, Washington, DC 20036. In press.
10. National Institutes of Health Consensus Development Conference. Sunlight, ultraviolet radiation, and the skin. Washington DC: National Institutes of Health, vol 7, 1989:1-9.
11. Taylor CR, Stern RS, Leyden JJ, Gilchrist BA. Photoaging/photodamage and photoprotection. J Am Acad Dermatol 1990; 22:1-5.

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