

Hydroxy Acids and Beyond

By *Barbara A. Green*

Alpha hydroxy acids (AHAs) have transformed skin care and have enjoyed huge commercial success since their introduction by dermatologist Eugene J. Van Scott, MD, and skin biochemist Ruey J. Yu, PhD, MD, in the early 1970s. It's hard to believe that 30 years have passed since the first benefits of AHAs were published, demonstrating their nearly miraculous, normalizing effects on severe dry skin and ichthyosis. After relentless teaching of their benefits for more than a decade, the first AHA-containing product, the prescription Lac-Hydrin[®], was launched in the mid-1980s. Then came the observation that AHAs can help to reverse signs of aging skin, and voila—the health and beauty market for AHAs took off, growing exponentially, beginning with the first product in the category, Avon's Anew[®].

Now, it's hard to find a company that has not launched a skin care product containing AHAs. Their reputation as an exfoliant, anti-aging ingredient and skin brightener has garnered AHAs a lead position in the market, well ahead of any competitive technology. AHAs remain one of two ingredients with substantial clinical and scientific evidence that

they can reverse the signs of dermatological aging. The other is retinoids. However, many consumers and skin care specialists do not understand many of their skin benefits. To add to the confusion, there are now hydroxy acid technologies that provide the anti-aging and skin smoothing effects of AHAs with many added benefits, including gentleness—the one feature that seems to have escaped AHAs.

AHA Benefits

Glycolic acid and lactic acid are the two most commonly used AHAs in cosmetics and therapeutic skin care, regardless of whether the products are found in retail outlets, spas and salons, or in physicians offices. Glycolic acid and lactic acid have earned the reputation as being the “workhorses” in AHA skin care. Rightfully so. Aside from their demonstrable benefits on skin turnover and exfoliation, these ingredients have been shown to reverse some of the histological signs of photo-aging in the dermis, where wrinkling and sagging actually occur. Studies have demonstrated a reversal of abnormal cell structure that results from cumulative sun exposure, as well as increased collagen levels and the water-binding glycosaminoglycan (GAG) substances, such as hyaluronic acid. Solar elastosis, a condition primarily characterized by a

proliferation of abnormal, globular elastic fibers that are incapable of stretching, can be reversed with AHA use leading to the development of normal, healthy elastic fibers and the resulting increase in skin elasticity. Wow! Who knew the AHAs could do all of this?

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These agents also promote epidermal normalization. This is important because the epidermis is responsible for generating a protective skin barrier on a daily basis. An unhealthy epidermis causes diminished barrier function, dehydration, scaling, flaking and roughness. The melanin-producing pigmentation cells reside in the epidermis, too. Cumulative exposure to sun causes abnormal behavior by these cells, leading to the development of sunspots and age spots. AHAs have been shown to normalize the epidermal structure, promoting more even pigmentation and a healthy stratum corneum. Both the epidermis and dermis benefit from AHA use.

It's an undeniable fact that most of the effective AHA products on the market are also the ones causing the stinging and burning many sensitive skin consumers experience. It makes sense, AHA

products need to contain free acid—not neutralized—to penetrate and have significant benefits on skin. The small molecules of glycolic and lactic acid in their free acid state get into the skin quickly and often elicit a stinging and burning effect. However, patented amphoteric technology can tie up the acid temporarily and slow down penetration without actually neutralizing it all, and the resulting benefits offer advancement in AHA skin care. Amphoteric amino acids, such as arginine and glycine, can be used during the formulating process to help adjust pH and form a temporary complex with the free glycolic acid. The result is reduced stinging, less irritation and retained effectiveness.

Traditional AHAs, including glycolic acid and lactic acid, are highly polar, water-soluble materials. Lipophilic AHAs also exist, and they offer benefits on oily and acne-prone skin because they can preferentially absorb into the oil rich follicles. Mandelic acid, glycolic acid with a phenyl group attached, and benzylic acid, glycolic acid with two phenyl groups attached, are two examples of AHAs with enhanced oil solubility. These agents have demonstrated anti-acne benefits and improvements in rosacea, perhaps due to absorption into the oily follicles and the resulting

normalization of keratinization in this microenvironment.

Some acetylated forms of AHAs, such as O-acetyl mandelic acid, have effects on skin and nails that are opposite to the traditional effect of AHAs. That is, they actually promote the accumulation of surface cells. It's easy to imagine the benefits of these compounds on thin, layered nails, a condition clinically referred to as onychoschizia. With regular use, nails become harder and thicker. Perhaps there is a use in skin as well to promote the formation of calluses. Golfers, weight lifters and runners are just a few that could benefit from this effect.

What's New

After the discovery of the AHAs, continued research led to the use of new poly hydroxy acids (PHA), including gluconolactone and glucoheptonolactone. Considered the "next generation" of AHAs, these compounds provide some unique benefits that other traditional AHAs do not offer. For example, many PHAs are antioxidants, functioning as chelators, which trap metals that can have a pro-oxidative effect. Some testing models have demonstrated that gluconolactone can prevent the oxidation of other substances similarly to ascorbic acid (vitamin C) and citric acid. Due to their multiple hydroxy groups—thus the name poly

hydroxy acid—these compounds are humectants that attract and bind water. In this regard, their effect is similar to other known humectants, glycerol and propylene glycol. Perhaps one of the most important benefits of the PHAs is their gentleness. When compared to glycolic acid and lactic acid, PHAs are non-irritating and non-stinging. Studies have demonstrated their compatibility with sensitive skin, even on rosacea and atopic dermatitis. These compounds are well-suited for use in the burgeoning post-procedures market, such as microdermabrasion, superficial glycolic acid peels and nonablative laser, as a result of the antioxidant and hydration effects in combination with their gentleness.

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There also are important benefits to skin health and safety. Glycolic acid and lactic acid have been shown to increase the skin's sensitivity to sunlight, necessitating the use of sunscreens in combination with AHAs during the day. A low SPF has been shown to prevent any increase in sun sensitivity by AHAs. PHAs have been shown not to have this negative effect on skin. Other

studies have demonstrated another important difference: PHAs actually can strengthen skin barrier function against an external irritant.

But do gentle PHAs have significant anti-aging benefits? Multiple research studies say yes. PHAs smooth skin, diminish the appearance of pore size and wrinkling, and improve elasticity, firmness and clarity. Formulated in much the same way as AHAs, PHA products include cleansers, toners, moisturizers, anti-aging treatments, serums and daily use lotions with sunscreens. A recent study comparing the anti-aging effects of AHA and PHA products demonstrated comparable levels of effectiveness over the twelve-week testing period, with improved mildness characteristics in the PHA treatment group.

“Lactobionic acid is a poly hydroxy bionic acid.”

The next “next generation” AHA is yet another step ahead. Lactobionic acid, a unique compound derived from milk sugar, is a poly hydroxy bionic acid. It is extremely hydrating, even film-forming. Once hydrated, it never dries to a powder because it holds water so tightly that a gel forms during the dehydration process. All of this provides a light occlusive effect on skin and silky smooth aesthetics. This compound has

potent metal chelating properties, making it a strong antioxidant. So much so, it is currently being used as an antioxidant preservative for organs during transplantation procedures. Metal chelation has another important effect, diminished metallo-proteinase enzyme activity in skin. Activation of these enzymes is largely responsible for the degradation of collagen in skin after sun exposure. Indeed, lactobionic acid formulations have been shown to provide significant benefits on the appearance and feel of photo-aged skin, but actual prevention of the photo-aging process remains to be seen.

Lactobionic acid is ideal for use post-procedurally. It is non-irritating and very hydrating. It is an antioxidant that may also promote healing. When formulated in an occlusive type vehicle, this compound provides a blanket of moisturization on skin. In addition, it helps extend the benefits of cosmetic procedures. Both microdermabrasion and superficial peels diminish skin barrier function. Topical application of a non-irritating bionic PHA enhances skin benefits by providing AHA effects on cell turnover, pigmentation normalization and collagen and elastin building qualities. Lactobionic acid is a breakthrough technology in skin care.

Around the Corner

Another significant ingredient technology of the future is acetylated amino acids and amino sugars. These new compounds are being developed and patented, promising to keep the anti-aging ingredient arena advancing at full speed. The compounds consist of N-acetyl amino acids, such as N-acetyl proline, and the neutral compounds N-acetyl amino sugars, such as N-acetyl glucosamine. Both categories of compounds have shown benefits on photo-aged skin, helping to plump skin by building water-binding materials in skin. Some others in these new ingredient categories are useful in treating eczema and itching conditions. They are gentle and physiologic.

In a Nutshell

Alpha hydroxy acids continue to be used extensively in the fight against photo-aging and for adjunctive therapeutic effects in clinician’s offices. Use of patented amphoteric formulation approaches can improve their side-effect profiles, while maintaining strong clinical effects. New, more lipophilic AHAs will be seen in the future when targeting oily skin. Poly hydroxy acids are a tremendous advantage in skin care. Offering all of the anti-aging benefits of AHAs, these hydrating compounds are also antioxidants, barrier conditioning, gentle and

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safe. Lactobionic acid, one of the bionic PHAs, is a unique compound with strong water-binding effects, antioxidant properties and skin smoothing benefits. Other new ingredient technologies are being developed to offer consumers the option of non-acid anti-aging skin care to complement the full range of hydroxy acids technology available.

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