

# A Polyhydroxy Acid Skin Care Regimen Provides Antiaging Effects Comparable to an Alpha-Hydroxyacid Regimen

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*There have been numerous clinical studies conducted to evaluate the beneficial effects of the polyhydroxy acids (PHAs) in skincare. Although there is significant evidence that PHAs provide antiaging effects to skin, a direct comparison between alpha-hydroxyacids (AHAs) and PHAs for these effects has not been conducted. This 12-week clinical study evaluated gluconolactone-containing products (PHAs) in comparison with glycolic acid-containing products (AHAs). Clinical grading of photoaging, as well as objective and subjective irritation, was conducted on the face at baseline and after 6 and 12 weeks of product use. Pinch recoil, silicone replicas of the crow's-feet area, and self-assessment of product efficacy and tolerance were also collected.*

*Both regimens showed significant antiaging benefits to skin as measured by silicone replicas, clinical grading, and pinch recoil for skin resiliency. There were only 2 statistically significant ( $P < .05$ ) differences between the regimens in antiaging benefits: (1) sallowness showed greater improvement with AHA use at week 12 only (AHA, 17.1%; PHA, 12.4%), and (2) pinch recoil showed greater improvement with AHA use at week 12 only (AHA, 13.5%; PHA, 10.2%). Irritation grading and subject self-assessment showed that the PHA regimen was better tolerated than the AHA regimen. Stinging and burning were significantly worse for subjects in the AHA treatment group at both week 6 and 12, and degree of sensitivity was rated worse for the AHA regimen as well. The present study shows the*

*enhanced mildness of PHAs and their equivalence in providing antiaging benefits compared with an AHA regimen.*

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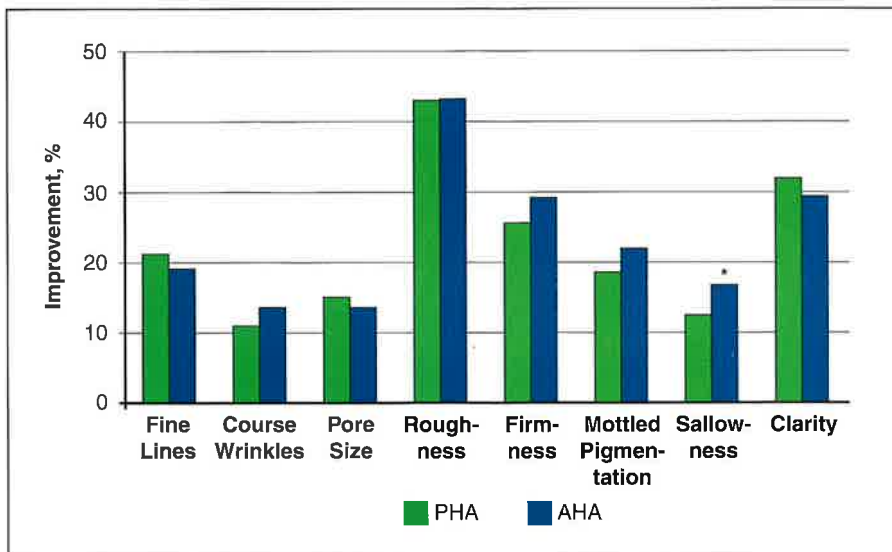
There have been numerous clinical studies conducted to evaluate the beneficial effects of polyhydroxy acids (PHAs) in skin care. PHAs have been shown to be compatible with clinically sensitive skin conditions such as atopic dermatitis and rosacea and can enhance skin barrier efficiency.<sup>1-3</sup> PHAs provide similar antiaging effects as alpha-hydroxyacids (AHAs) but are more gentle to the skin and do not cause any of the sensory discomfort that AHAs have been known to impart.<sup>1,2,4,5</sup> Although there is significant evidence that PHAs provide antiaging effects to skin, a direct comparison of AHAs and PHAs for these antiaging effects has not been conducted. This study compares a PHA skin care regimen with an AHA regimen to assess their relative equivalence in improving the signs of aging and to demonstrate the enhanced mildness of PHAs.

## Methods

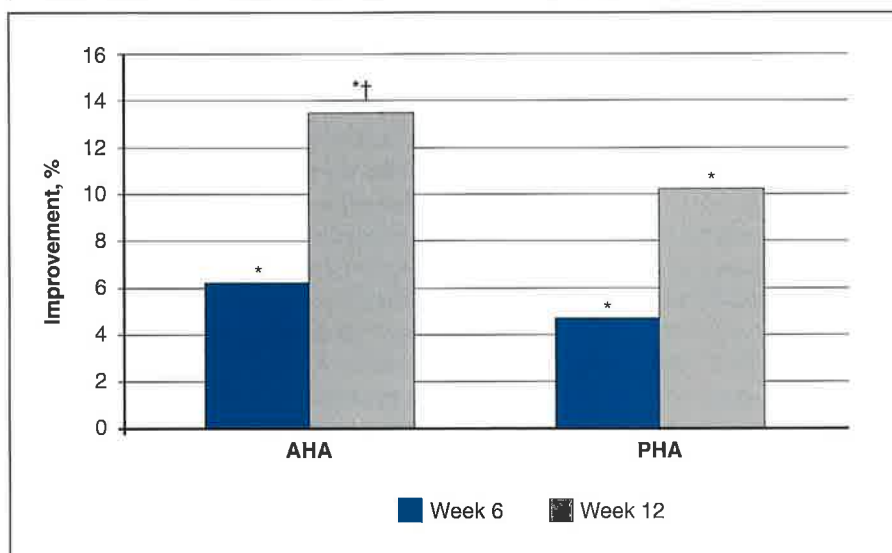
This was a 12-week, controlled-use study of independent groups. Caucasian women with mild to moderate facial photodamage were enrolled in the study. Subjects were instructed to discontinue use of all products on the face 3 to 5 days prior to study initiation except for their regular cleanser and glamour products.

The test products were provided in blinded packaging. Each subject used a gluconolactone-containing wash-off cleanser twice daily followed by application of the applicable AHA or PHA moisturizer. The PHA regimen consisted of a gluconolactone 4% day lotion containing a sun protection factor of 15 (pH 3.8) and a gluconolactone 10% night cream (pH 3.6). The AHA regimen included a glycolic acid 8% day cream with sun protection factor of 15 (pH 3.8) and a glycolic acid 8% night cream (pH 3.7). Marketed

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**Figure 1.** Percentage improvement of antiaging parameters at week 12 in groups treated with alpha-hydroxyacid (AHA)(n=27) and polyhydroxy acid (PHA)(n=30) regimens. All parameters within each regimen significantly improved from baseline. Asterisk indicates significantly more improved ( $P<.05$ ) vs the PHA regimen at week 12 only. All other parameters between the regimens were statistically equivalent.



**Figure 2.** Percentage improvement in pinch recoil as a measure of skin resiliency or elasticity in groups treated with alpha-hydroxyacid (AHA)(n=27) vs those treated with polyhydroxy acid (PHA)(n=30). Asterisks indicate significant improvement vs baseline; dagger, significantly greater improvement ( $P<.05$ ) vs the PHA regimen at week 12.

products were selected to obtain relatively equivalent total daily usage of the AHA or PHA.

Clinical evaluations were conducted on the face at baseline and after 6 and 12 weeks of product use. Photoaging parameters were assessed by a trained evaluator using a 10-cm scale. The photoaging parameters assessed included fine lines, coarse wrinkles, pore size, roughness, firmness, mottled pigmentation, sallowness (dullness), and clarity. Facial irritation was assessed objectively for erythema, edema, and dryness and subjectively for itching, stinging, burning, tightness, and tingling. A 4-point scale (none, mild, moderate, severe) was used to assess all irritation.

Pinch recoil was employed as a method to determine skin resiliency and firmness. The skin was mechanically distorted (pinched), and the time it took for the skin to recover (recoil) was measured.<sup>6</sup> Silicone replicas of the crow's-feet area were taken

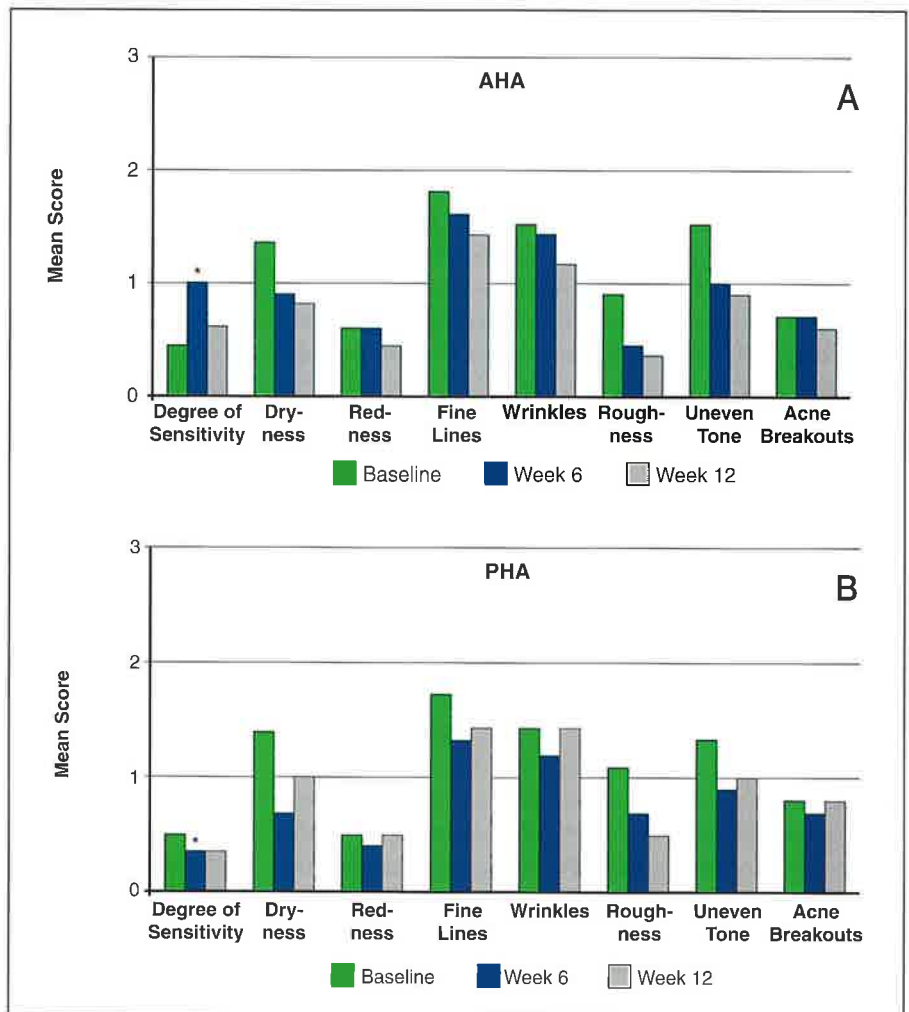
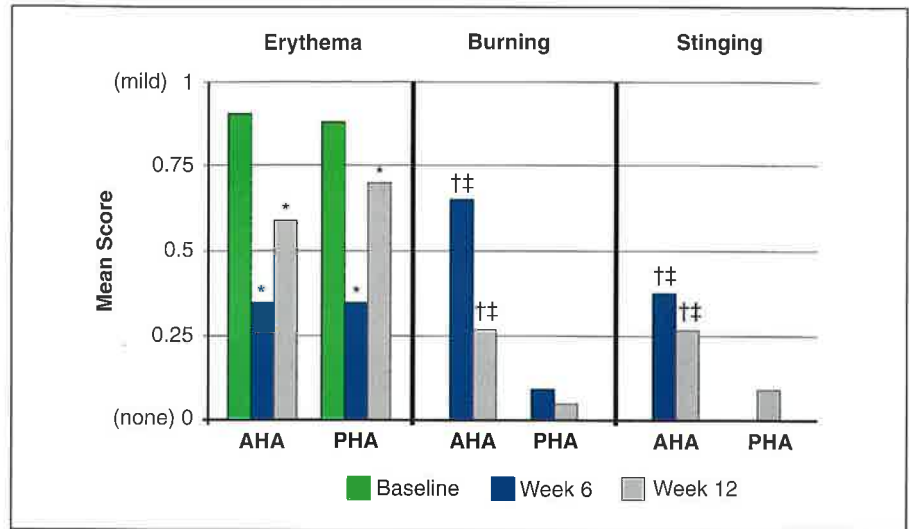
to assess changes in skin topography (wrinkles) both at baseline and at week 12. In addition, self-assessment questionnaires were administered to collect consumer perception of product efficacy and tolerance.

Data collected from clinical evaluations and pinch recoil measurements were compared with baseline within each treatment group using a paired *t* test at the  $P<.05$  significance level. Between-treatment comparisons were made using analysis of variance with pair wise comparisons using Fisher LSD test. Mean percentage changes from baseline were calculated. Silicone replicas were analyzed via image analysis.

### Results

Twenty-seven subjects completed the study in the AHA treatment group, and 30 completed the study in the PHA treatment group. Subjects ranged in age from 31 to 58 years.

**Figure 3.** Irritation assessment for groups treated with alpha-hydroxyacid (AHA) (n=27) and polyhydroxy acid (PHA)(n=30) regimens. Irritation was low overall. Asterisks indicate significant improvement vs baseline; daggers, significantly worse vs baseline; double daggers, significantly worse ( $P<.05$ ) vs the PHA regimen.



**Figure 4.** Subject self-assessments of the alpha-hydroxyacid (AHA)(n=27)(A) and polyhydroxy acid (PHA) (n=30)(B) regimens. Asterisks indicate PHA was significantly better ( $P<.05$ ) vs the AHA regimen at week 6 (scale: 0=none, 1=mild, 2=moderate, 3=severe).

Both the AHA and PHA regimens showed improvements in photoaged skin after 6 and 12 weeks of product use. After 6 weeks, all of the photoaging parameters except wrinkles were statistically significantly improved from baseline for both regimens.

After 12 weeks, all parameters were significantly improved from baseline (Figure 1). Compared with the PHA regimen, the AHA regimen scored significantly better ( $P<.05$ ) for sallowness at week 12 (17.1% vs 12.4%, respectively). All other photoaging

parameters were statistically equivalent when comparing the 2 regimens.

Skin resiliency measured through pinch recoil was improved significantly both at week 6 and week 12 for both regimens (Figure 2). Although the AHA regimen improved this parameter more strongly ( $P < .05$ ) than the PHA regimen at week 12, this difference is not likely to be perceivable to the patient. Percentage improvements at week 12 were 13.5% for the AHA treatment group and 10.2% for the PHA treatment group.

Silicone replicas showed significant improvements in wrinkles for the AHA regimen as measured by Ra, Rz, spacing, shadows, and number of wrinkles. The PHA regimen showed significant improvements in the number of fine lines. There were no significant differences detected between the 2 regimens for any of the parameters.

Clinical evaluations for irritation showed that both regimens were well tolerated with a low overall level of irritation (Figure 3), but there were statistically significant differences. Both regimens showed significant improvements in erythema versus baseline. The AHA regimen, however, had significantly increased ( $P < .05$ ) burning and stinging compared with baseline and the PHA regimen.

The AHA and PHA regimens were rated favorably through subject self-assessment for providing antiaging effects (Figure 4). After 2 weeks, 48% of the subjects in AHA treatment group and 53% of those in the PHA treatment group believed that their skin looked and felt younger. After 4 weeks, 74% and 80% of the subjects in the AHA and PHA treatment group, respectively, rated their skin "younger looking." In addition to these antiaging effects, subjects rated irritation and skin sensitivity parameters. The PHA regimen was statistically significantly ( $P < .05$ ) better tolerated at week 6 based on self-assessed "degree of skin sensitivity."

## Conclusion

These study results show a relative equivalence of AHAs and PHAs in treating photoaged skin. Both regimens provided significant antiaging benefits to skin as measured by clinical evaluations, pinch recoil measurements, and silicone replicas. There were only 2 statistically significant differences between the regimens in antiaging benefits: sallowness showed greater improvement with AHA use at week 12 only (AHA, 17.1%; PHA, 12.4%), and pinch recoil was more improved with AHA use at week 12 only (AHA, 13.5%; PHA, 10.2%). Irritation grading and self-assessment showed that the PHA regimen was better tolerated than the AHA regimen. Stinging and burning were significantly worse for subjects in the

AHA treatment group both at week 6 and week 12, and degree of sensitivity was rated worse for subjects in the AHA treatment group as well.

Patients have observed real improvements in their skin condition with the use of both AHAs and PHAs, thus providing numerous reasons to select these ingredients for skin care. Both AHAs and PHAs have been shown to provide skin smoothening and antiaging effects.<sup>1,2,5,7-9</sup> In addition, PHAs have been shown to be compatible with sensitive skin conditions such as rosacea and atopic dermatitis.<sup>1,2,5</sup> Many PHAs are antioxidants<sup>4,10</sup> and can be combined with active ingredients for added benefit.<sup>11</sup> The present study shows the enhanced mildness of PHAs and their equivalence to AHAs in providing antiaging benefits.

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