



A HYALURONIC ACID-BASED FORMULA WITH POLYGLUTAMIC ACID IMPROVES SKIN CONDITIONS AND PREVENT CELLULAR SENESCENCE

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INTRODUCTION

Hyaluronic acid (HA) is a crucial component of the extracellular matrix, renowned for its ability to improve skin moisturization and volume in cosmetic applications. On the other hand, polyglutamic acid (PGA) has emerged as a promising biopolymer for deep moisturization, aiding in wrinkle reduction and overall skin enhancement. Additionally, cellular senescence, a process directly impacting skin health and appearance, has garnered attention for its role in aging-related skin changes. Despite the distinct yet complementary mechanisms of action of HA and PGA, further research is warranted to validate their combined benefits for skin health. Thus, this study sought to assess the effectiveness of a cosmetic formulation containing HA in five different molecular weights combined with PGA.

OBJECTIVE

The objective was to address skin dehydration and sagging typically associated with aging, while also targeting the prevention or reduction of cellular senescence.

METHODS

To evaluate the benefits of the combination of HA and PGA on the skin, a specially formulated product was developed with a high concentration of HA at various molecular weights together with PGA. A clinical trial was conducted involving 24 volunteers who consented to participate in the study. Skin hydration was evaluated by corneometry, as well as deep hydration, firmness and elasticity by cutometry, considering the parameters U_v , U_e and U_f , which correspond to viscoelastic, elastic and maximum deformation, respectively. Measurements were taken before and after a single application, as well as after prolonged use of the product for up to 56 days. A preclinical study was conducted to investigate the impact of the formula on cellular senescence. For this purpose, the senescence-associated secretory phenotype (SASP) was evaluated by measuring the production of the enzyme β -Galactosidase in human fibroblast cultures, in addition to the interleukins IL-6 and IL-8 in human keratinocyte cultures. Statistical significance was considered with a 95% confidence interval.

RESULTS

The experimental product provided a significant increase in skin hydration by 30% after 24 hours of a single application, and kept the skin hydrated for up to 48 hours ($p < 0,05$). A significant increase in deep skin hydration was observed with a single application of 21% after 1h, 22.3% after 4h, 21.5% after 6h and 18% after 8h (Image 1). With continuous use, a significant increase of 9%, 12.1% and 14.2% was observed after 14, 28 and 56 days of use, respectively (Image 2).

Average values of immediate deep hydration

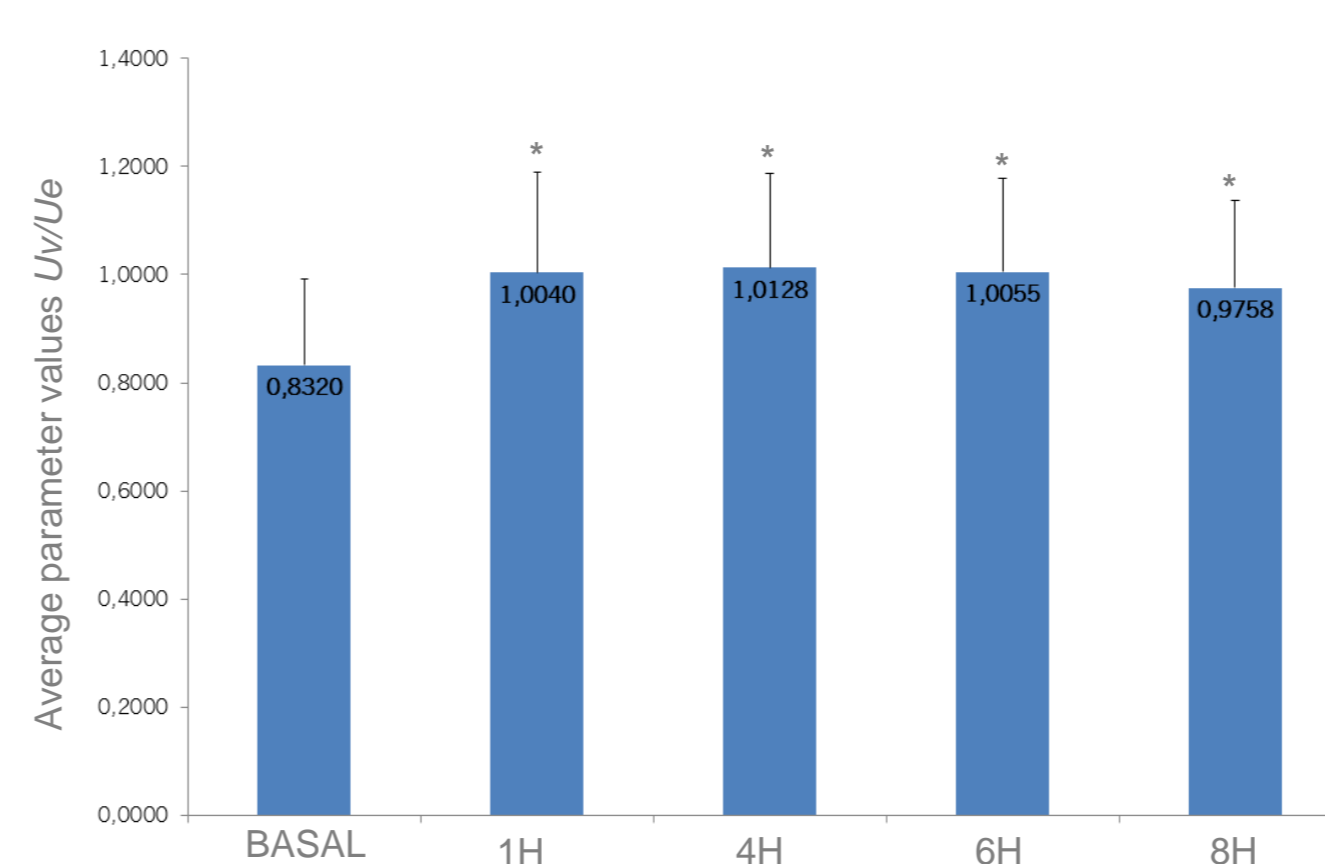


Image 1. Average values of the U_f parameter of deep hydration after a single application.

Average values of prolonged deep hydration

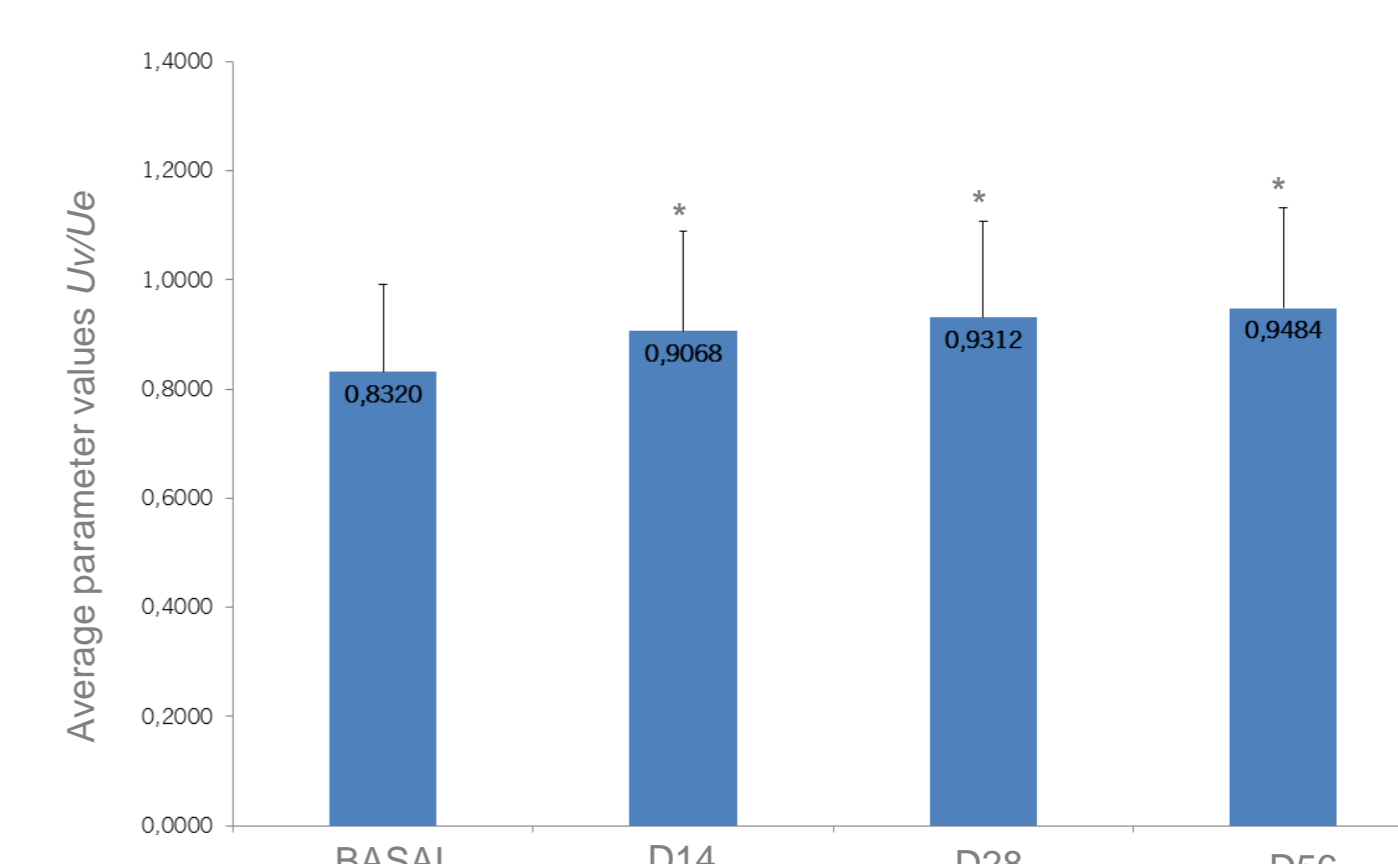


Image 2. Average values of the U_f parameter of deep hydration with prolonged use.

The formula studied showed a significant increase of 13.3% in firmness (image 3) and 13.4% in elasticity (image 4) of the skin after 56 days of use. The results showed high statistical significance ($p < 0.0001$).

Average firmness values

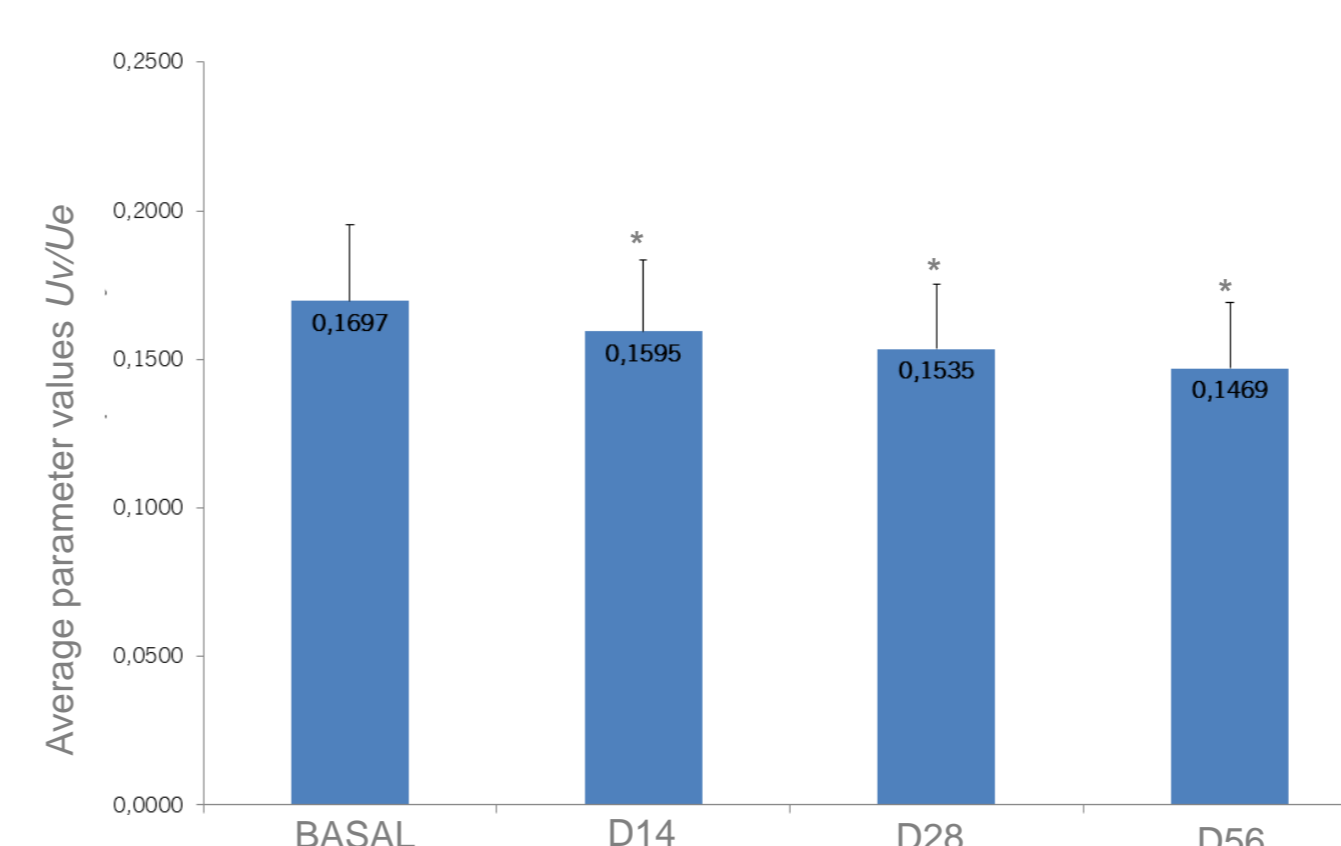


Image 3. Average values of the U_f firmness parameter with prolonged use.

Average elasticity values

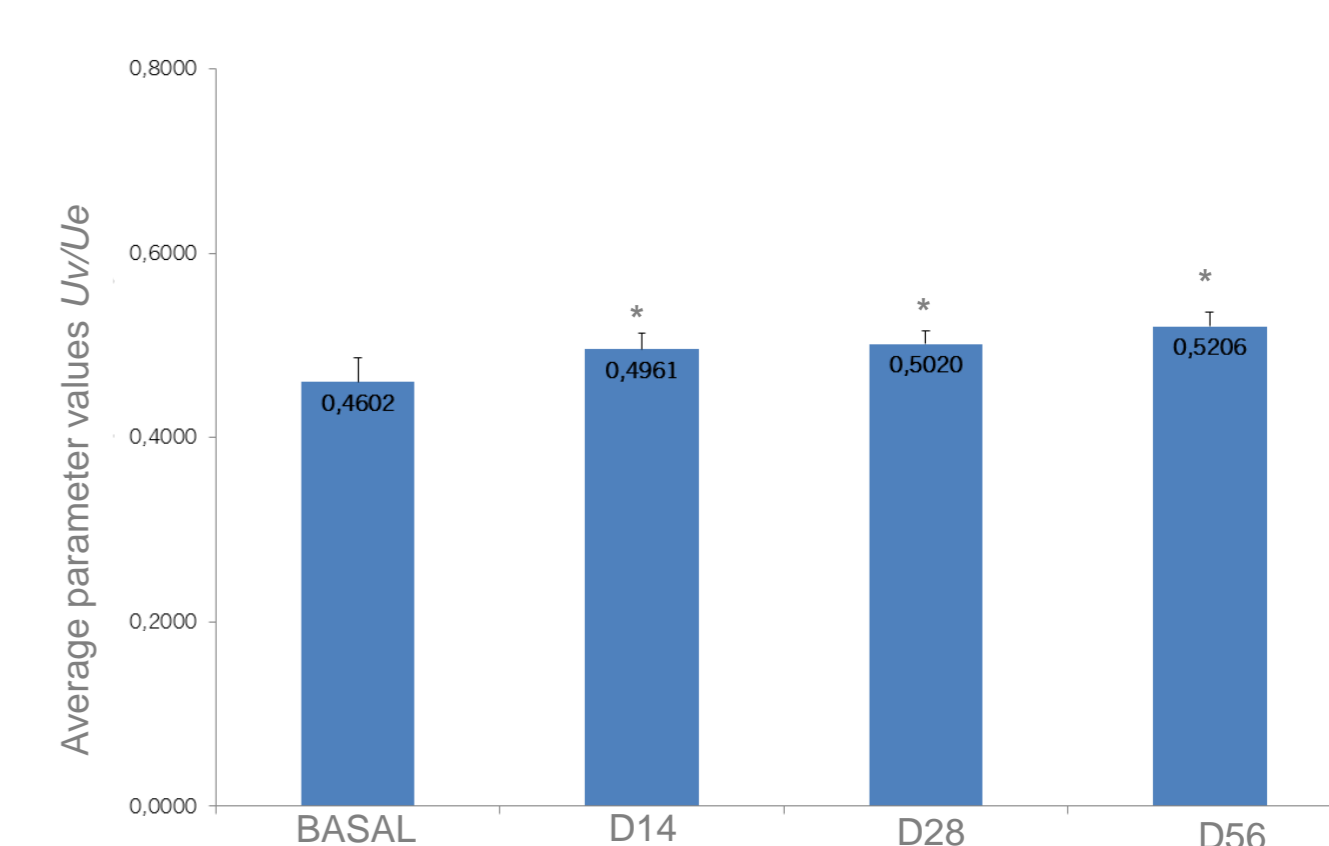


Image 4. Average values of the elasticity parameter U_f with prolonged use.

The preclinical study demonstrated a decrease in the quantification of β -galactosidase by 66.99% (Image 5), and of the IL-6 and IL-8 proteins by 7.93% and 7.25%, respectively, proving the reduction of SASP.

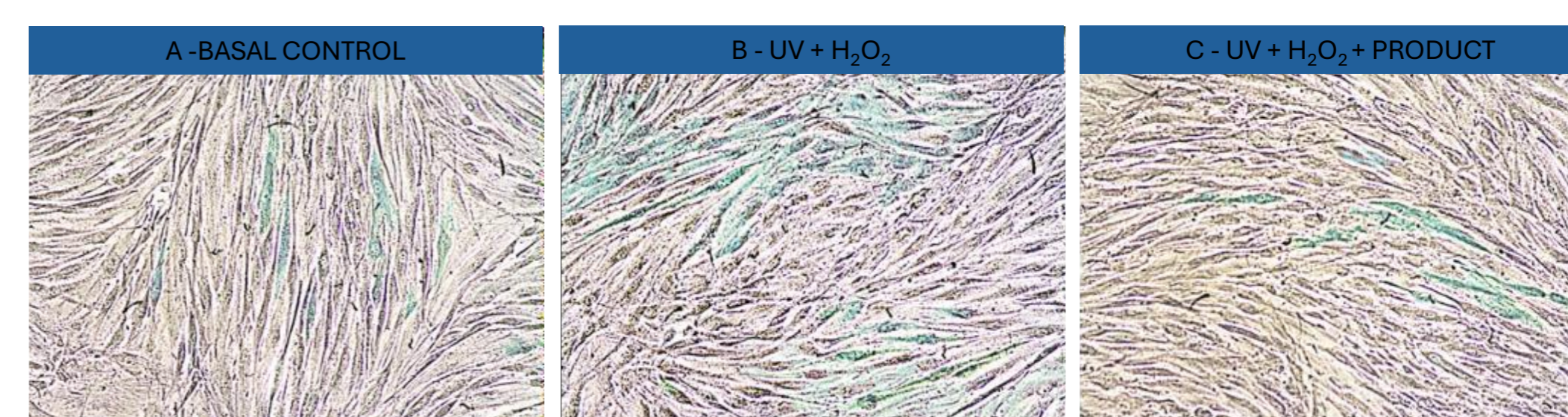


Image 5. Micrograph of human fibroblast cultures, where A is the basal control, B is a cell culture exposed to UV radiation and H_2O_2 (10 μM) and C is a cell culture exposed to UV radiation, H_2O_2 (10 μM) and the product studied. Cytochemistry for beta-galactosidase corresponding to the blue staining present in the cytoplasmic vesicles.

DISCUSSION

The combination of high concentration HA of 5 molecular weights with PGA significantly increased skin hydration, firmness and elasticity from the first application, parameters highly correlated with the improvement of signs of aging. Preclinical results show that the studied formula has a promising role in preventing cellular senescence and reducing cellular inflammation.

CONCLUSION

The combination of HA with PGA has proven effective in improving skin conditions and health, in addition to contributing to the prevention of cellular aging and the inhibition of SASP.

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