AC Pina Colloida

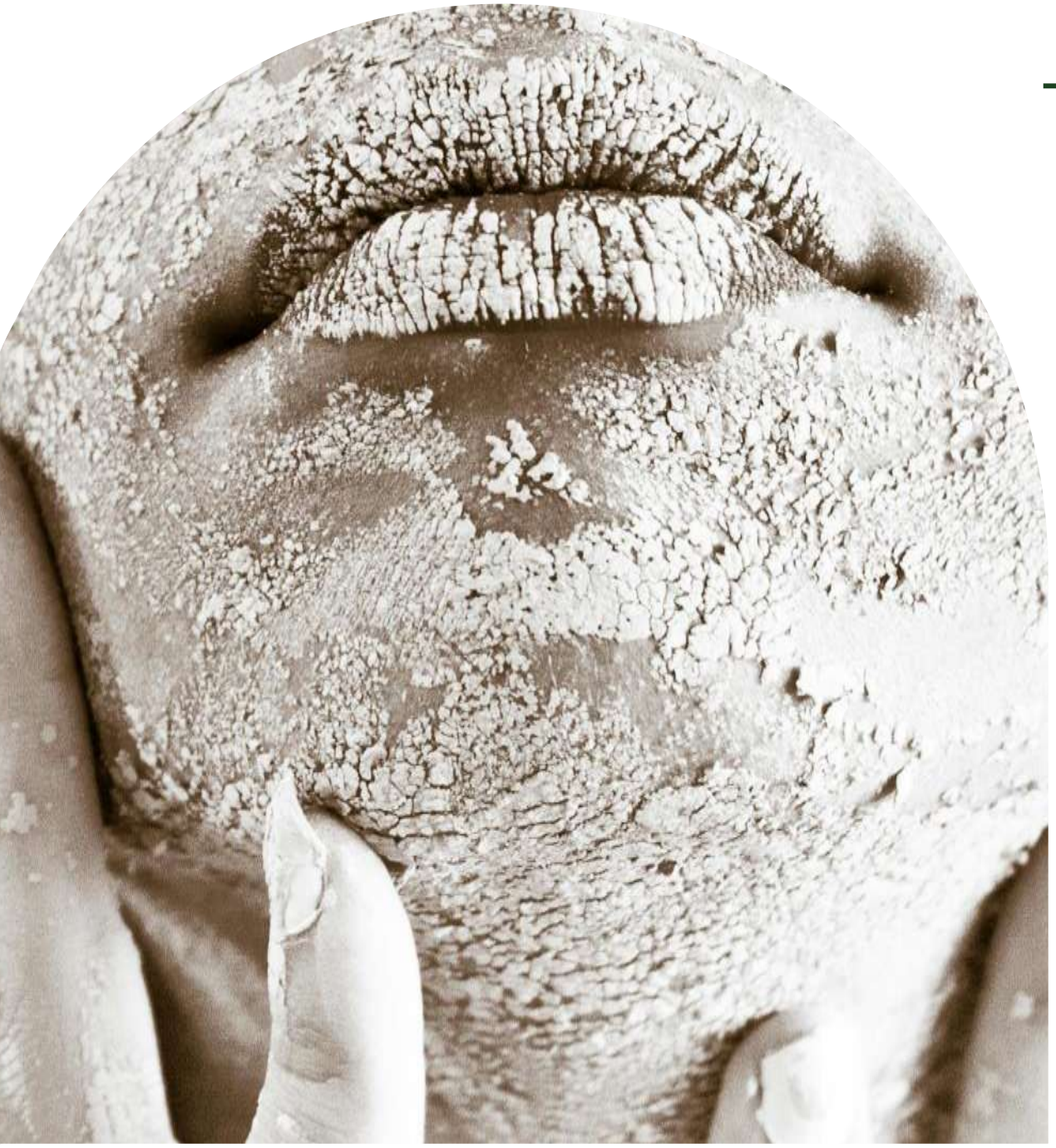
INCI : Water & Saccharomyces/Hydrolyzed Pineapple Fruit Crown Extract Ferment Filtrate & Lactobacillus Ferment

Active Concepts

Warming Attention

Record temperatures are being observed worldwide, altering our clothing and grooming habits. The increasing **heat** and worsening **pollution** are influencing trends in the fashion and beauty industries.

The market for skincare products with **anti-pollution** properties is projected to reach $1.4 billion by the close of 2031[1], and consumers are turning to **more technologically advanced** products for sun protection.

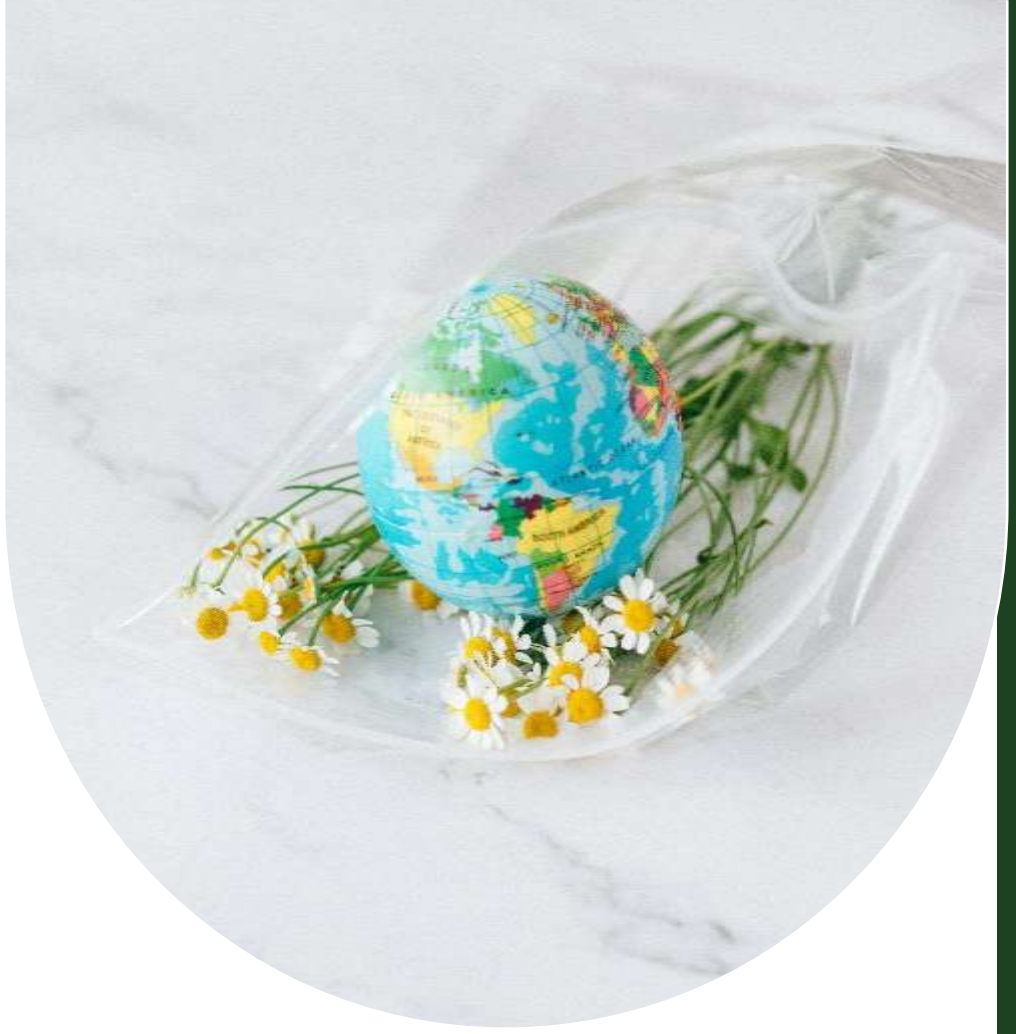


Under Attack

The aging and quality of skin and hair can be **directly influenced** by global warming. Presently, the risk of skin damage induced by UV rays is progressively rising due to climate change, and the skin and hair **lack inherent mechanisms** to **shield** themselves adequately from the sun and environmental stress.

As the **beauty industry** undergoes an **eco-conscious** transformation, consumers are becoming more aware of the **environmental impact** of their daily routines and are actively seeking high performance products without causing harm to the planet.[2]

Addressing the global necessity to **mitigate harm** from **petrochemical pollutants**, eco-friendly and biodegradable solutions have become imperative.



The Eco-Conscious Transformation

How can we counteract the impacts on our skin and hair resulting from the constantly shifting and tumultuous climate of the planet with a sustainable impact?

Our responsibility

is to **initiate** the cosmetic industry's **supply chain** with natural and sustainable solutions. As biotechnology progresses, we can offer **innovative approaches** to obtain biopolymers and enhance their performance.

Our objective

Develop an innovative eco-solution for safeguarding hair & skin.

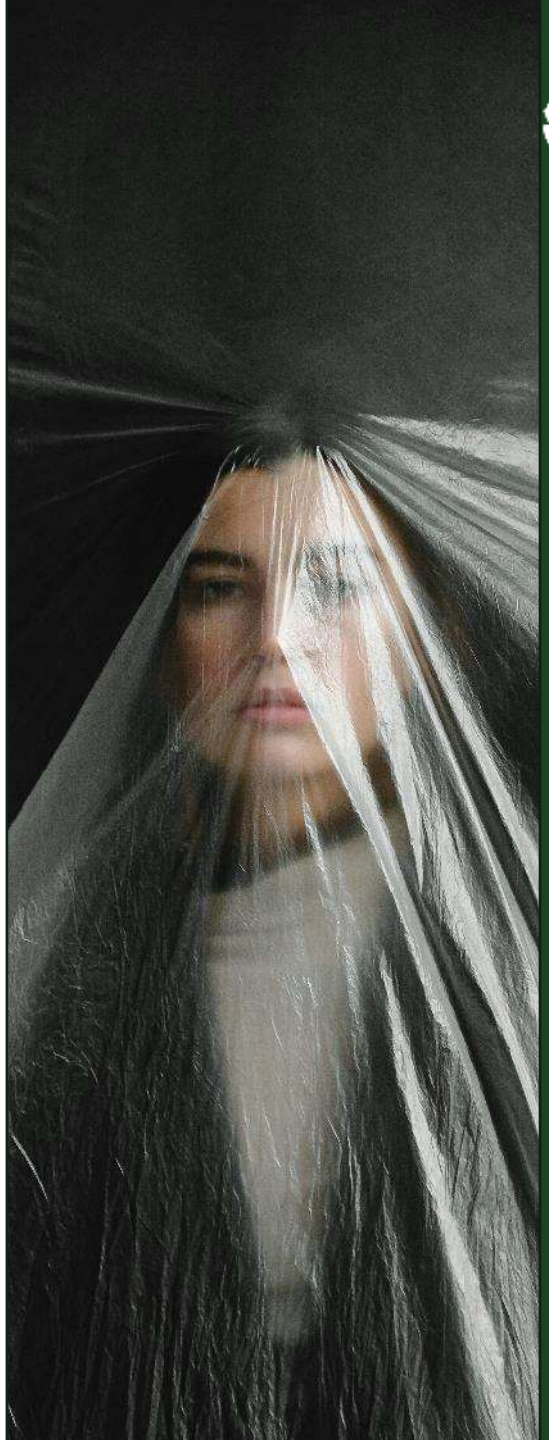
- Creating a novel natural polymer
- Acting as a shield against environmental factors
- Promoting eco-friendliness through sustainable sourcing

Green Switch

Polymers, large molecules with repeating structural units connected by covalent chemical bonds, include natural polymers like cellulose found in nature.

Biodegradable polymers offer **eco-friendly choices**, but unmodified types may **lack strength** and water resistance. Researchers explore enhancement techniques.[3]

Enhancement methods for biodegradable polymers may **raise complexity** and carbon footprint by demanding more materials and energy. **Reevaluating** both the techniques and aspects involved in **ingredient modification** is crucial for the sustainable development of polymers.



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Biomaterials Science

The **environmental challenges** linked to the **energy crisis**, production, disposal, and recycling of synthetic fiber-based polymer composites have inspired the exploration of **eco-friendly natural fibers**, with the aim of introducing innovative biopolymers and eco-textiles.

At Active Concepts, we embrace diverse realms of science and industry. Exploring solutions from food to fashion, we identify **potential alternatives** in technology and fiber sources that could contribute to **sustainable practices** for the creation of our novel ingredient.

PALF

Ecoalf

Source: Ecoalf Website

Piñayarn®

offers a 100% plant-based, recyclable, and biodegradable textile solution for a world otherwise dominated by petroleum-based textiles and resource intense virgin fibres.

Source: Anans Anam Website

Pineapple leaf fiber (PALF) is valued for its **high cellulose content** and strength. Processing **pineapple crown leaves** (PCL) contributes to pollution and agricultural issues. PALF finds use in textiles, paper, and polymers, but **burning leaves harms the environment**. Repurposing PCL waste as a cellulose source addresses pollution, leveraging its **renewable nature**. This strategy tackles environmental challenges by utilizing pineapple crown leaves sustainably.

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Pina-Appeal

Pineapple, a non-climacteric fruit, ranks **third** globally in cultivation after banana and citrus, being consumed worldwide. Major producers include Costa Rica, the Philippines, and Brazil. Each plant yields 40-60 tonnes per hectare, generating about 40–50 leaves or 2.3 kg of pineapple leaves per shoot. This abundance results in substantial **by-products**, especially pineapple leaves, totaling approximately **3 billion tons annually**.[4]

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Global agricultural post-harvest waste poses a pressing issue, often being burned, discarded, or used solely as organic fertilizer without generating additional income and contributing to pollution. These wastes are rich in cellulose, hemicellulose, and lignin.

Goal is repurpose

Repurposing a portion of this waste offers a promising solution to minimize waste and introduce a beneficial sourcing strategy for producing new biopolymers.

Upcycling Strategy

Agricultural waste is a major contributor to pollution, with millions of tons of crops either abandoned or burned annually, releasing harmful greenhouse gases. However, there's a **sustainable alternative** in PALF, which transforms this waste into valuable products, effectively reducing pollution and promoting a closed-loop system in the **circular economy**.

For our sourcing, we strategically identified three local methods to acquire pineapple crowns, meeting the requirements of our production sites.

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Upcycled Sourcing

Pineapple crowns are utilized from a local grocery store in the United States that would have otherwise been discarded as waste, saving approximately 2.6 metric tons. These crowns are sustainably used to extract fibers and are sourced from a certified Costa Rican supplier practicing sustainable cultivation.

US

In the region of Piemonte in Italy, our European pineapple crown supplier prioritizes quality, health, and sustainability. They annually discard 8,500 Costa Rican pineapple crowns, repurposing them in line with their commitment to innovation and eco-conscious practices.

EU

In Taiwan, a local family farm partners with us to supply pineapple crowns. Focusing on pineapple, our supplier creates culturally significant pineapple cakes, with most fruit sourced locally. Emphasizing non-toxic, pesticide-free practices, they distribute fresh produce in community markets, ensuring fruit freshness and consumer healthiness.

Asia

Acquiring discarded pineapple crowns

Mechanical crushing of crowns and treatment resulting in pineapple leaf fiber (PALF) extract

Fermentation of yeast with PALF solution

Extraction under specific conditions of yeast polysaccharides/PALF cross-linked polymer

Addition of *Lactobacillus* ferment.

AC Pina Colloida

Manufacturing Process

AC Pina Colloida

New **beauty protection** against global warming: a **film-forming pineapple biopolymer**, safeguarding both skin and hair while promoting environmental sustainability. AC Pina Colloida repurposes pineapple crown leaf waste to create a **shield against environmental factors** with a cross-linking technology based on yeast, addressing environmental pollution and contributing to a greener future.

Natural Biopolymer| Environmental Protection| Moisturization

Benefits

- AC Pina Colloida is a **new biopolymer** that improves the **skin's protective** barrier function, helping to **lock in moisture** and **prevent micro-pollution** attacks. By working on the dermal-epidermal junction integrity, it can **prevent** visible **signs of aging**.

- AC Pina Colloida **enhances** the structural **integrity of hair** by **preventing** the **harmful effects** of UV irradiation resulting in healthier hair.

- AC Pina Colloida demonstrates **effective pigment dispersing** properties which improves overall skin coverage and product appearance.

Available Efficacy Studies

In Vitro .

- Total Cellular Protein in Response to UV-B Irradiation Assay
- Airborne Pollutants Assay
- Color Pigment Dispersion Assay
- SPF Pigment Dispersion Assay
- Sunscreen Sensory Analysis /Triangle Test

In Vivo .

- Carbon Pollution Protection Study
- 24 Hour TEWL Assay
- 24 Hour Moisturization Assay
- UV Hair Protection Assay-Report
- Transfer Resistance Study
- Salon Half-Head Study-2%
- Global Warming Hair Protection Assay

Tox & Safety

- AMES
- Cellular Viability
- Dermal & Ocular Irritation
- Phototoxicity Assay
- OECD 201 Fresh Water Algae Growth Inhibition
- OECD 301B Ready Biodegradability Assay
- OECD TG 442C – Direct Peptide Reactivity Assay
- OECD TG 442D – In Vitro Skin Sensitization Report

24-Hour Moisturization Assay

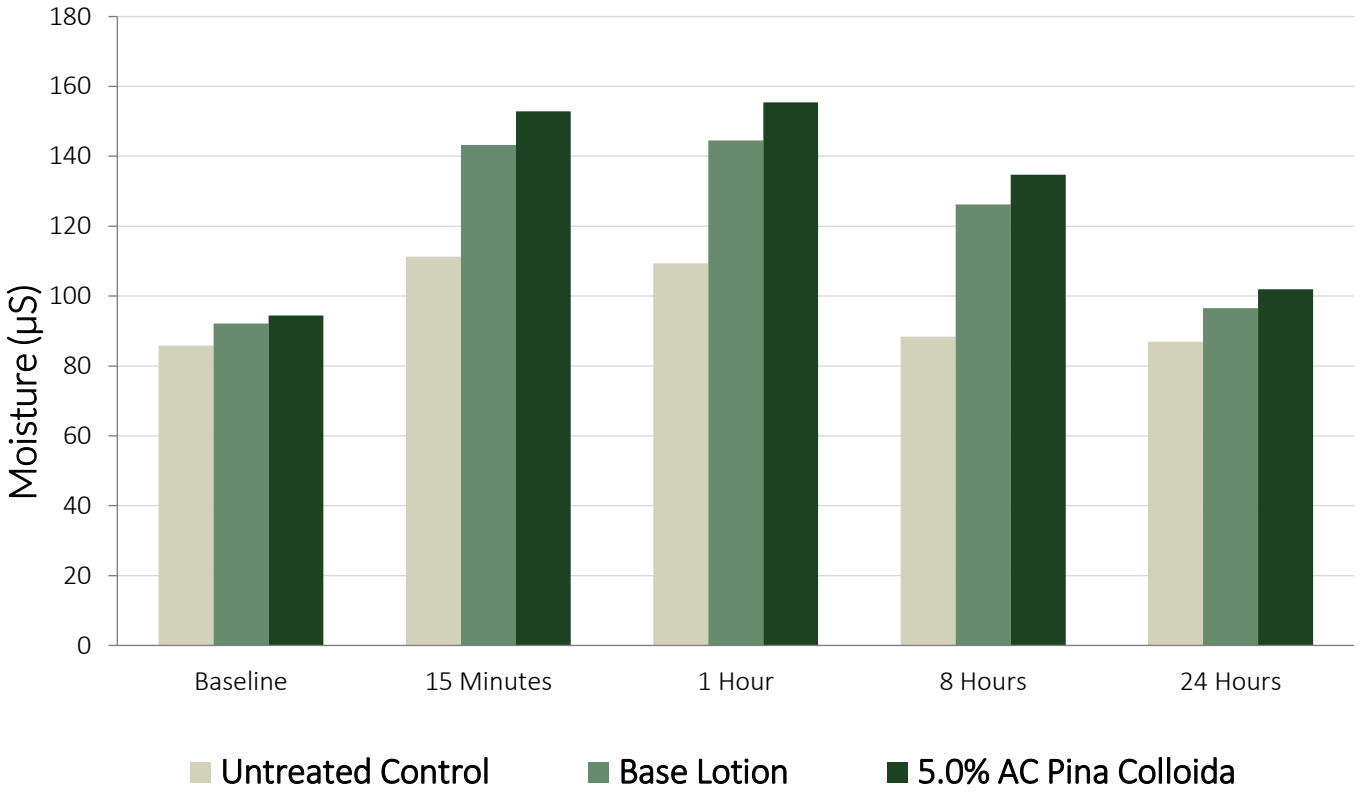


Figure 1. Skin Hydration Overtime

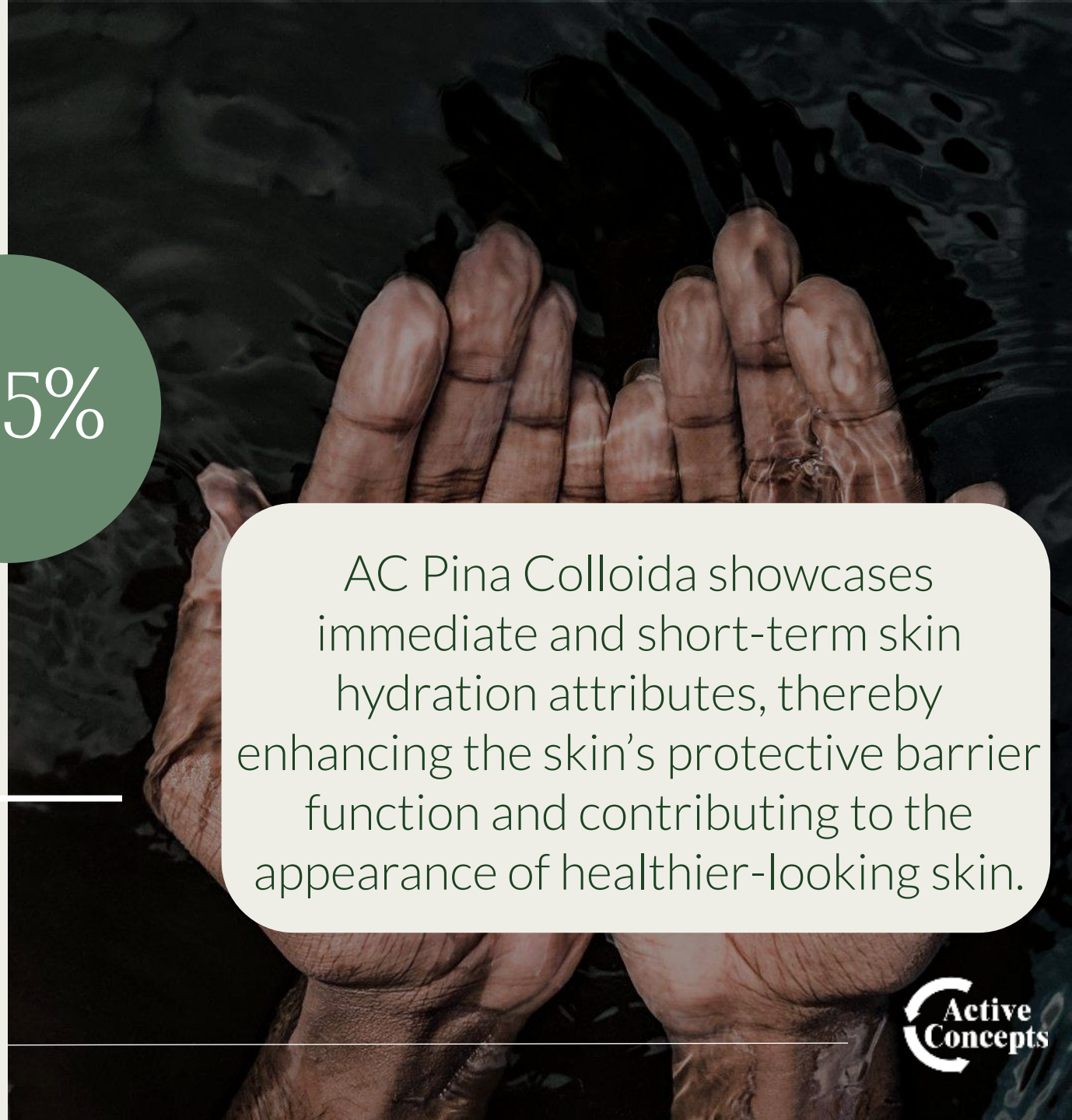
Proper hydration maintains the skin's structural and functional integrity and contributes to the appearance of healthier-looking skin.

Accordingly, a moisturization study was conducted to evaluate the immediate and short-term skin hydrating properties of AC Pina Colloida.

Applying 5.0% AC Pina Colloida significantly augmented skin moisturization one hour after application by

+65%

Benefits



AC Pina Colloida showcases immediate and short-term skin hydration attributes, thereby enhancing the skin's protective barrier function and contributing to the appearance of healthier-looking skin.

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24-Hour Transepidermal Water Loss Study

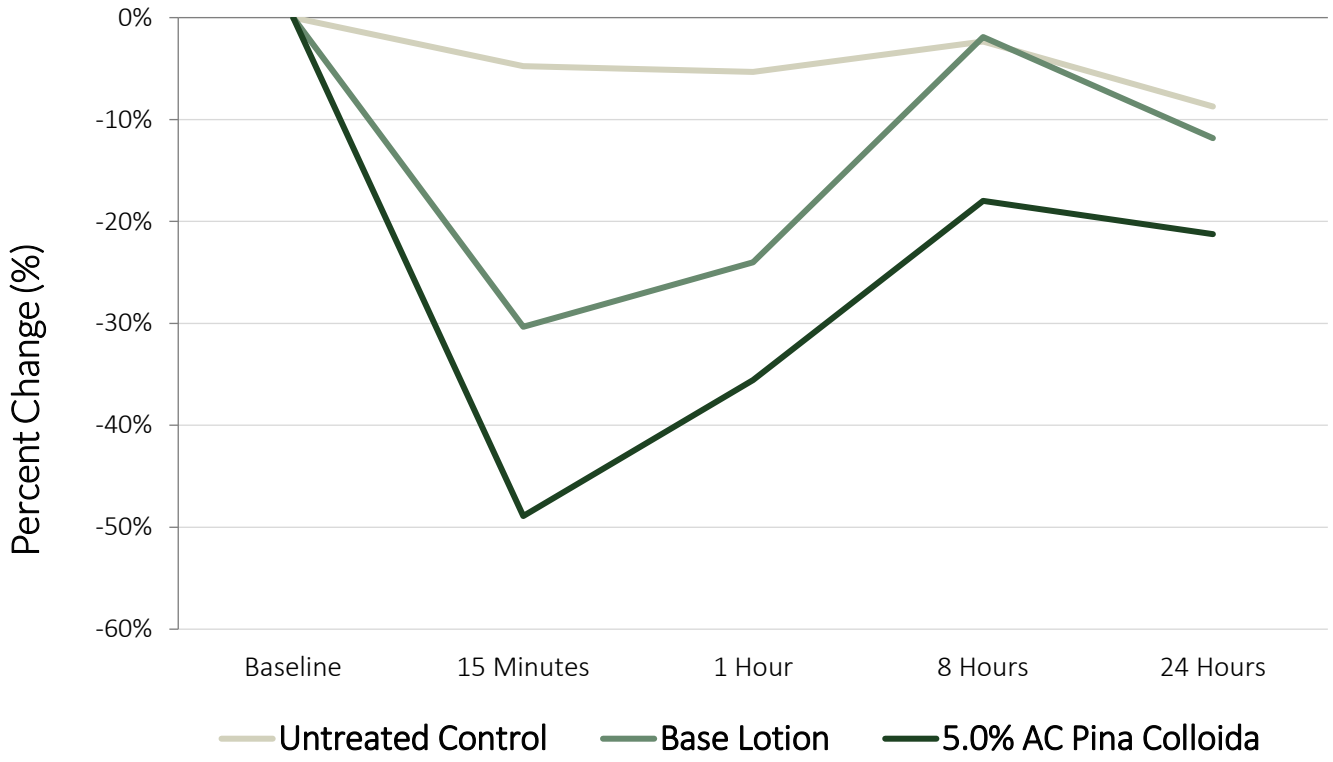

Figure 2. Percent Change in Transepidermal Water Loss Relative to Baseline Values.

Moderating excessive TEWL improves the skin's protective barrier function and contributes to the appearance of healthier-looking skin.

Accordingly, a transepidermal water loss study was conducted to evaluate the immediate and short-term moisture retention properties of AC Pina Colloida.

Applying 5.0% AC Pina Colloida significantly reduced TEWL one hour after application by

-36%

Benefits

AC Pina Colloida exhibits immediate and short-term moisture retention capabilities, enhancing the skin's protective barrier function and promoting a visibly healthier complexion.

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Carbon Pollution Protection Study

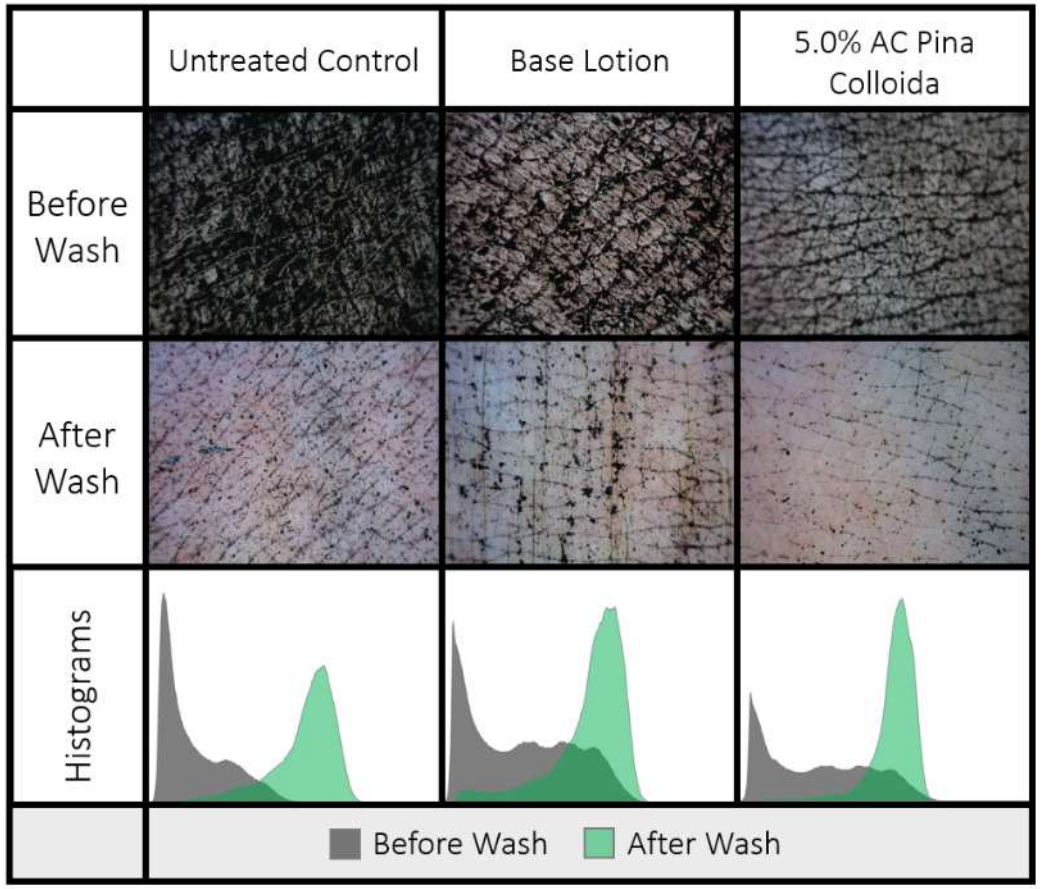
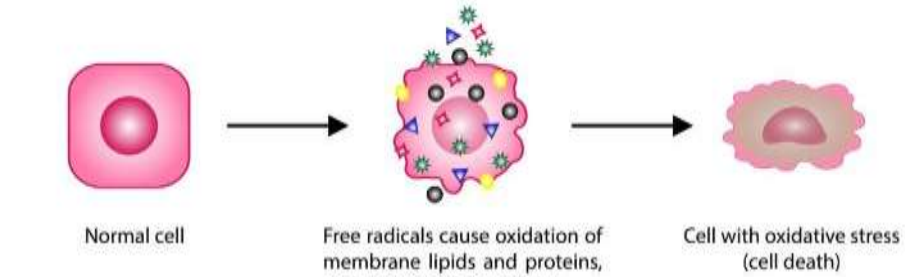


Figure 3. Images of each treatment site before and after washing with light intensity histograms of each site before and after washing



Oxidative Stress

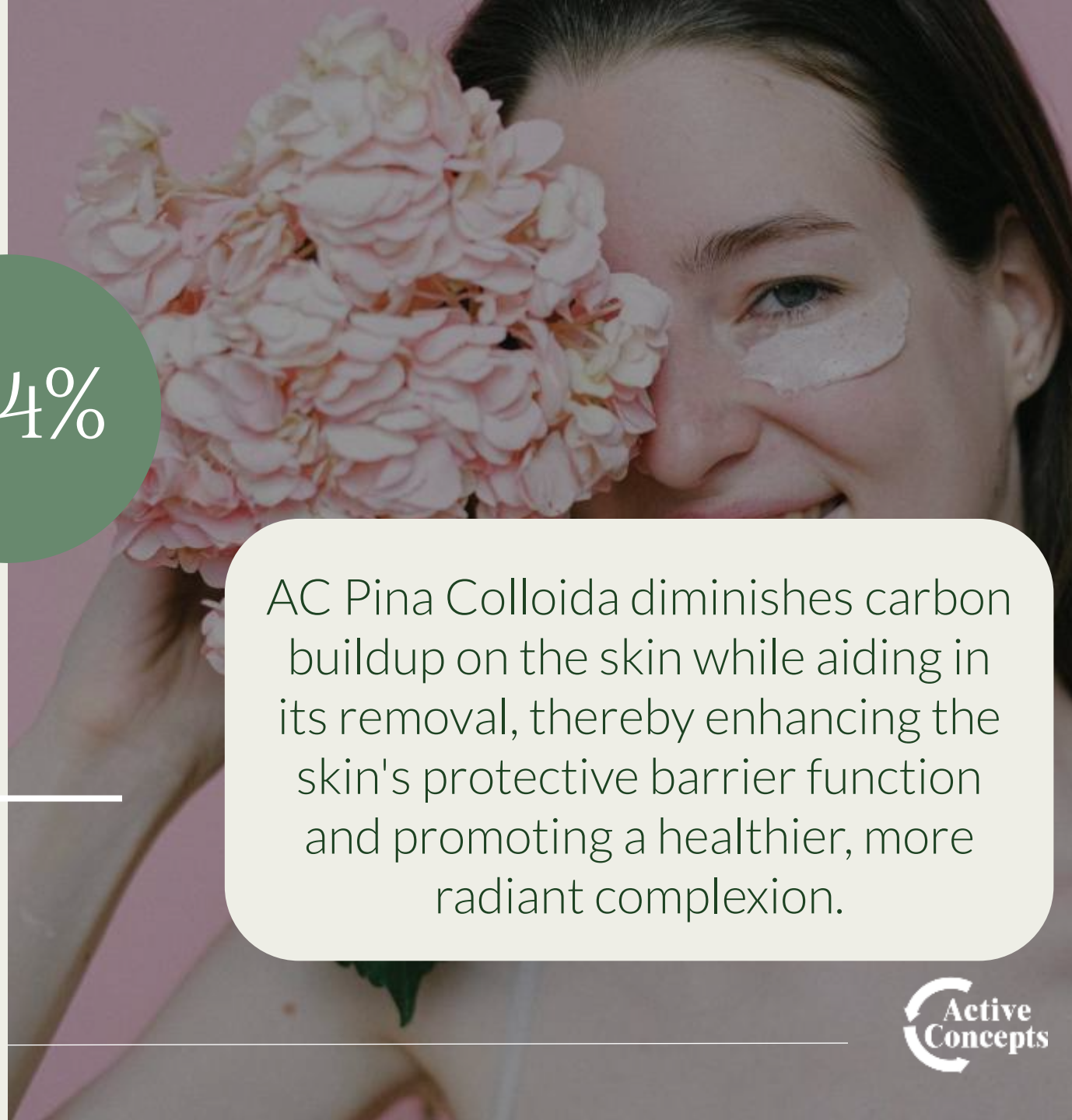
New research indicates air pollution plays a detrimental role in extrinsic aging. Carbon and metal micro-particles found in polluted air embedded in the dermis cause oxidative stress, initiating inflammatory cascade leading to the breakdown of collagen, elastin, and other structural components in the skin. Providing a physical barrier will prevent embedment of carbon particles, thus reducing the signs of extrinsic aging.

Applying 5.0% AC Pina Colloida reduced carbon on the skin after wash by

-64%

Benefits

AC Pina Colloida diminishes carbon buildup on the skin while aiding in its removal, thereby enhancing the skin's protective barrier function and promoting a healthier, more radiant complexion.



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Airborne Pollutants Assay

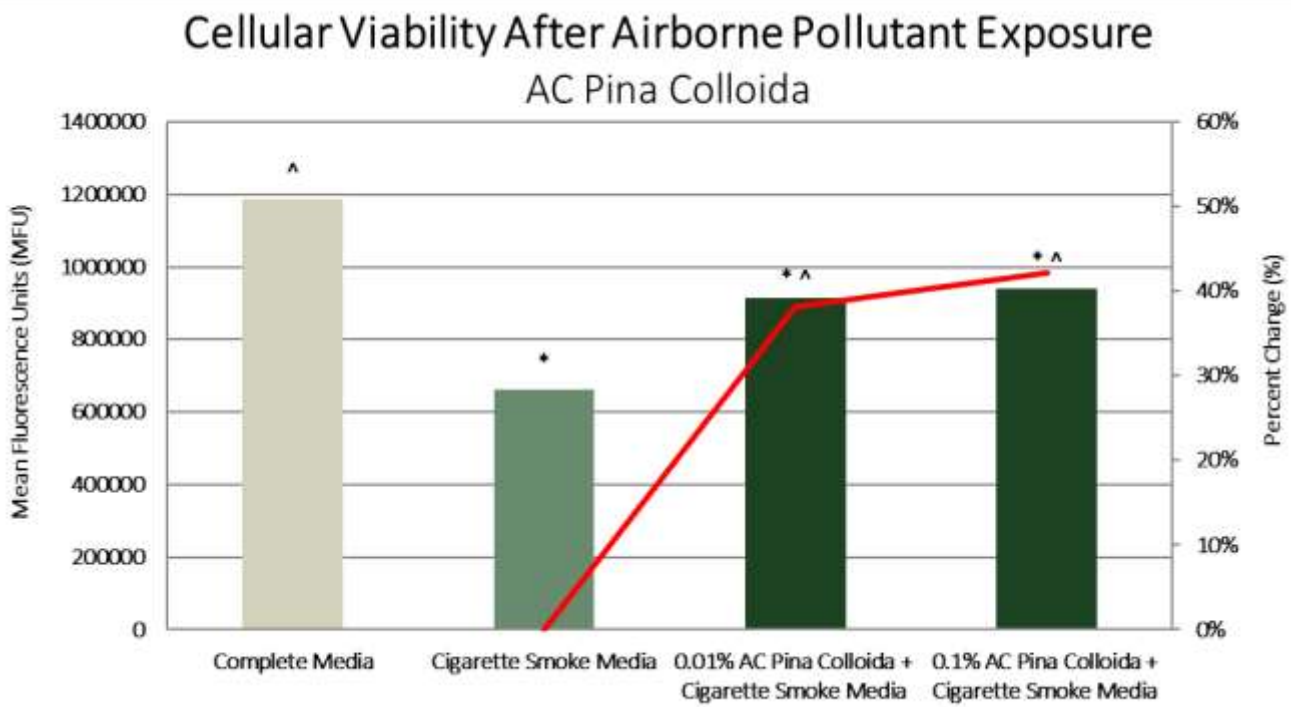


Figure 4. Cellular Viability of Fibroblasts.
* indicates significance ($p \leq 0.05$) compared to untreated fibroblasts. ^ indicates significance ($p \leq 0.05$) compared to Cigarette Smoke Media-treated fibroblasts.

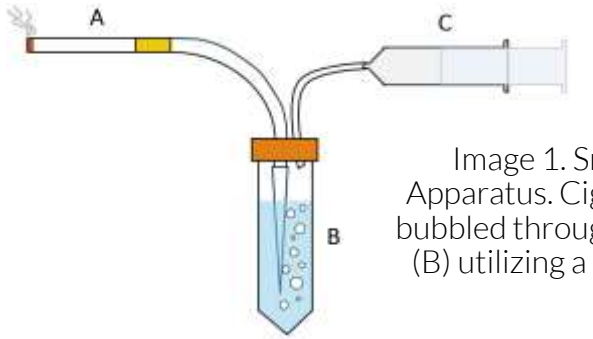


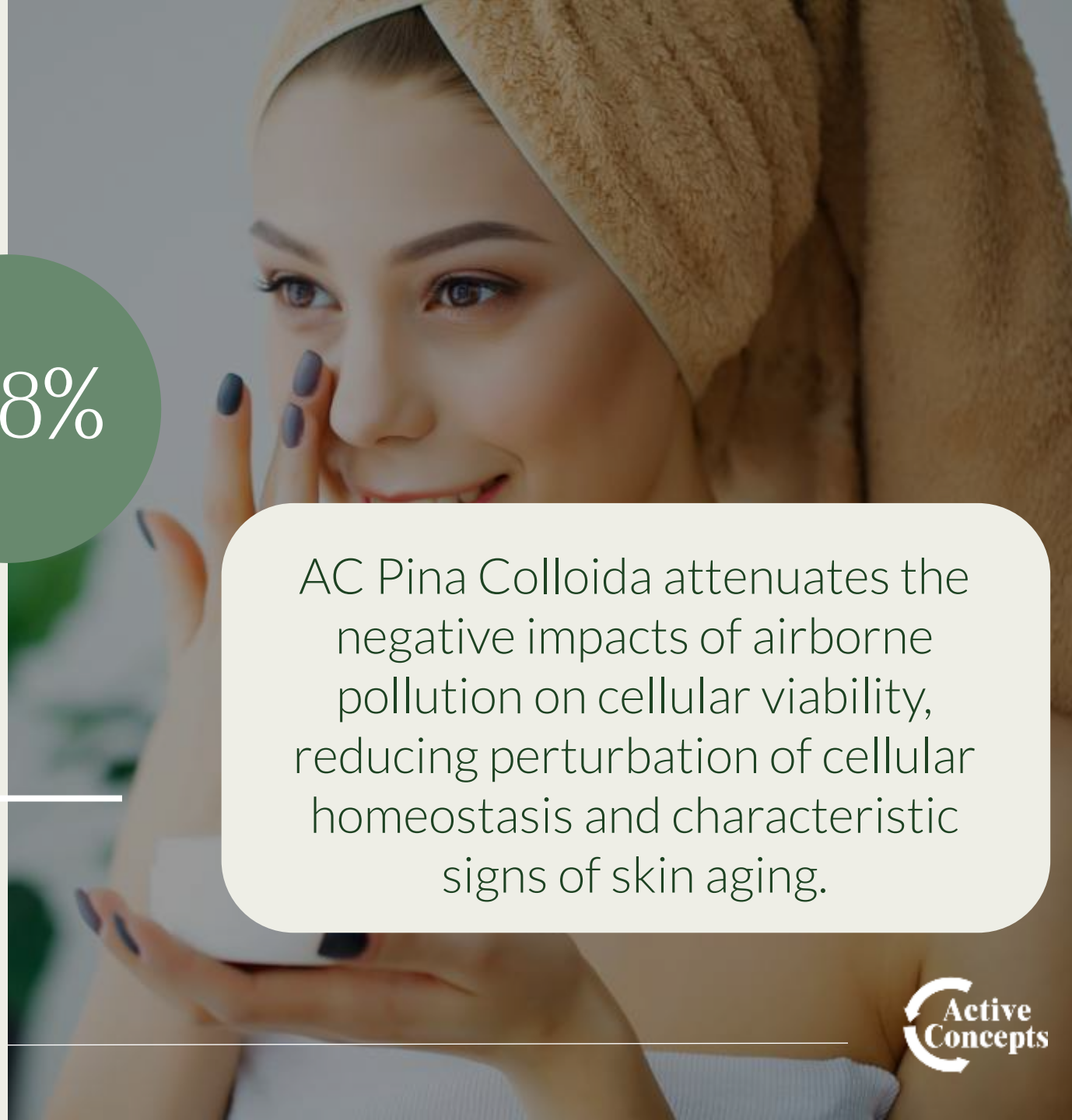
Image 1. Smoke Extraction Apparatus. Cigarette smoke (A) is bubbled through cell culture media (B) utilizing a manual syringe (C).

Airborne pollutants, such as cigarette smoke and secondhand smoke, are a threat to skin health as they disrupt natural biological processes. At the molecular level, exposure to airborne pollutants causes inflammation, physical damage, and accelerates characteristics of aging. an in vitro air pollution protection assay was conducted to assess the ability of AC Pina Colloida to protect cellular homeostasis against exposure to soluble cigarette smoke pollutants.

0.01% of AC Pina Colloida significantly demonstrated increase in viability of fibroblasts by

+38%

Benefits



AC Pina Colloida attenuates the negative impacts of airborne pollution on cellular viability, reducing perturbation of cellular homeostasis and characteristic signs of skin aging.

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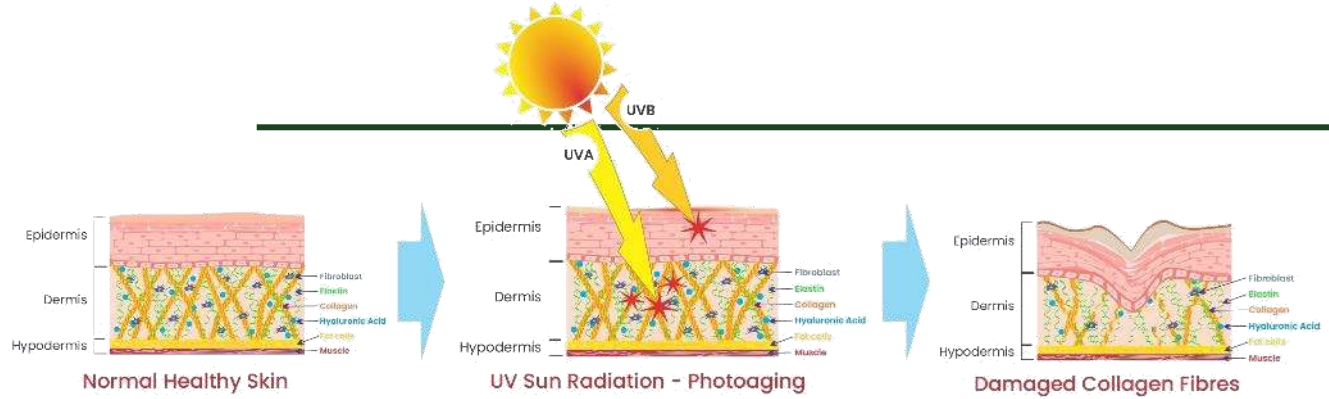
Total Cellular Protein in Response to UV



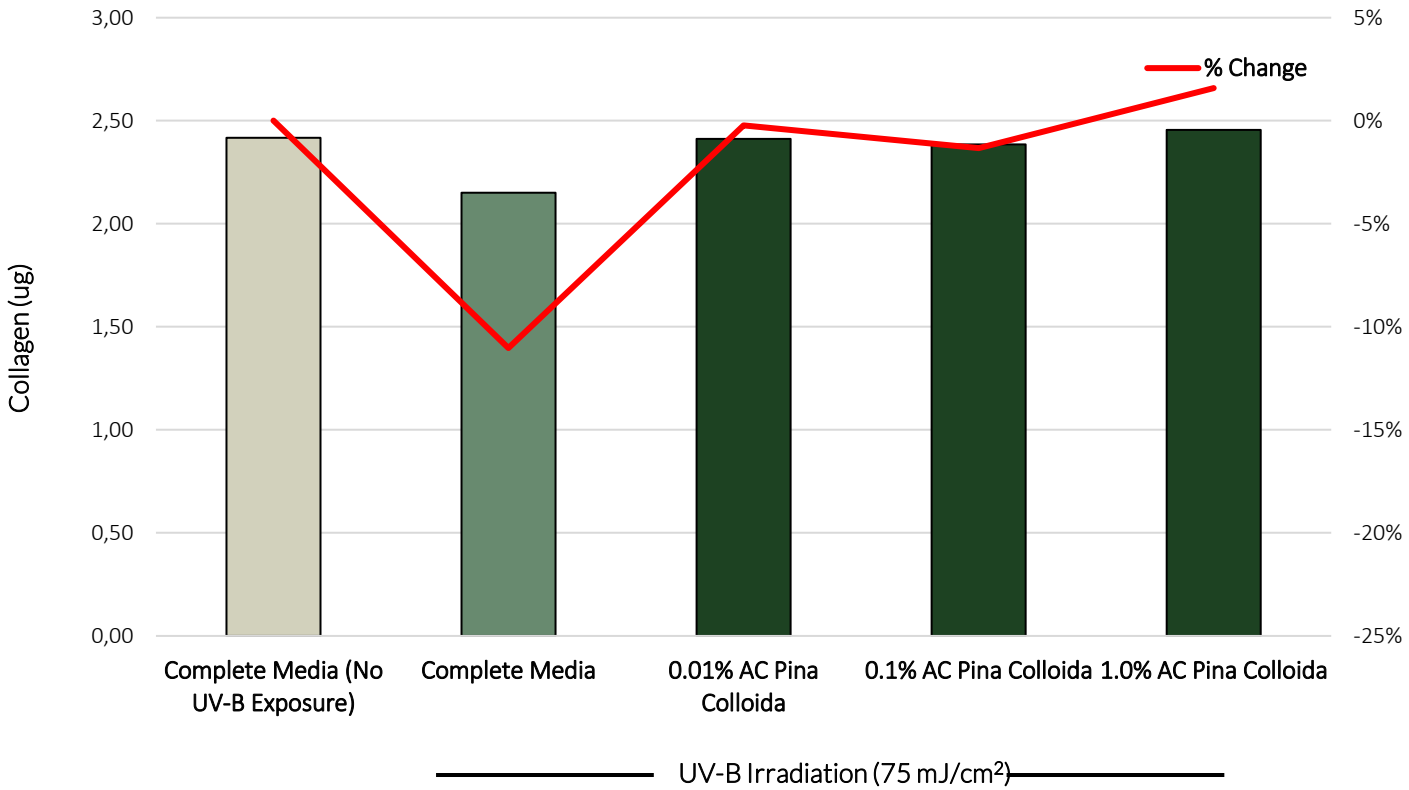


Figure 5. The effect of UV-B irradiation on collagen.

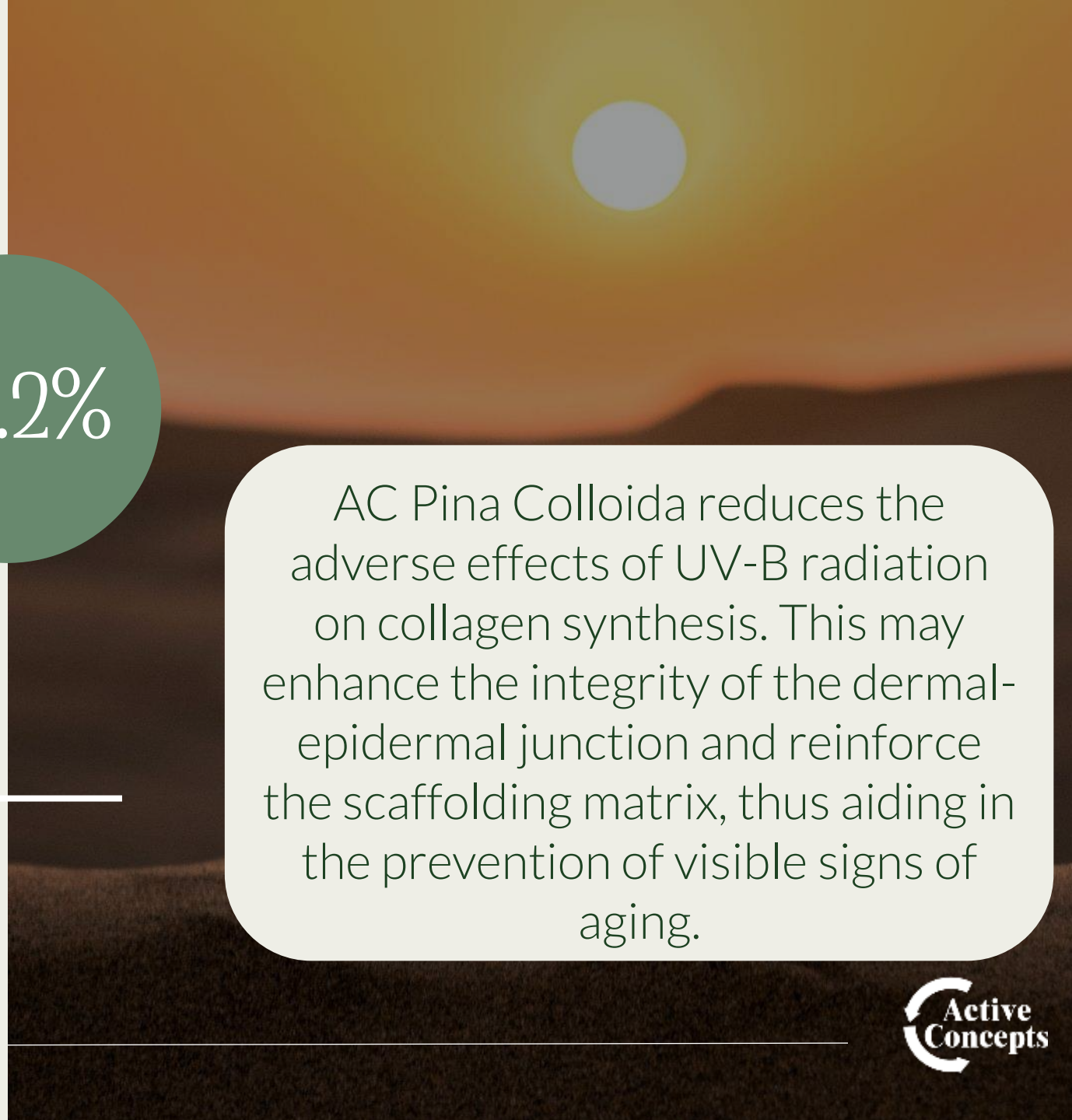
A Sirius Red/Fast Green Collagen Assay was conducted to assess the *in vitro* protective effect of AC Pina Colloida against reductions in collagen synthesis and non-collagenous protein levels caused by UVB irradiation. Excessive exposure to UVB light stimulates inflammation, reactive oxygen species, DNA mutations, and disruptions in dermal-epidermal junction integrity, which can exacerbate skin wrinkling and aging.

0.01% of AC Pina Colloida blunted the negative effects of UVB irradiation compared to untreated fibroblasts by

-0.2%

Benefits

AC Pina Colloida reduces the adverse effects of UV-B radiation on collagen synthesis. This may enhance the integrity of the dermal-epidermal junction and reinforce the scaffolding matrix, thus aiding in the prevention of visible signs of aging.

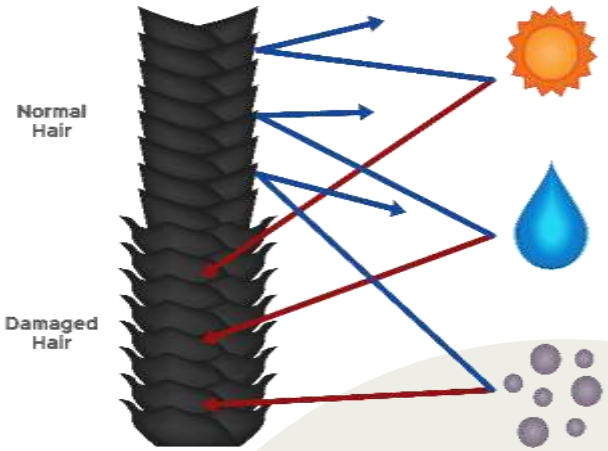


Active Concepts

UV Hair Protection Assay

Tryptophan Degredation After 48 Hours of UV Exposure

Figure 6. Percent Change in Tryptophan after 48 Hours of UV Exposure Compared to Hair without UV Exposure. Positive Control: it's a 10 Miracle Leave-In Product.



Lipid Peroxidation After 48 Hours of UV Exposure

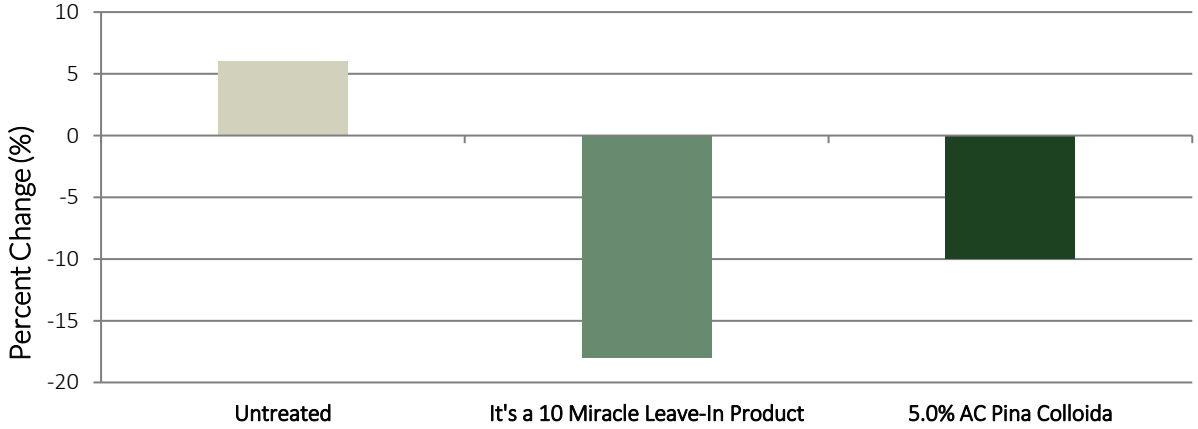


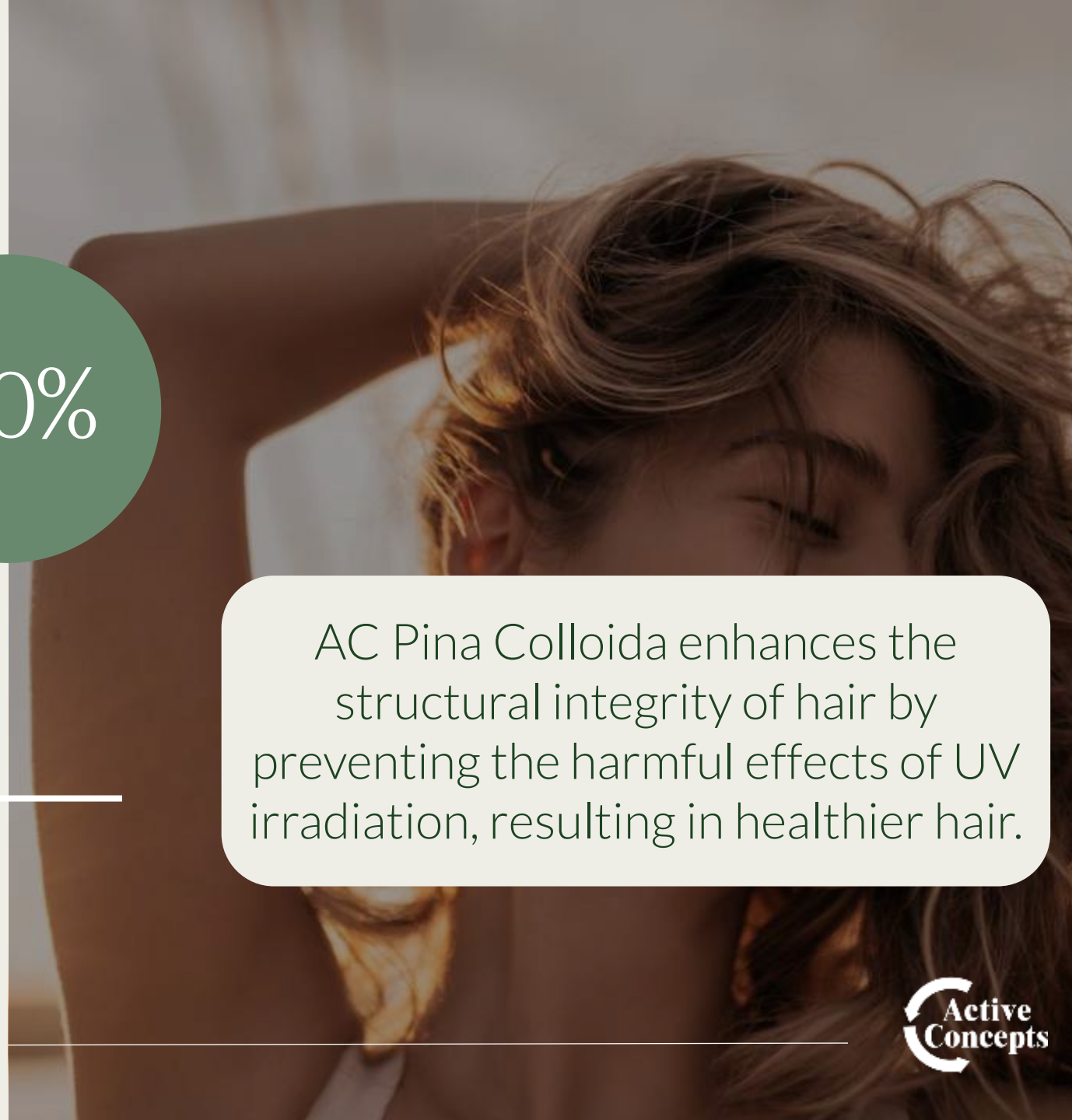
Figure 7. Percent Change in MDA Concentration after 48 Hours of UV Exposure Compared to Hair without UV Exposure. Positive Control: it's a 10 Miracle Leave-In Product.

The deleterious effects of UV exposure in hair care are a new frontier for active ingredients given the vulnerability of hair and lack of protective mechanisms against the sun. A multiparameter approach was used to determine the UV protection capabilities of cosmetic hair applications. The ability of AC Pina Colloida to protect hair from UV irradiation was assessed via determination of amino acid and lipid degradation.

5% of AC Pina Colloida helped maintain hair shaft structural integrity by protecting amino acids and reducing lipid peroxidation in hair compared to control by

–10%

Benefits



AC Pina Colloida enhances the structural integrity of hair by preventing the harmful effects of UV irradiation, resulting in healthier hair.

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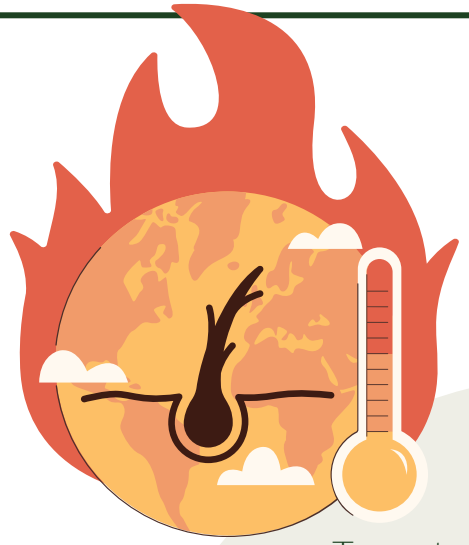
Global Warming Hair Protection Assay

Hair Longevity.

As global temperatures rise, understanding the long-term effects of environmental heat on hair has become a new focus in cosmetic science. Traditional studies focus on brief exposures of styling heat, but prolonged exposure to elevated ambient temperatures causes gradual protein degradation that compromises hair health.



To capture this real-world impact, we developed a novel ex vivo “Global Warming Hair Protection Test”, simulating six months of 50 °C exposure and tracking tryptophan fluorescence as a precise marker of protein integrity. This pioneering assay links long-term environmental stress to hair longevity, demonstrating how advanced actives like AC Pina Colloida can preserve hair strength, resilience, and beauty over time

Global Warming Hair Protection Assay

BRUNETTE HAIR. Protein Content After Heat Exposure

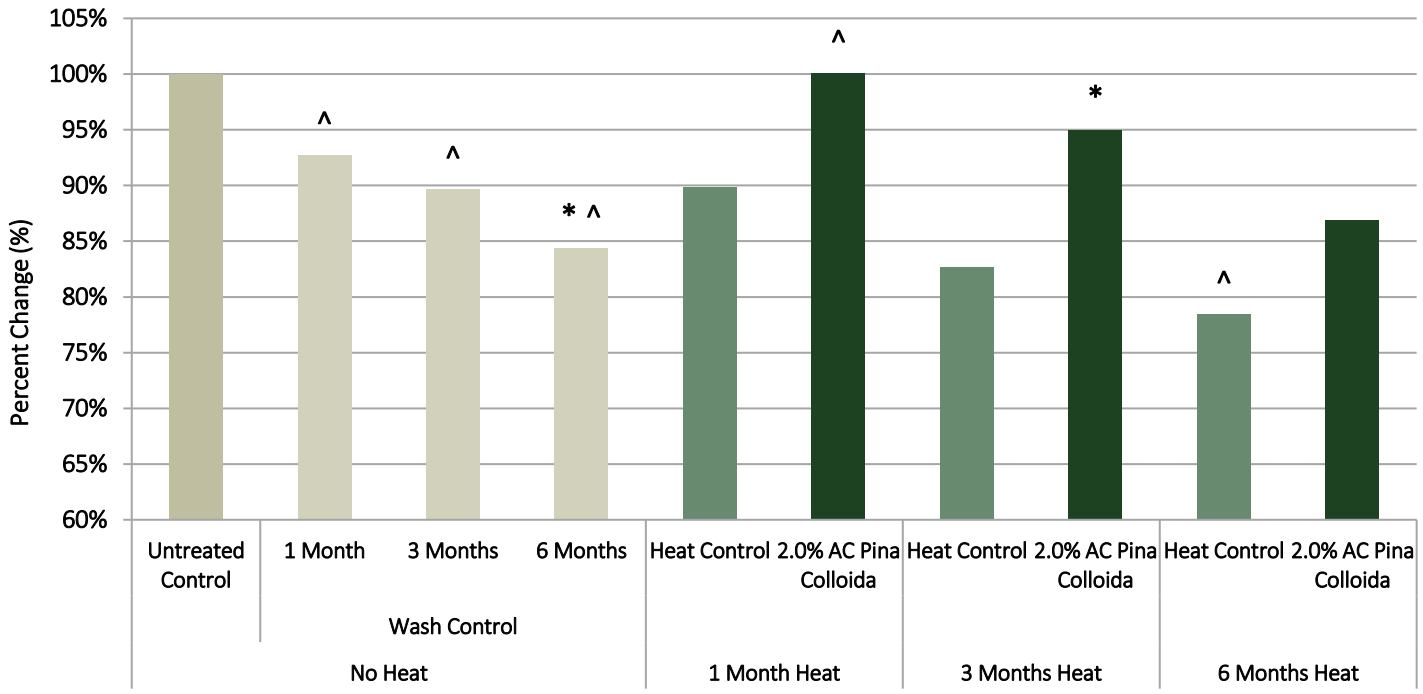


Figure 8, Percent Change in Brunette Hair Tryptophan after Long Term Heat Exposure Relative to Untreated Control Hair Tresses. * indicates significance ($p \leq 0.05$) compared to Untreated Control. ^ indicates significance ($p \leq 0.05$) compared to Heat Control at each time point.

Brunette hair treated as the Wash Control experienced insignificant decreases in tryptophan throughout the six-month period compared to the Untreated Control. This data indicates washing alone partially reduces amino acid content in brunette hair over time. The reductions in tryptophan after six months of exposure experienced by the tresses treated with 2.0% AC Pina Colloida were significantly less than those exhibited by the Heat Control alone

Global Warming Hair Protection Assay

BLONDE HAIR. Protein Content After Heat Exposure

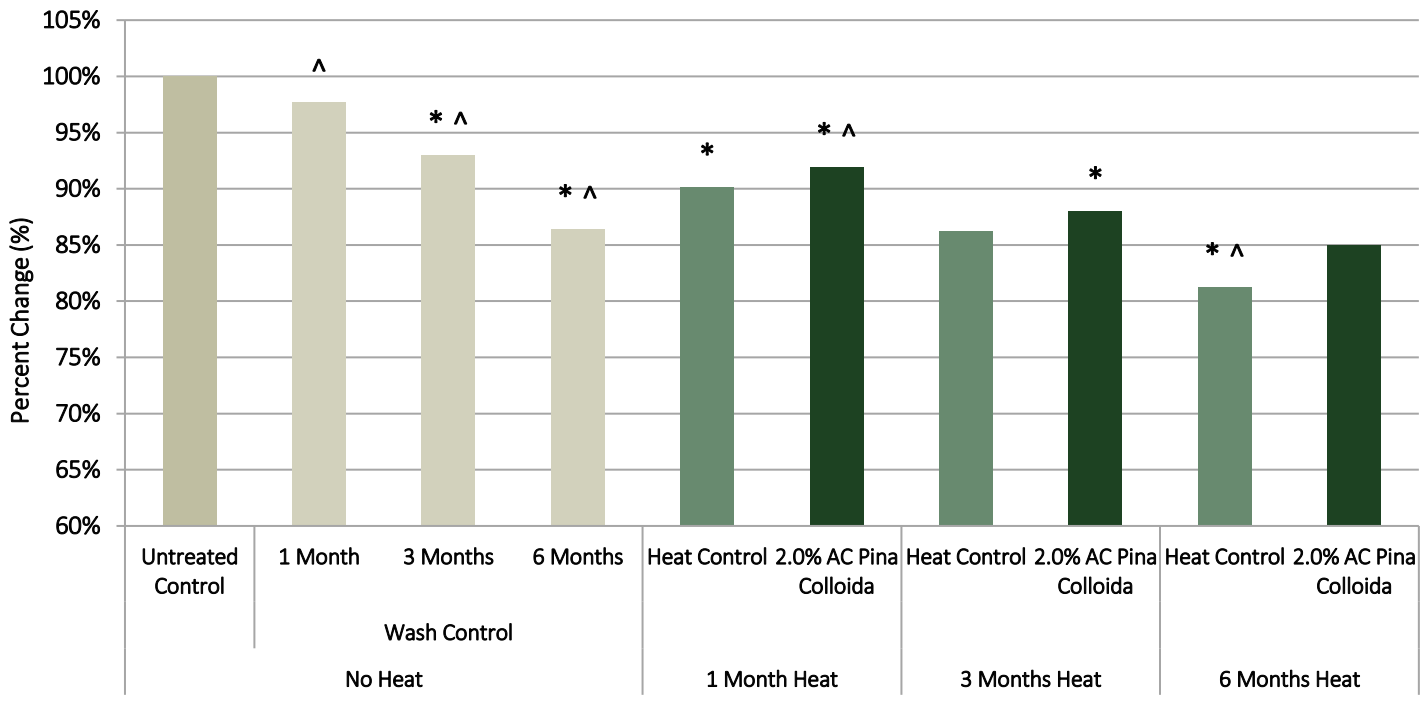


Figure 9, Percent Change in Blonde Hair Tryptophan after Long Term Heat Exposure Relative to Untreated Control Hair Tresses. * indicates significance ($p \leq 0.05$) compared to Untreated Control. ^ indicates significance ($p \leq 0.05$) compared to Heat Control at each time point.

Blonde hair treated as the Wash Control experienced insignificant decreases in tryptophan throughout the six-month period compared to the Untreated Control. This data indicates washing alone partially reduces amino acid content in blonde hair over time. The reductions in tryptophan after six months of exposure experienced by the tresses treated with 2.0% AC Pina Colloida were significantly less than those exhibited by the Heat Control alone

Global Warming Hair Protection Assay

CURLY HAIR. Protein Content After Heat Exposure

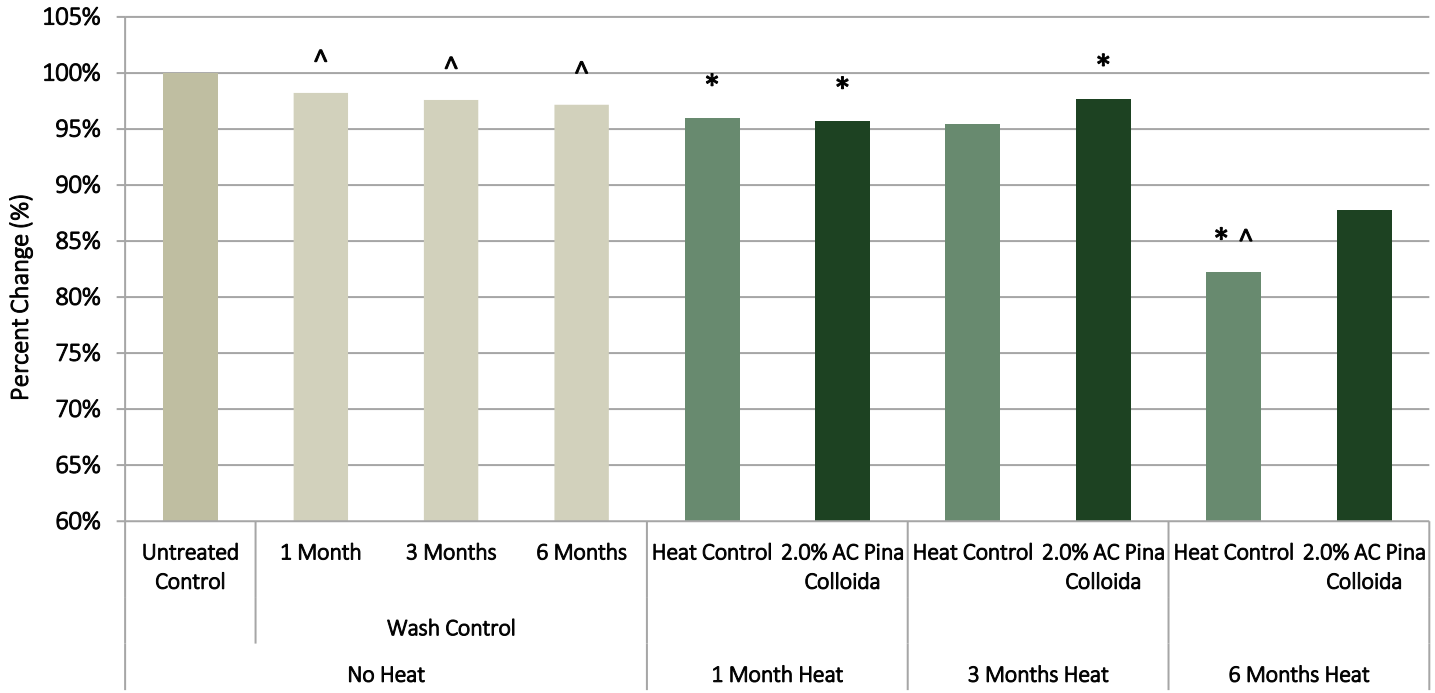


Figure 10. Percent Change in Curly Hair Tryptophan after Long Term Heat Exposure Relative to Untreated Control Hair Tresses. * indicates significance ($p \leq 0.05$) compared to Untreated Control. ^ indicates significance ($p \leq 0.05$) compared to Heat Control at each time point.

Curly hair treated as the Wash Control experienced insignificant decreases in tryptophan throughout the six-month period compared to the Untreated Control (Table 7). This data indicates washing alone does not significantly reduce amino acid content in curly hair. The reductions in tryptophan after six months of exposure experienced by the tresses treated with 2.0% AC Pina Colloida were significantly less than those exhibited by the Heat Control alone

Repeated use of 2.0% AC Pina Colloida in hair care applications prevents degradation of structural proteins to amino acids such as tryptophan.

Benefits

Positive results for brunette, blonde, & curly hair

AC Pina Colloida maintains hair health and boosts protein resiliency in virgin brunette, blonde, and curly hair in response to prolonged exposure to high temperatures which can be visualized as smoother and shinier hair.

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Half-head Study

Figure 11. Participant Images Before Shampoo and Conditioner Application and After Blow Drying

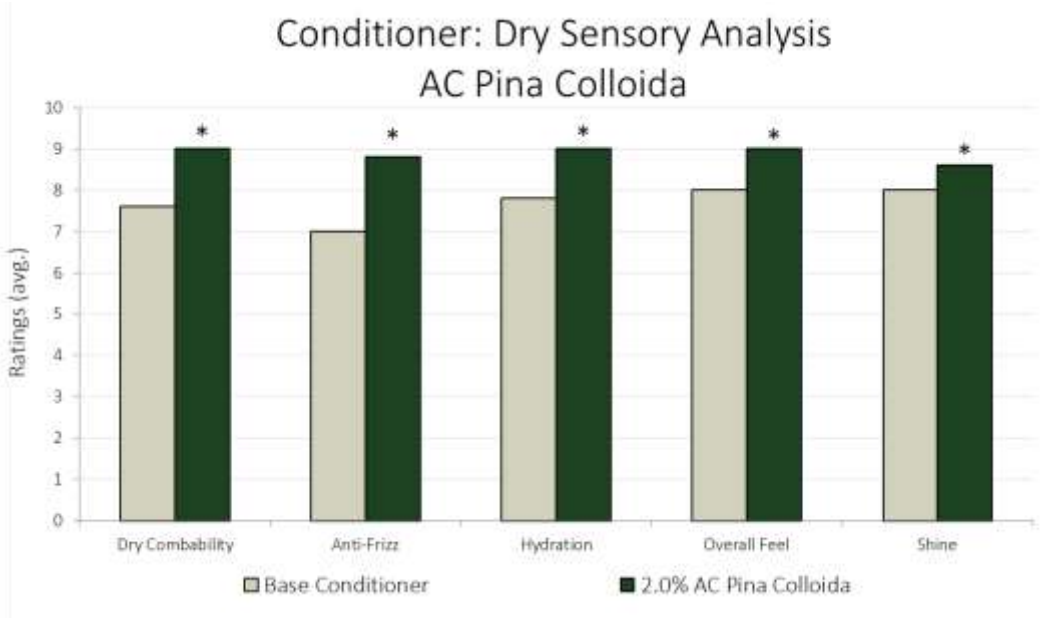


Figure 12. Results of the Dry Sensory Analysis After Conditioner Treatments and Hair was Blown Dry.

Hair appearance is reflective of an individual's self-esteem, mental-image, and well-being. The assay evaluate the perceived hair benefits of AC Pina Colloida in a shampoo and conditioner on wet and dry hair. Analyses were completed using a scale from 1 to 10, with 1 indicating the lowest perceived benefit and 10 representing the highest perceived benefit. * indicates significance ($p \leq 0.05$) between conditions.

Benefits

2.0% of AC Pina Colloida significantly improved perceived benefits of dry hair by

18% Dry Combability
26% Anti-Frizz
15% Hydration
13% Overall Feel
8% Shine

AC Pina Colloida demonstrates visual and perceived hair characteristics which contribute to a healthier looking hair appearance.

Active Concepts

Color Pigment Dispersion

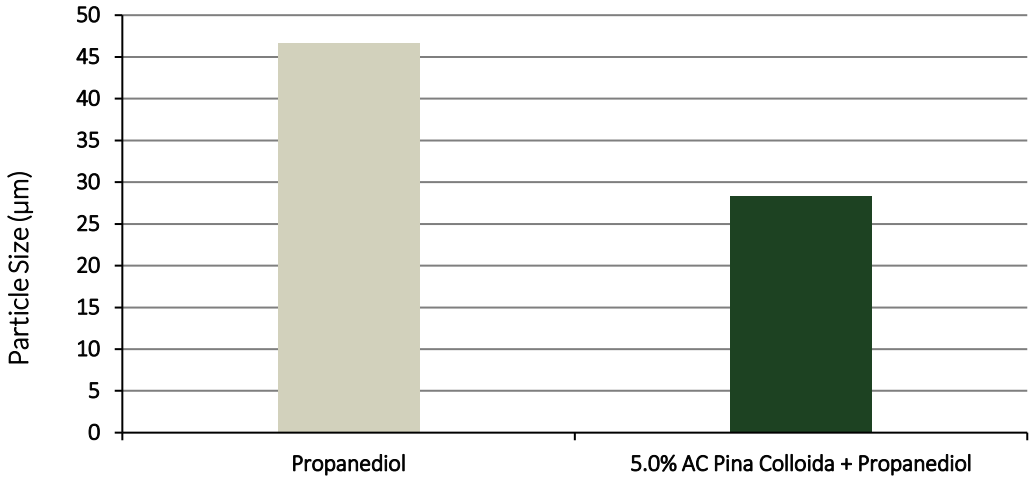


Figure 13. Grind Guage Particle Size (µm) of a Four-Pigment Blend in Propanediol and 5.0% AC Pina Colloida Immediately After Homogenization.

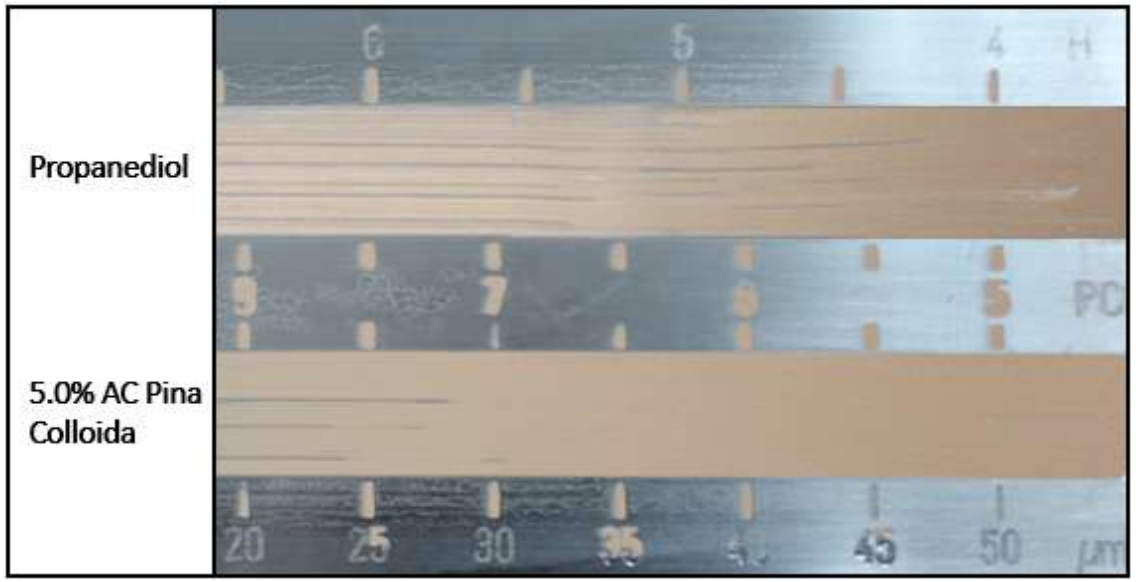


Figure 14. Grind Gauge Image of Each Pigment Dispersion

A product that disperses pigments evenly will provide better overall coverage and can improve the product's appearance on the skin. A well-dispersed product will consist of small pigment particles that are not agglomerated together and will stay dispersed over time. Improving pigment dispersion can also positively impact color intensity of a product as well, such as in foundations, blushes, or eyeshadows.

Color Pigment Dispersion Assay

AC Pina Colloida augments the color intensity of pigment dispersions in color cosmetics.

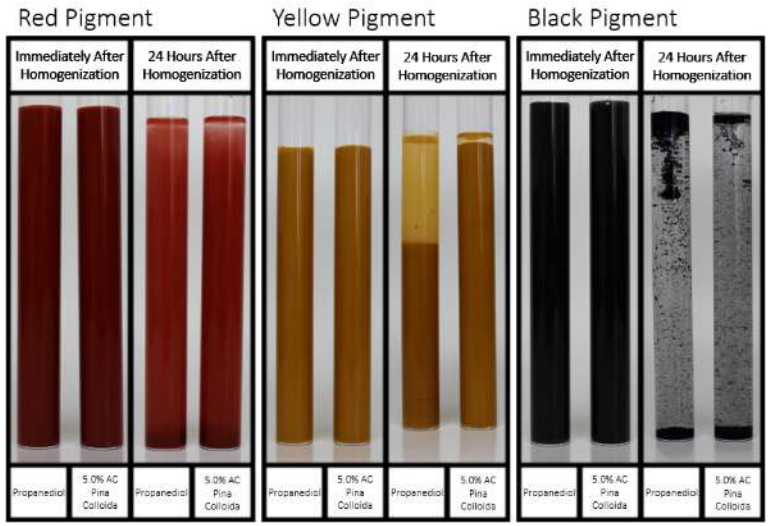


Figure 15. Pigment Sedimentation in Propanediol and 5.0% AC Pina Colloida Immediately and 24 hours After Homogenization

AC Pina Colloida reduced sedimentation and improved stability with red, yellow, and black pigment dispersions 24 hours after homogenization: maintains a uniform pigment dispersion with little to no precipitation or color change following homogenization.

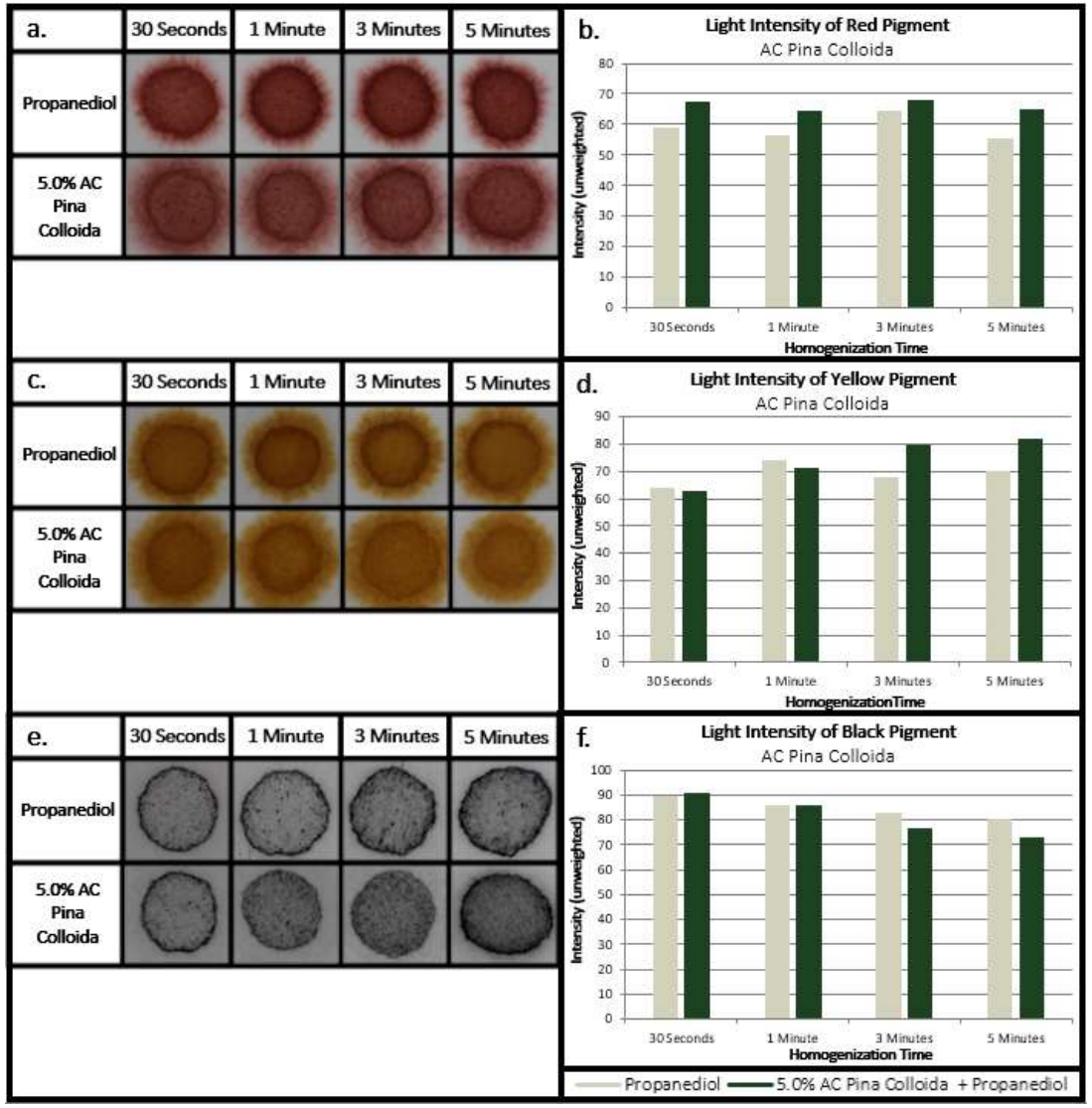


Figure 16. Color Intensity Analysis for 1.0% Unipure Red LC 381 BA (a-b), 2.0% Unipure Yellow LC 182 BA (c-d), & 0.5% Unipure Black LC 989 BA (e-f) in Propanediol and 5.0% AC Pina Colloida Over Time

5.0% AC Pina Colloida reduced particle agglomeration in the four-pigment blend, compared to propanediol by

–39%

Benefits

AC Pina Colloida demonstrates effective pigment dispersing properties which improves overall skin coverage and product appearance.

Active Concepts

SPF Pigment Dispersion Assay

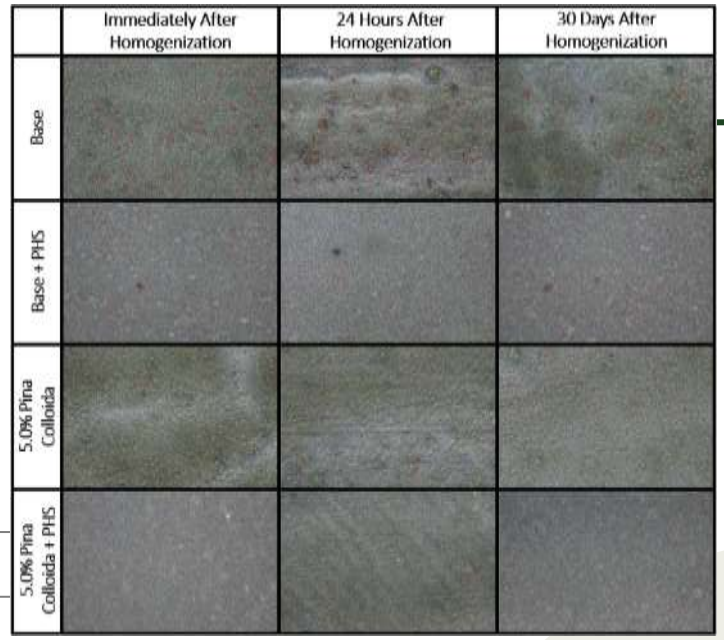


Figure 17. Images of pigment dispersions over time; agglomerates are indicated by red circles

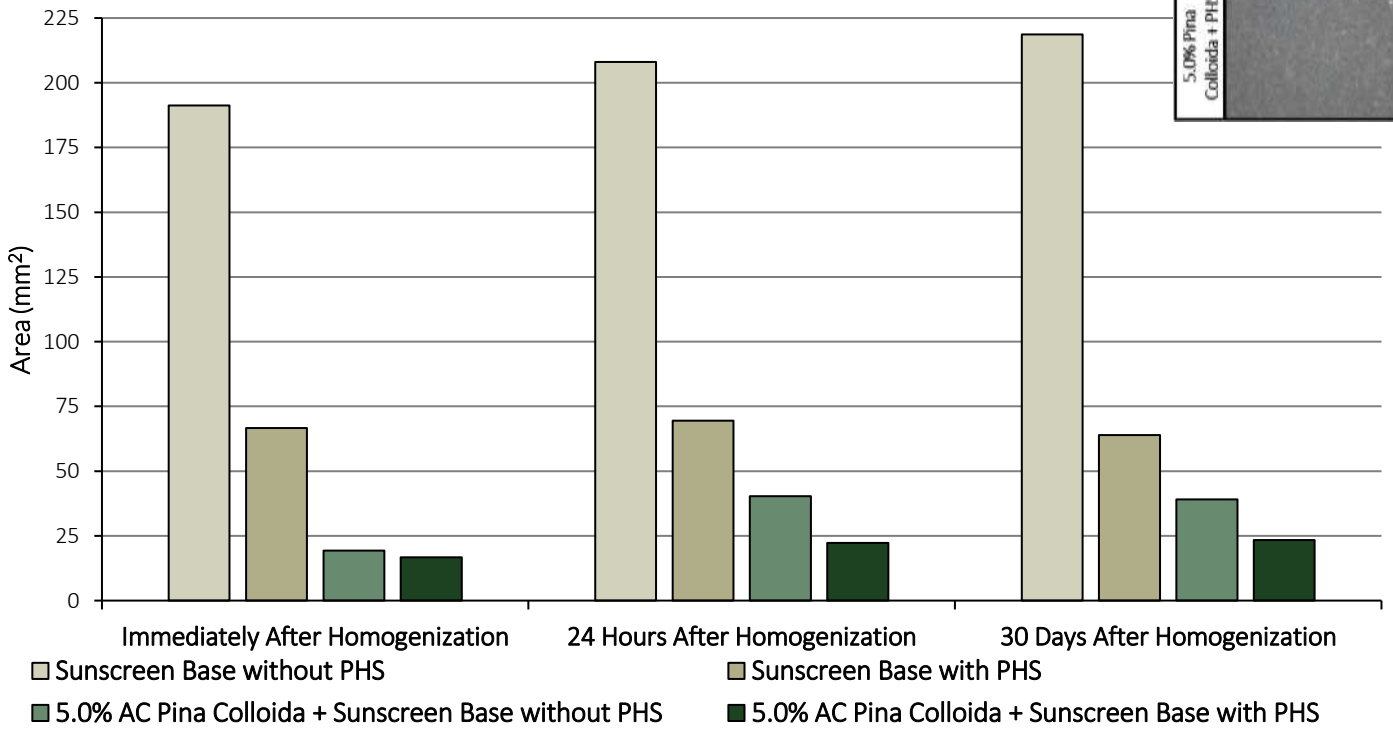


Figure 18. Area of Pigment Agglomerates (mm2) Over Time

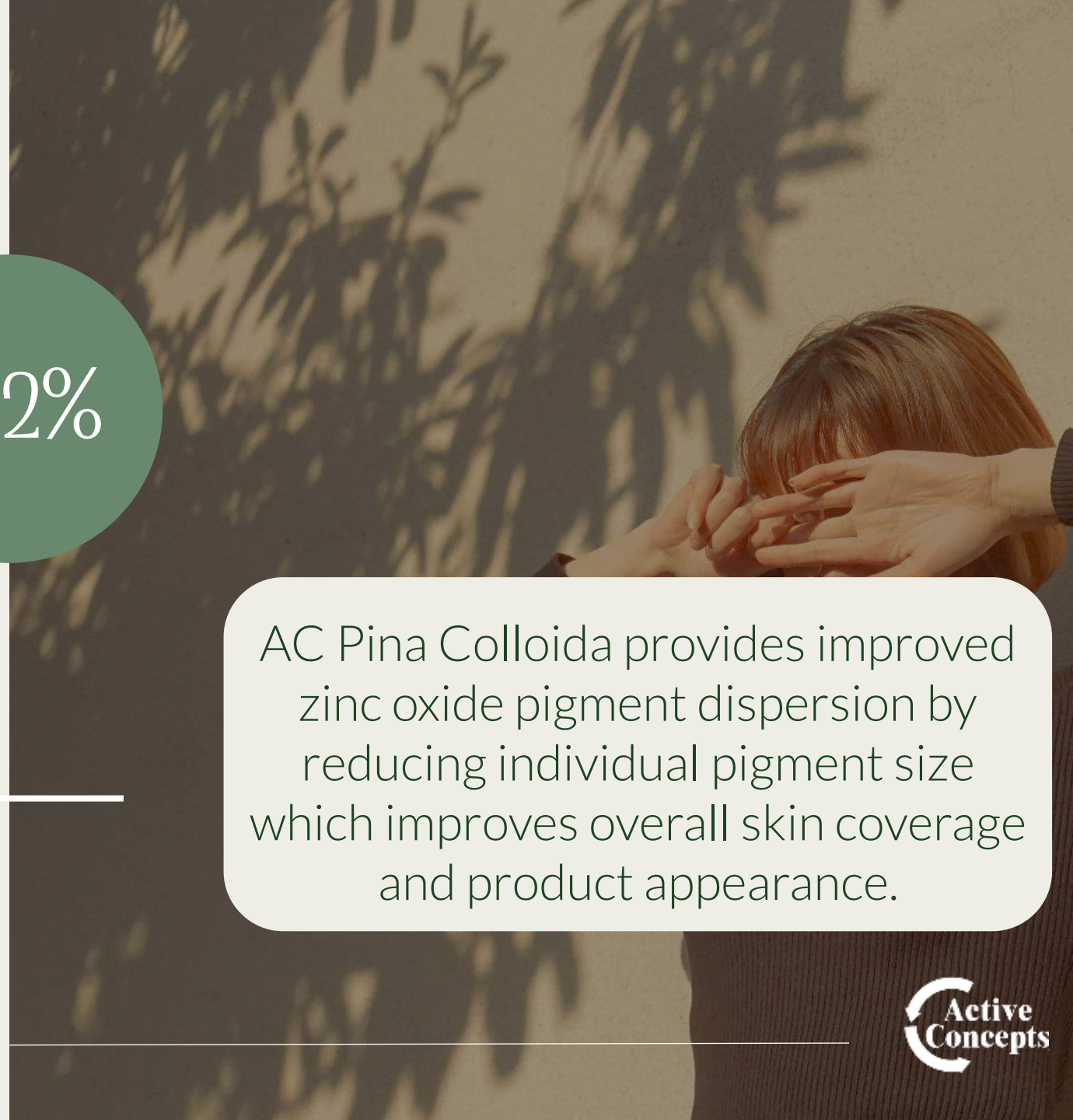
Mineral sunscreens containing zinc oxide are known to leave a chalky or bluish finish on the skin which is undesirable to consumers. Pigment size and dispersion play a key role in the appearance of a product on the skin. An evenly dispersed product contains small pigments and appears more natural on the skin. Reducing particle size and agglomeration increases pigment transparency, resulting in a more desirable finish on the skin.

5.0% AC Pina Colloida significantly reduced pigment agglomeration area compared to the Base after 30 days by

-82%

Benefits

AC Pina Colloida provides improved zinc oxide pigment dispersion by reducing individual pigment size which improves overall skin coverage and product appearance.



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Transfer Resistance Assay

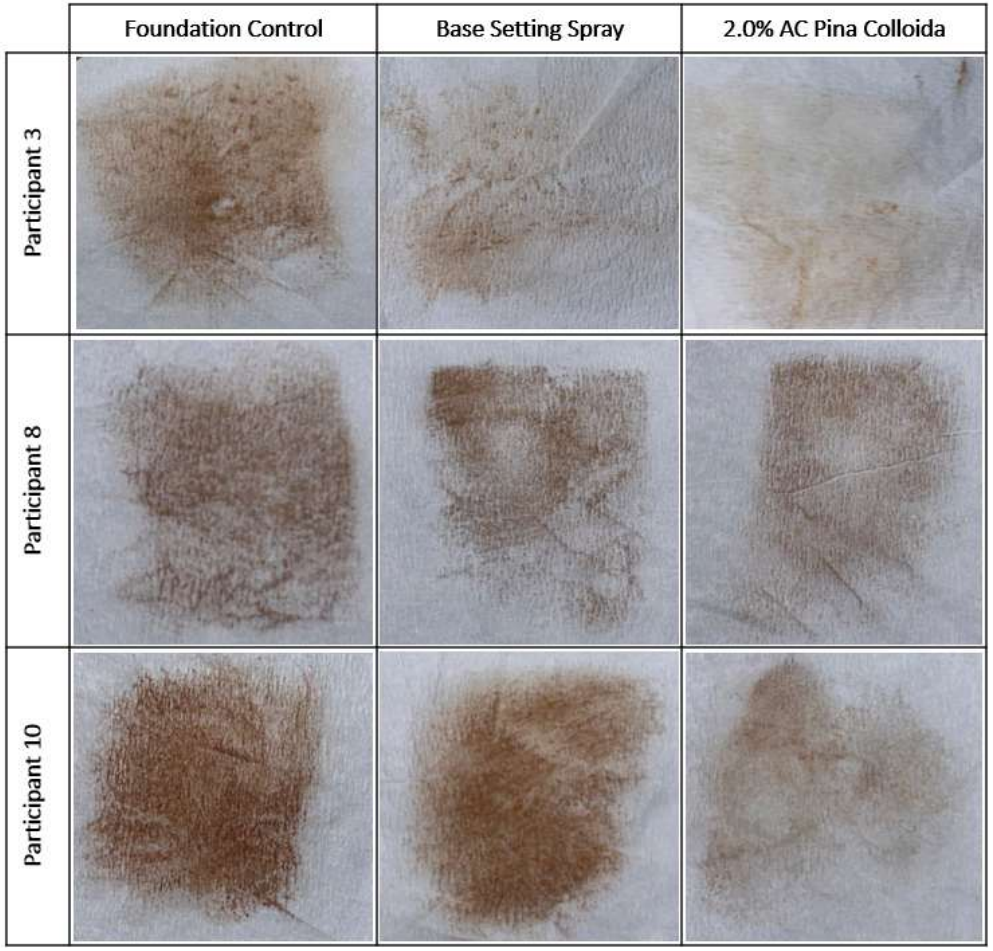


Figure 19. Representative images of foundation transfer on Kimwipes® from three different participants 8 hours after foundation application at each test site.

Makeup setting sprays that enhance longevity and adhesion of foundation have become the new expectation from consumers when purchasing color cosmetics. Utilizing setting sprays with adhesion properties as a makeup finisher is a viable option to reduce smudging or fading of foundation when in contact with clothing or other surfaces.

40 mg swatches of the foundation were applied. Each foundation test site was allowed to dry for two minutes before the base setting spray was applied. Following base setting spray application, each test site was left untouched for eight hours before testing foundation transfer. Pre-weighed Kimwipes® were pressed firmly to determine quantity of makeup transferred.

Transfer Resistance Assay

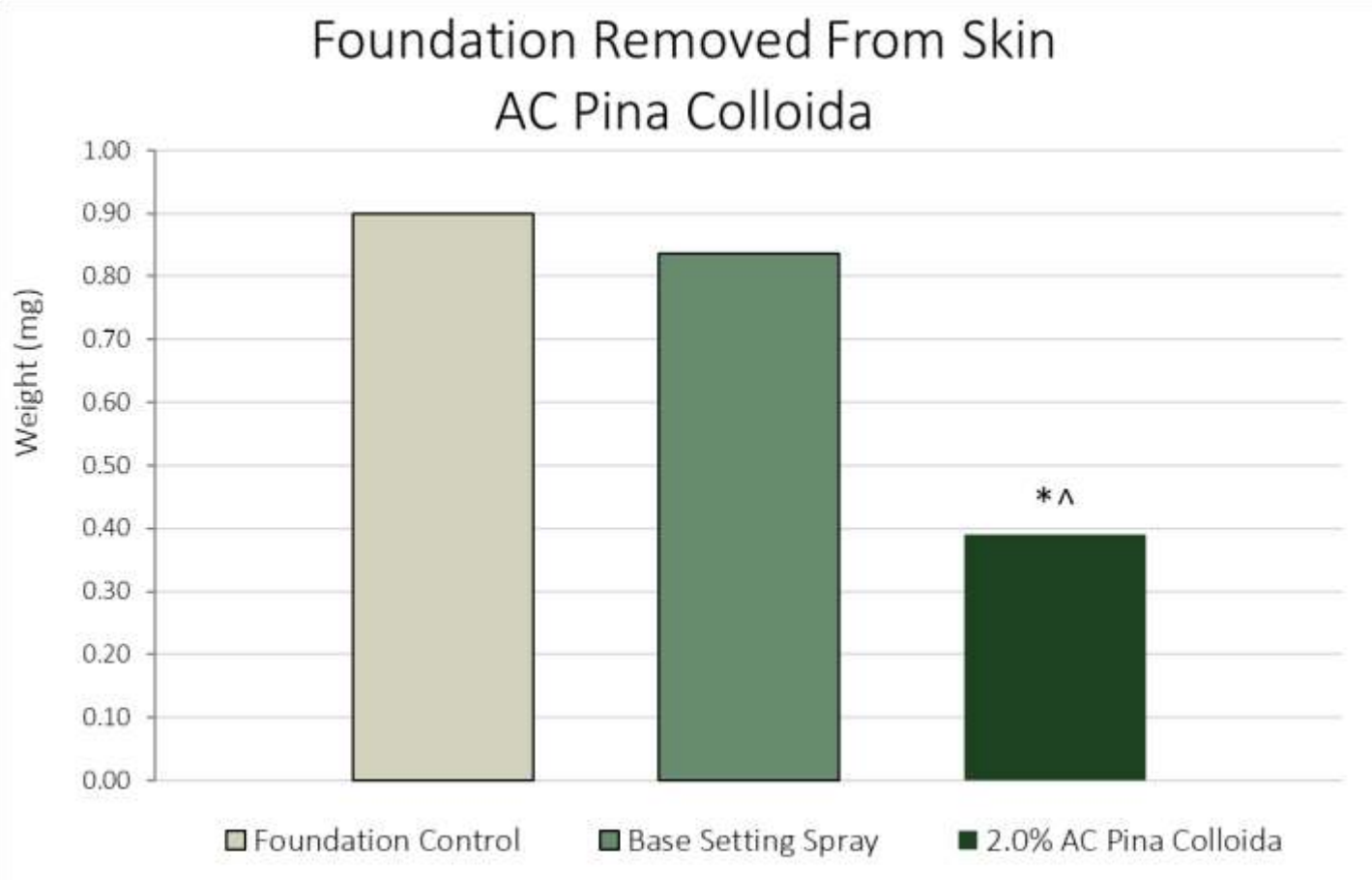


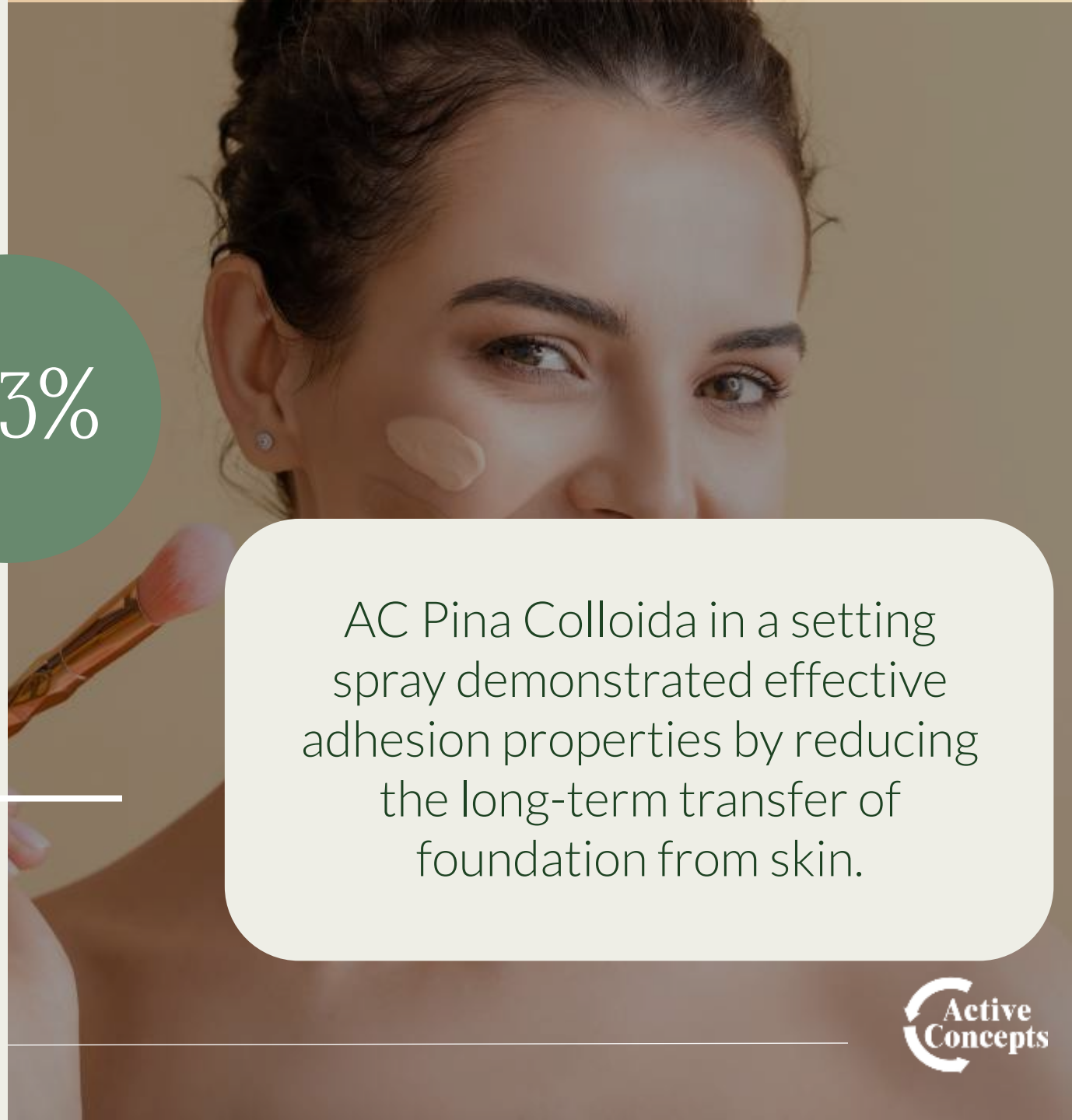
Figure 20. Weight of foundation removed from each test site. 40 mf of foundation was initially applied and allowed to dry for 2 minutes before setting spray was applied.

Foundation removal occurred 8 hours after setting spray application. * indicates significance ($p \leq 0.05$) compared to Foundation Control within the same timepoint. ^ indicates significance ($p \leq 0.05$) compared to Base Setting Spray within the same timepoint.

Adding 2.0% of AC Pina Colloida to the base setting spray significantly reduced the amount of foundation removed from the skin compared to the base setting spray by

-53%

Benefits



AC Pina Colloida in a setting spray demonstrated effective adhesion properties by reducing the long-term transfer of foundation from skin.

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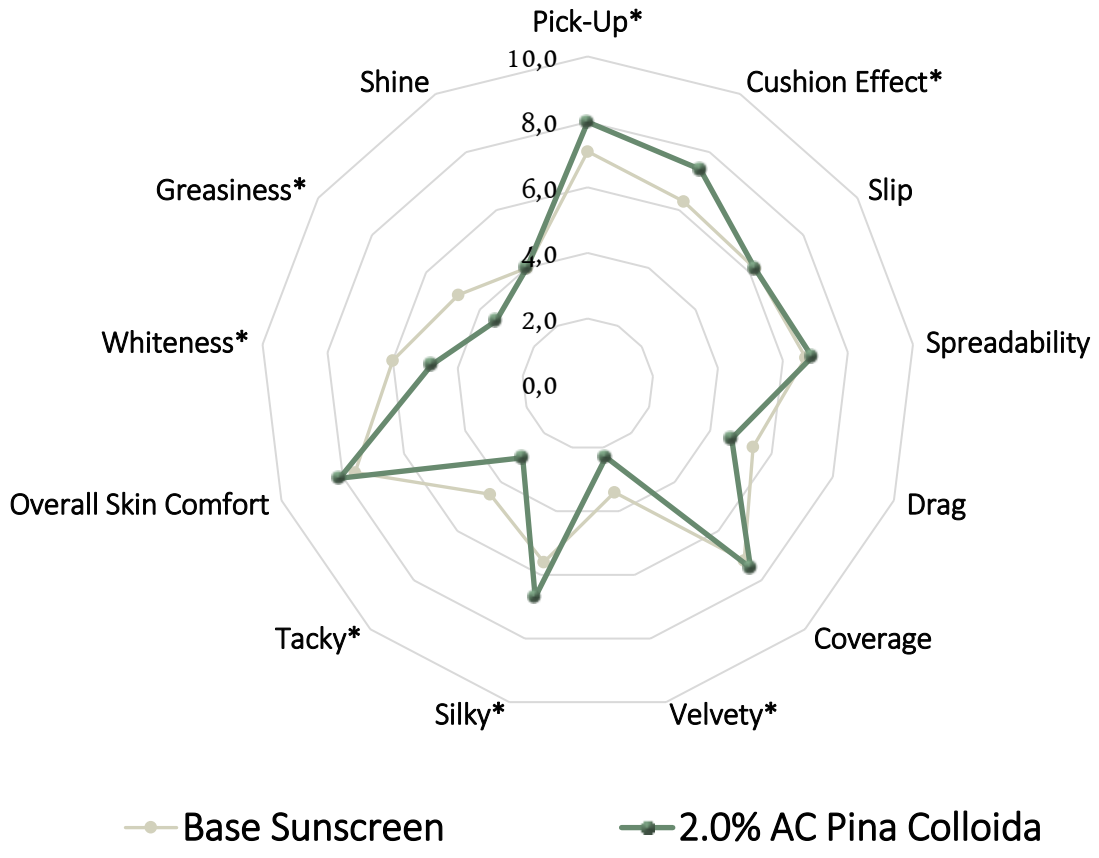
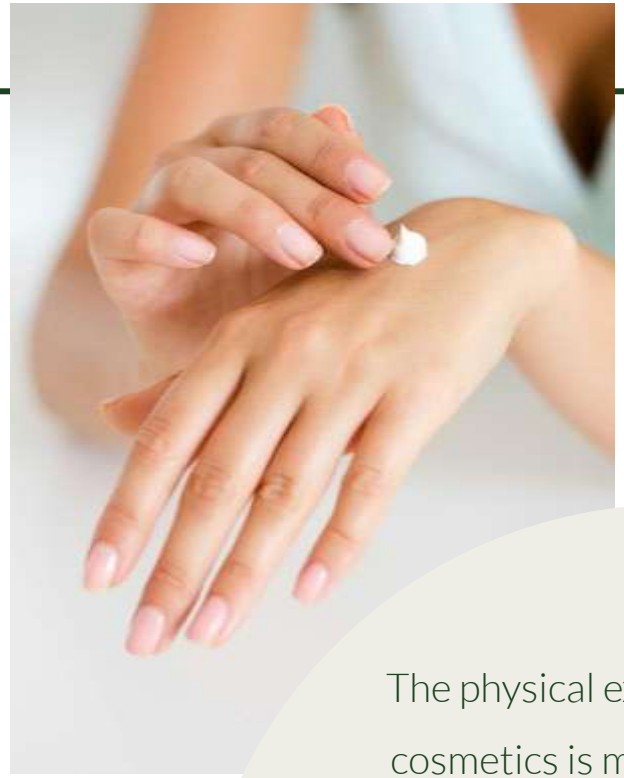
Triangle Test



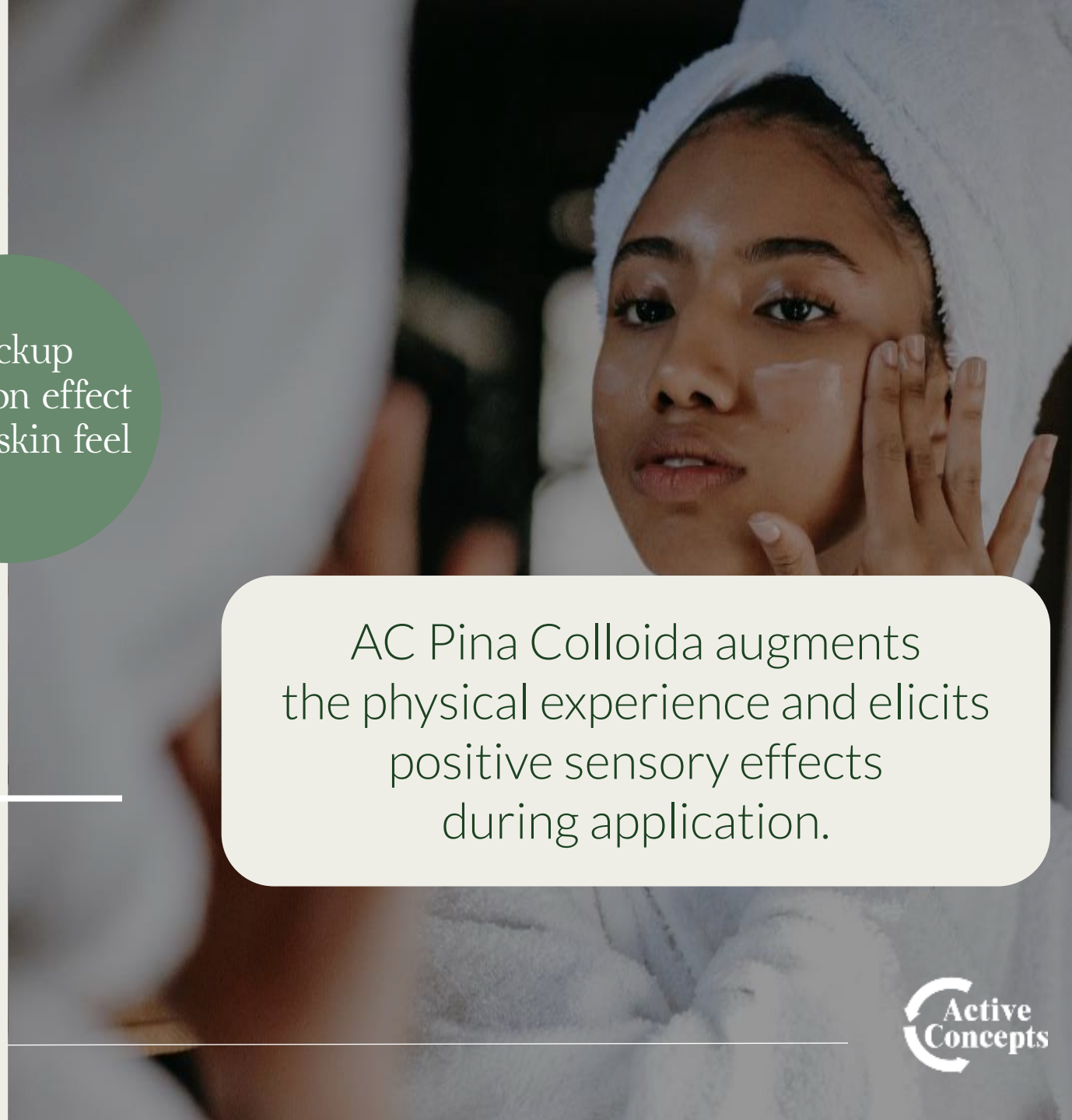


The physical experience of applying cosmetics is multi-dimensional and influences how consumers perceive products, demonstrating the importance of quantifying the sensory effects of a cosmetic product during application. This study was conducted to determine if there is a detectable difference when AC Pina Colloida is added to a personal care product.

2.0% AC Pina Colloida in a sunscreen is easier to pickup and moves easily across skin, leaveing behind less whiteness and greasiness, without a sticky or powdery after-feel when compared to the base sunscreen.

Benefits

+ pickup
+ cushion effect
+ silky skin feel



AC Pina Colloida augments the physical experience and elicits positive sensory effects during application.

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Summary

WHAT.

Cosmetic formulations utilize diverse raw materials, including **biopolymers**, to shield the body from environmental factors. Our aim was to develop an **eco-friendly solution** using **natural polymers** sourced **sustainably**.

WHY.

The rise in **global temperatures**, leading to record highs, directly impacts skin and hair quality as well as aging. **Pollution** and **waste reduction** are increasingly crucial concerns in our daily management.

MADE OF.

Inspired by **cellulose-based** polymers and **PALF** technologies, our focus on **waste reduction** led to exploring **pineapple crowns**, resulting in AC Pina Colloida. Our **biofermentation** expertise helped us in crafting this **upcycled natural active** delicately.

ACTION.

AC Pina Colloida **prevents** visible **signs of aging** by enhancing dermal-epidermal junction integrity and providing **moisturizing** benefits. It also **protects hair** from UV damage, improving hair health, and disperses pigment effectively, **enhancing** skin coverage and **product appearance**.

AC Pina Colloida

Code: 12053

US INCI - Water & Saccharomyces/Hydrolyzed Pineapple Fruit Crown Extract Ferment Filtrate & Lactobacillus Ferment

***EU/CHINA INCI** - Water & Ananas Sativus (Pineapple) Fruit & Yeast Polysaccharides & Lactobacillus Ferment

Appearance: Clear to Slightly Hazy Liquid - Colorless to Yellow

Suggested Use Level: 1-10%

Suggested Applications: Antipollution . Anti-Aging . Skin & Hair Protection . Moisturization . Dispersant

In Vitro
In Vivo
ISO 16128 NI & NOI
Vegan Compliant
COSMOS Compliant
Product Passport

Active Concepts

Active Concepts

Social: @activeconceptsglobal

Website: www.activeconceptsllc.com

Email: info@activeconceptsllc.com

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