

# Phytofuse Rejuvenate®



## BACKGROUND

*Salvia hispanica*, commonly known as chía, is considered an ancient grain that has been around for centuries, but its extraordinary nutritional properties have led to a recent resurgence in the dietary supplement and food industries. *Salvia hispanica* is a desert plant native to central and southern Mexico and Guatemala that produces several small white and black seeds. The remarkable nutritional profile of these seeds surpasses that of any other superfood. *Salvia hispanica* seeds are a natural source of antioxidants that protect the skin from free radical damage. The seed also has a significant amount of protein and dietary fiber.

With unprecedented hydrophilic properties, *Salvia hispanica* seeds produce a unique protective mucilage. When the seed is placed in water, it exudes a mucilaginous polysaccharide with the potential for use in innovative cosmetic and personal care applications. Active Concepts has sustainably isolated these natural mucilaginous polysaccharides to create Phytofuse Rejuvenate®, the next iteration of the Active Concepts' Phytofuse line. Phytofuse Rejuvenate® is capable of delivering exceptional wound healing, anti-inflammatory, film forming, and anti-irritant benefits as well as improving the sensorial properties of any formulation.

"Chía" is the ancient Mayan word for "strength". Over time, skin loses strength and elasticity, resulting in fine lines and visible signs of aging. Phytofuse Rejuvenate® harnesses the therapeutic properties of *Salvia hispanica* seed mucilage to naturally strengthen and revitalize the skin. The Mayans and Aztecs used this now wildly popular superfood in regenerative medicine as a poultice for gunshot wounds to promote healing and reduce inflammation.<sup>1</sup> These restorative qualities of the *Salvia hispanica* seeds are a result of mucilaginous polysaccharide. Topical application provides intense, long-term moisturization and a persistent and perceivable sensation of skin smoothing and soothing properties.

*Salvia hispanica* is near unparalleled in regards to sustainability. *Salvia hispanica* seed mucilage allows the seed to retain enough water to germinate and grow well in semi-arid regions. Able to grow in a range of climates that span several continents, *Salvia hispanica* is very easily harvested both mechanically and by hand.

**Code Number:** 16882

**INCI Name:** Salvia Hispanica Seed Extract

**INCI Status:** Approved

**REACH Status:** Complies

**CAS Number:** 93384-40-8

**EINECS Number:** 297-250-8

**Origin:** Botanical

**Processing:**

GMO Free

No Ethoxylation

No Irradiation

No Sulphonation

**Additives:**

Natural Antimicrobial: Lactobacillus Ferment

Preservatives: None

Antioxidants: None

Other additives: None

**Solvents Used:** Water

**Appearance:** Hazy Viscous Gel, Light Yellow to Ambe

**Soluble/Miscible:** Water Soluble

**Ecological Information:**

90.9% Biodegradability

**Microbial Count:**

< 100 CFU/g, No Pathogens

**Suggested Use Levels:** 1.0% - 10.0%

**Suggested Applications:** Natural Cosmetics, Skin Care, Hair Care, Wound Healing, Anti-Inflammatory, Film-Forming, Antioxidant

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## SCIENCE

Polysaccharides are long chain carbohydrates capable of stabilizing biomolecules and assemblages, such as cell wall membranes. Polysaccharides, such as hyaluronic acid, are sought after for their unparalleled film forming and hydration capacities in personal care formulas. Additionally, they contribute to the skin's natural ability for repair and renewal. Decreased elasticity and the development of fine lines and wrinkles is a result of damage to the skin's protective barrier, a natural loss of water, and a decline in polysaccharide concentration on the skin. The barrier function of the skin is affected by insult and injury from several factors including environmental stress and transepidermal water loss. Exposure to ultraviolet radiation and environmental pollution can disrupt the skin's natural moisture levels. Scaly, dry skin is a direct result of an abnormal skin barrier caused by low moisture levels. Damaged skin needs to be protected at the surface and allowed to heal from within. The film forming capacities of polysaccharides defend the skin barrier and promote repair.

Current data suggests high molecular weight polysaccharides, such as  $\beta$ -Glucans, have potent immunomodulatory effects that regulate and improve the efficiency of the immune system.<sup>3,4</sup> Inflammation in the skin is attributable to Interleukin-6 (IL-6), a proinflammatory cytokine known to play a role in immunology and aging. Reducing the level of IL-6, and other inflammatory mediators, is believed to slow down degradation of the skin matrix, and possibly stimulate its replenishment. Any immunomodulatory effects are a result of the unique polysaccharide structure. Based on the lab work and data reported, Active Concepts believes the polysaccharides in Phytofuse Rejuvenate® decrease the production of IL-6 and reduce inflammation, which can decrease signs of aging and reduce the appearance of fine lines and wrinkles.

Chía seed mucilage is a complex carbohydrate that is secreted when the seed comes into contact with water, generating a viscous solution. Extracted mucilage exhibits thixotropy, which is a timedependent, shear thinning property. This is the reason the mucilage is highly viscous under static conditions, but becomes less viscous when agitated or stressed. This thixotropic nature contributes to the enhanced tactility of Phytofuse Rejuvenate® in formulations which gives the material a wide range of applications in skin and hair care products. Through a proprietary process, Active Concepts isolated this mucilage and bio-transformed the polysaccharides via fermentation yielding a much higher molecular weight species. This resulting natural polysaccharide is responsible for the notable wound healing, anti-inflammatory, and film forming properties of Phytofuse Rejuvenate®.



## BENEFITS

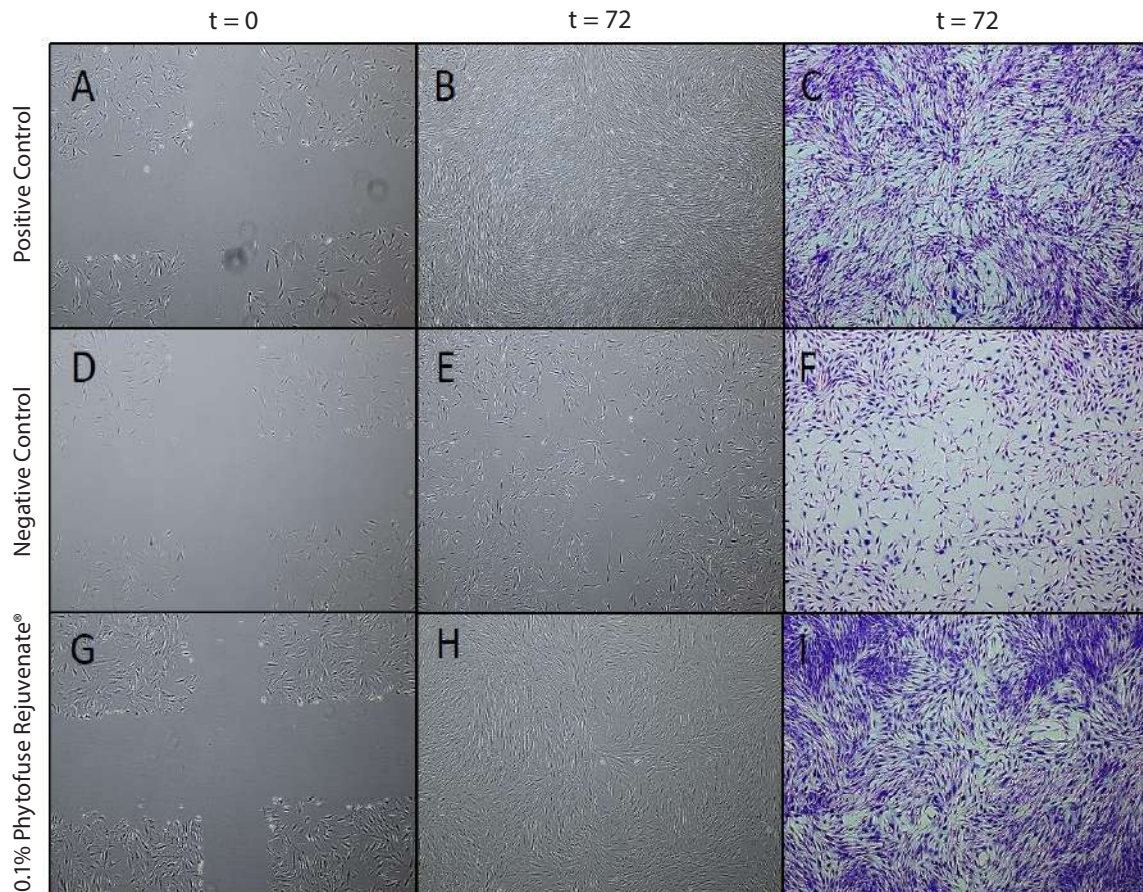
Phytofuse Rejuvenate® is a natural alternative for the current carbohydrate chemistry seen in the medical industry for the creation of synthetic scaffolding that promotes wound healing. The isolated polysaccharides extracted from the *Salvia hispanica* seed have demonstrated their ability to aid in cell proliferation and thus impart wound healing and anti-inflammatory properties to the skin. A functional, active ingredient that improves the slip and cushion in finished formulations, Phytofuse Rejuvenate® soothes the skin and provides antioxidant and moisturization benefits. Phytofuse Rejuvenate® is ideal for skin and hair care formulations, helping to increase moisture levels and provide protection from environmental stressors.

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## EFFICACY

Wounded tissue has a cascading effect, starting with a complex and structured series of events in order to repair the damaged region. Some of these events include upregulation of angiogenic factors causing increased vascularization, increased deposition of extracellular matrix, and increased cell proliferation. The wound healing process begins as cells polarize toward the wound, initiate protrusion, migrate, and close the wound area. These processes reflect the behavior of individual cells as well as the entire tissue complex. The scratch assay was conducted to assess the wound healing properties of Phytofuse Rejuvenate® treated in-vitro cultured human dermal fibroblasts.

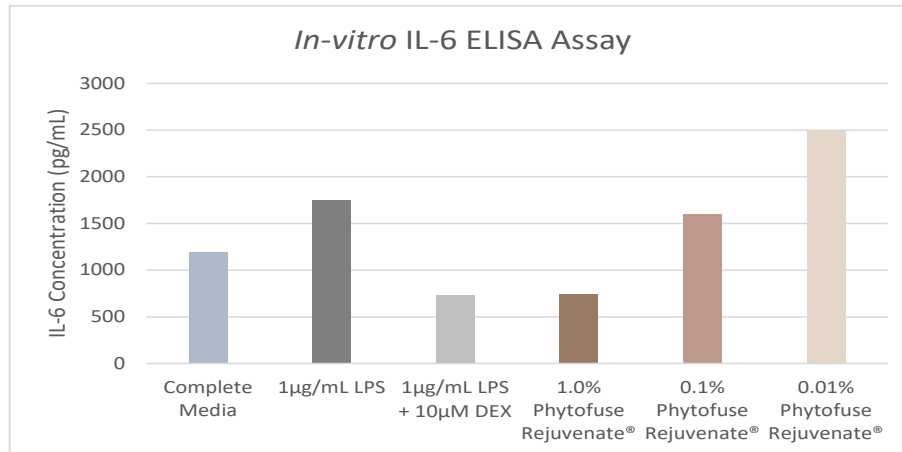


**Figure 1.** Images at t=0 hours (A, D, G) and t=72 hours (B, E, H) for Phytofuse Rejuvenate®, positive control, and negative control. At experiment completion (t=72 hours), cells were fixed in paraformaldehyde and stained with crystal violet (C, F, I)

From the results illustrated in Figure 1, Phytofuse Rejuvenate® was able to increase cell migration and close the scratch at a rate comparable to the positive control. The mechanisms of the cells in the in-vitro scratch assay mimic the mechanisms seen in in-vivo wound healing therefore we can be assured that our results are translatable outside the laboratory. Results from this assay suggest that the product has wound healing abilities and cell proliferation properties.

Interleukin-6 ELISA was conducted to assess the changes in IL-6 levels in Phytofuse Rejuvenate®-treated in-vitro cultured human dermal fibroblasts. As shown in Figure 2, Phytofuse Rejuvenate® exhibited anti-inflammatory effects on LPS-treated fibroblasts. This decrease in IL-6 production indicates a reduced inflammatory environment which could decrease the signs of aging and reduce the formation of fine lines and wrinkles. This data suggests that Phytofuse Rejuvenate® enhances soothing and anti-aging properties at normal use concentrations.

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**Figure 2.** Decrease in IL-6 concentration when using 1.0% Phytofuse Rejuvenate®

A Sirius Red/Fast Green Collagen Assay was also conducted to assess the changes in collagen synthesis by Phytofuse Rejuvenate®-treated *in-vitro* cultured human dermal fibroblasts. The greatest percentage of collagen to non-collagen proteins was observed at 1.0% Phytofuse Rejuvenate®. The results of this assay show an increase in the percent of collagen to non-collagen proteins that correlates to an increase in the concentration of Phytofuse Rejuvenate®. The increase in collagen production may lead to improvement in the dermal-epidermal junction integrity as well as an improved scaffolding matrix. For these reasons, we can assume Phytofuse Rejuvenate® is suitable for cosmetic applications designed to boost collagen synthesis to aid in providing a younger and healthier complexion.

**References:**

- 1) Cahill, Joseph. 2005. Journal of Ethnobiology. Human selection and domestication of chia (*Salvia hispanica* L.). 25(2): 155-174.
- 2) Adams, James. 2014. International Journal of Genuine Traditional Medicine. What can traditional healing do for modern medicine. 4(2): 1-6.
- 3) Tzianabos, Arthur. 2000. Clinical Microbiology Review. Polysaccharide immunomodulators as therapeutic agents: structural aspects and biologic function. 13(4): 523-533.
- 4) Novak et al. 2008. Journal of Immunotoxicology. Beta-glucans, history, and the present: immunomodulatory aspects and mechanisms of action. 5(1): 47-57.

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