ACB Yerba Santa Glycoprotein PF

BACKGROUND

In the late 18th century, Native Americans living in the southwestern US and northern Mexico introduced Yerba Santa to Spanish settlers who colonized the area. Spanish priests, impressed by its medicinal properties, gave the plant its current name, meaning 'holy weed'. Commonly known as Mountain Balm, Sacred Herb, Bear's Weed, Gum Plant or Consumptive Weed, this Native American medicinal plant has been used as an herbal remedy for centuries.

Yerba Santa (*Eriodictyon californicum*) is an evergreen native to California and Oregon but is found in Northern Mexico as well. It is a perennial, woody shrub with a height range from 2 to 9 feet tall with dark green, leathery, lance-shaped leaves covered with shiny resin.[1] Clusters of six to ten trumpet-shaped white, blue or purple flowers can be found growing from the top of the plant.

As for medicinal use, Yerba Santa leaves are harvested after flowering, typically summer into fall, when leaves begin to be tacky but are still green. The taste of the leaves is balsamic and the flowers and leaves smell pleasantly aromatic on a warm day.[2] Yerba Santa's unique taste is often used to disguise bitter-tasting medicines such as quinine.[3] Traditionally, a tea, tincture, or syrup is made from dried leaves and used as a remedy for a variety of respiratory ailments, for example, colds, asthma, pleurisy, pneumonia and tuberculosis. It is known to function as an expectorant to treat coughs and congestion as well as causing dilated bronchial tubes which can effectively ease asthma and allergy attacks.

SCIENCE

Yerba Santa is comprised of mucopolysaccharides and glycoproteins that functions to coat the mucous membrane, holding the aqueous component in contact with the cells, thus allowing it to increase hydration and lubricity. Due to its richness in compounds such as mucopolysaccharides and glycoproteins,

Code Number: 20342PF

INCI Name: Lactobacillus/ Eriodictyon Californicum Ferment Extract & Leuconostoc/Radish Root Ferment Filtrate
INCI Status: Conforms
REACH Status: Complies
CAS Number: 68990-14-7 & 1686112-10-6 (or) 84775-94-0
EINECS Number: 273-580-8 & N/A (or) 283-918-6

Origin: Botanical
Processing:
GMO Free
No Ethoxylation
No Irradiation
No Sulphonation
Additives:
Natural Antimicrobial: Leuconostoc/ Radish Root Ferment Filtrate
Preservatives: None
Antioxidants: None
Other additives: None
Solvents Used: Water
Appearance: Clear Viscous Liquid
Soluble/ Miscible: Water Soluble
Ecological Information:
89.75% Biodegradability
Microbial Count: <100 CFU/g, No Pathogens

Suggested Use Levels: 1.00 - 5.00%
Suggested Applications:
Moisturization, Enhance Epidermal Slip, Antioxidant, Increase Cellular Viability

Benefits of **ACB Yerba Santa Glycoprotein PF:**

- Enhances Aesthetics of Final Formulas
- Intense Moisturizing Benefits
- Hydration and Lubricity
- Improves Barrier Function
- Antioxidant Protection

ACB Yerba Santa Glycoprotein PF

Yerba Santa functions well to counteract excessive drying of the mucous membranes in the respiratory tract.[2] Yerba Santa, an exceptional member of the family Hydrophyllaceae (Waterleaf) that also contains Phacelia and Baby Blue Eyes. Most members of this group grow in cool, moist environments. However, Yerba Santa has adapted to the Mediterranean climate of the western USA which can be characterized by wet, mild winters and hot, dry summers. With its tough, resinous leaves, it is able to hold and conserves watermore effectively than other plants, it does this in order to assimilate with an environment in which bush flourishes; dry, mountainous slopes, sparse of vegetation at altitudes of up to 4,000 feet.[4]

It is believed the flavonoid, eriodictyol, contributes to the expectorant properties of Yerba Santa. Many Native American tribes dried and smoked the leaves as a treatment for asthma and lung congestion. Historically, sticky Yerba Santa leaves were used to seal skin wounds before sterile bandages were widely available. Often, a poultice of leaves was applied to painful joints and bruises for relief.

BENEFITS

By fermenting the leaves of the plant with the bacteria *Lactobacillus lactis*, we are able to breakdown many of the complex bio-molecules found naturally in the plant, which lead to the isolation of beneficial components such as the natural glycoproteins. Yerba Santa is capable of achieving a moisturizing effect via hydrogen bonding of water by its glycoprotein components. **ACB Yerba Santa Glycoprotein PF** imparts moisturization and soothing properties, making suitable for skin and hair care formulations.

EFFICACY DATA

At concentrations exceeding 0.1%, the antioxidant activity is too intense to measure, resulting in over-saturation of the signal. This over-saturation produces results that exceed those of the standard curve. Therefore, lower concentrations were tested to ensure an accurate result. The antioxidant capacity of **ACB Yerba Santa Glycoprotein PF** increased as the concentration increased. As a result we can assure that its ability to minimize oxidative stress is dose dependent. We can confirm that this unique ingredient is capable of providing antioxidant benefits when added to cosmetic applications.

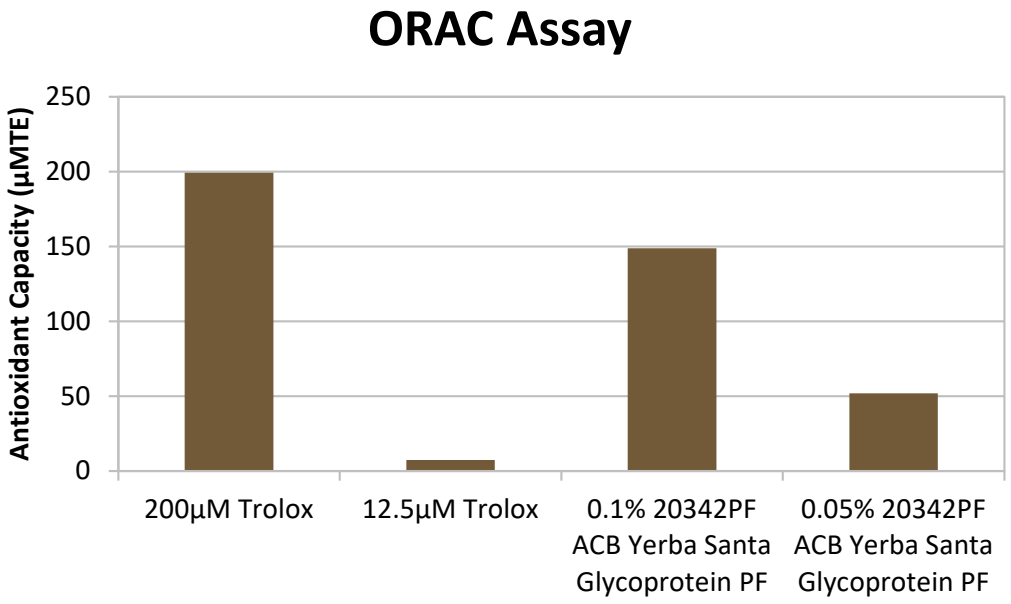

Figure 1. Antioxidant capacities.

ACB Yerba Santa Glycoprotein PF

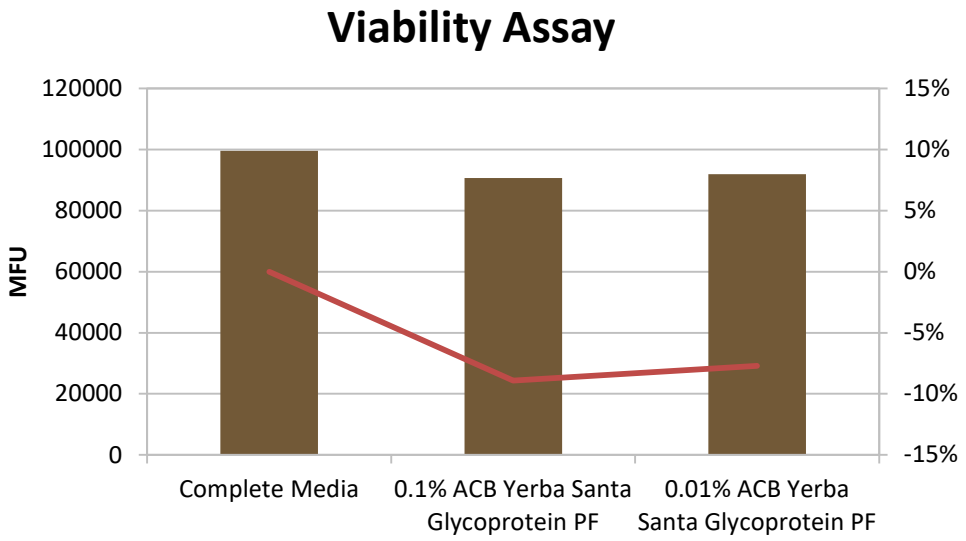

Figure 2. Cellular Metabolism of **ACB Yerba Santa Glycoprotein PF**- treated fibroblasts expressed in terms of percent of control.

In this study, **ACB Yerba Santa Glycoprotein PF** was tested to evaluate its effects on the viability of normal human dermal fibroblasts (NDHF). At concentrations of both 0.1% and 0.01%, **ACB Yerba Santa Glycoprotein PF**, nor the preservatives contained therein exhibited any inhibition of cell viability. It can therefore be concluded that at normal use concentrations, **ACB Yerba Santa Glycoprotein PF** is not cytotoxic. The data obtained from this study met criteria as a valid assay and the controls performed as anticipated.

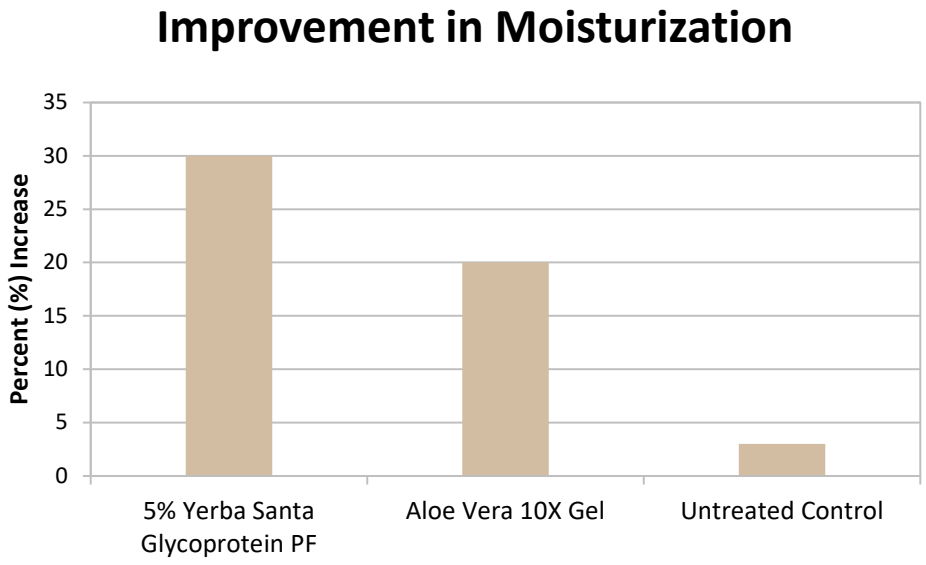

Figure 3. Improvement in Moisurization when using **ACB Yerba Santa Glycoprotein PF.**

An in-vivo clinical moisturization/hydration assay was carried out over a thirty-day period to evaluate the long-term effects of the cosmetic raw material, ACB Yerba Santa Glycoprotein PF on skin moisturization. Yerba Santa is capable of achieving a moisturizing effect via hydrogen bonding of water by its glycoprotein components. **ACB Yerba Santa Glycoprotein PF** imparts moisturization and soothing properties, for skin and hair.

ACB Yerba Santa Glycoprotein PF

ACB Yerba Santa Glycoprotein PF was tested in order to quantify a new anti-pollution standard concerning common pollutants that are >2.5µm in size. **ACB Yerba Santa Glycoprotein PF** was applied to the skin and then contaminated with a premeasured amount of activated charcoal (>2.5µm size particles). It was then washed using a controlled amount of water in order to quantify **ACB Yerba Santa Glycoprotein PF's** ability to inhibit these particles from remaining on the skin. These results were compared against an untreated control and can be seen below, translated from a histogram denoting color change (lower is better, indicates skin tone).

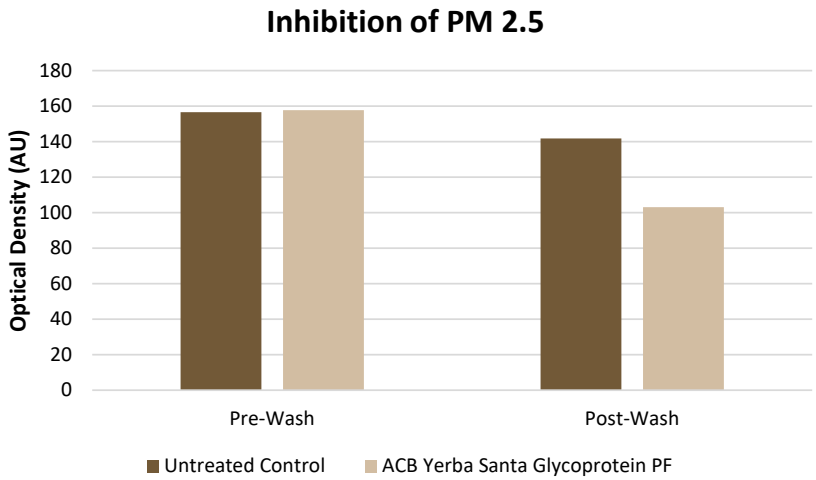

Figure 4. Ability to inhibit accumulation of particles >2.5µm in size on the skin.

It can be clearly seen in Figure 3 that **ACB Yerba Santa Glycoprotein PF** is able to effectively prevent the deposition of invasive PM 2.5 particles into the skins fine lines and wrinkles. While in the untreated control group, it is shown that these particles are able to easily penetrate these lines, and remain there even after thorough washing.

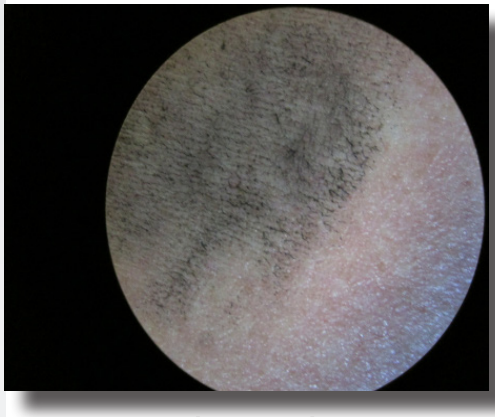

Figure 5. ACB Yerba Santa Glycoprotein PF pre-wash.

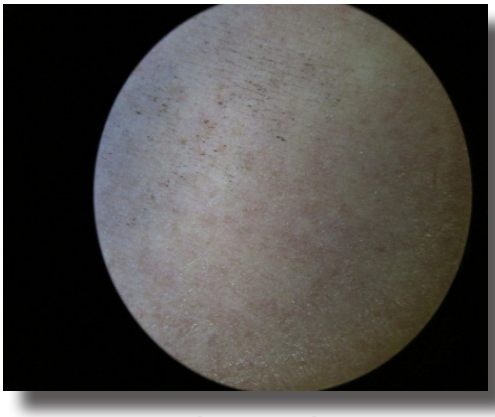

Figure 6. ACB Yerba Santa Glycoprotein PF post-wash.

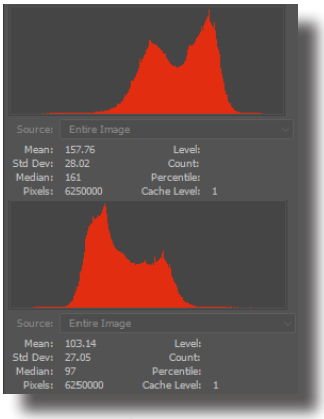

Figure 7. ACB Yerba Santa Glycoproptein PF Histograms.

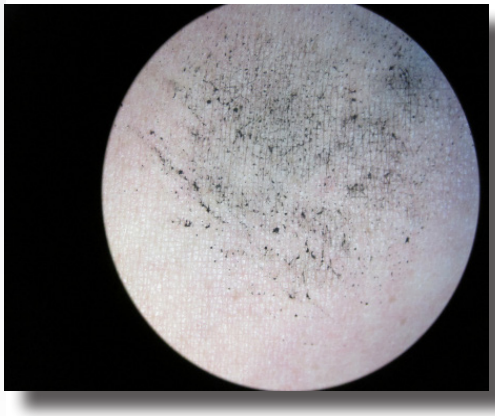

Figure 8. Untreated control pre-wash.

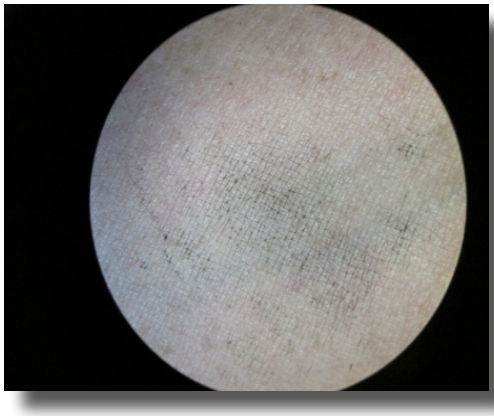

Figure 9. Untreated control post-wash.

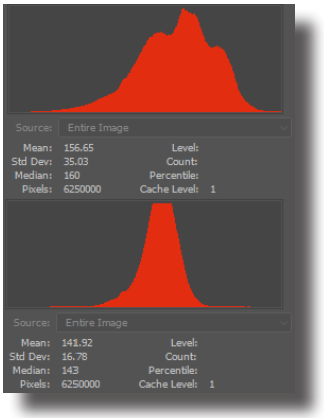

Figure 10. Untreated Histograms.

ACB Yerba Santa Glycoprotein PF

An *in-vitro*, interleukin-6 ELISA assay was conducted to assess the changes in IL-6 levels in cultured human dermal fibroblasts treated with **ACB Yerba Santa Glycoprotein PF**. Interleukin-6 is a proinflammatory cytokine known to play an active role in inflammation, immunology, bone metabolism, reproduction, arthritis, neoplasia, and aging. IL-6 signals through the nuclear factor-kappa B pathway that results in the transcription of inflammatory mediators, including matrix metalloproteinase-1 (MMP-1). MMP's are responsible for breaking down the extracellular matrix and collagen in the skin leading to wrinkles, fine lines, and loss of skin elasticity. 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.

As shown in Figure 1, results indicate **ACB Yerba Santa Glycoprotein PF** exhibited anti-inflammatory effects on LPS-treated fibroblasts utilizing various concentrations of **ACB Yerba Santa Glycoprotein PF** including 1%, 0.1%, 0.01%. 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 study indicates, at normal use concentrations, **ACB Yerba Santa Glycoprotein** enhances soothing and anti-aging properties.

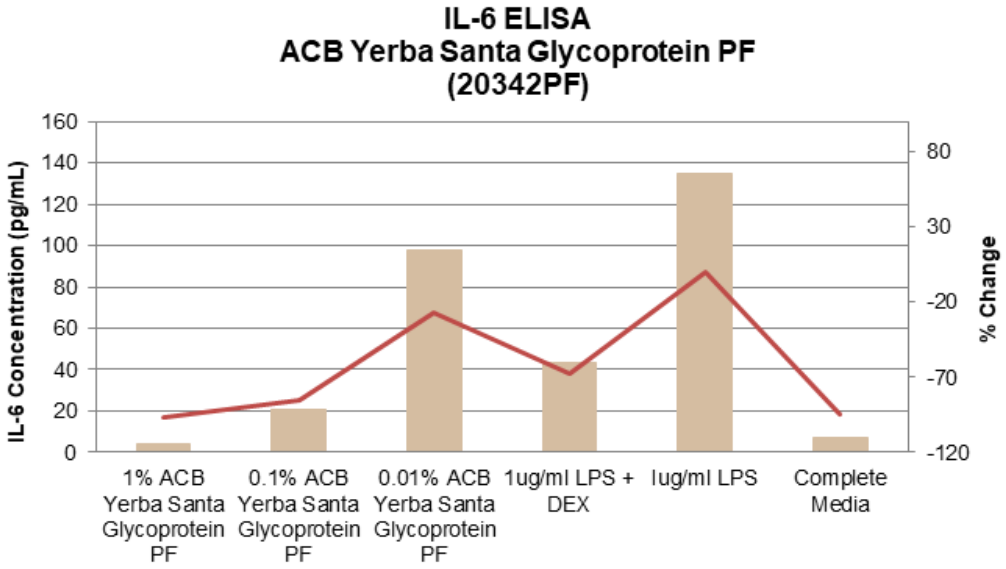

Figure 11. Anti-inflammatory properties.

In addition to hair diameter, a half head study was conducted in order to determine the comparison of using a shampoo incorporating **ACB Yerba Santa Glycoprotein PF** vs. a control shampoo, in addition to the comparison of using a conditioner incorporating **ACB Yerba Santa Glycoprotein PF** vs. a control conditioner. The images of the half head study were used in conjunction with a sensory assessment subjectively rating the parameters - cleansing, smoothing, dry and wet combability, anti-frizz, overall feel, shine and hydration. This assessment was conducted both before and after treatment.

Based on the results obtained, **ACB Yerba Santa Glycoprotein PF** is capable of enhancing wet and dry combability, anti-frizz, overall feel, shine and hydration of the hair. The professional stylist who performed the actual tests by applying the product, styling the hair and documenting the images said **ACB Yerba Santa Glycoprotein PF** is great for improved hydration and shine of the hair. It was also reported that this product helped enhance volume and did not weigh hair down. Perfect for use in treatments to enhance shine and hydration for healthier hair.

ACB Yerba Santa Glycoprotein PF

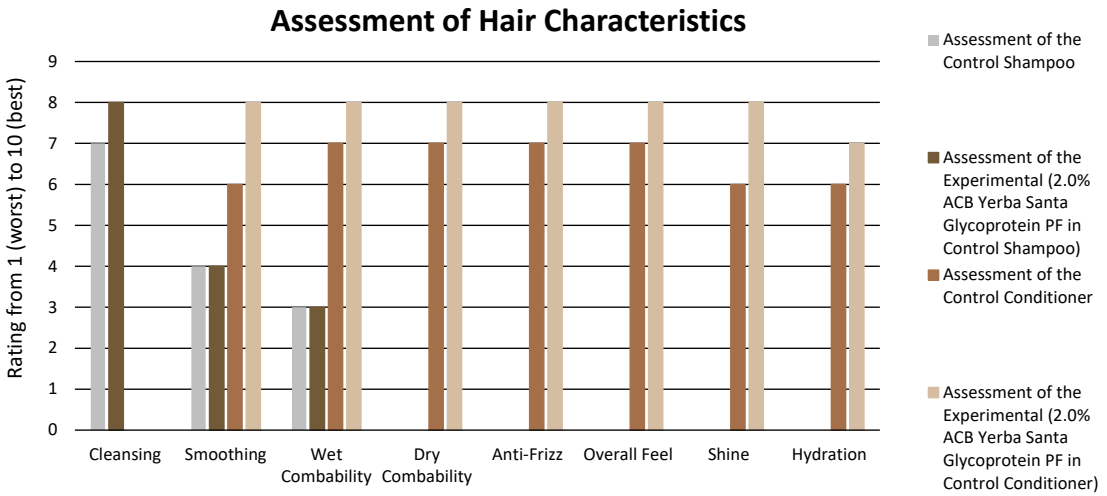

Figure 12. Rating of hair characteristics following sensory assessment.

Figure 13. Full head Baseline, Untreated Hair.

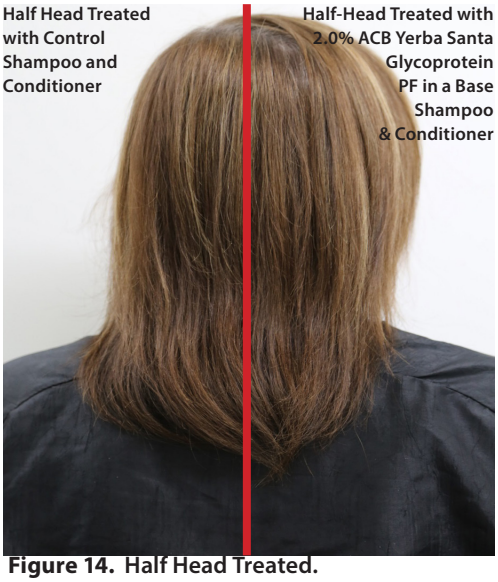

Figure 14. Half Head Treated.

Figure 15. Full head Baseline, Untreated Hair.

Figure 16. Half Head Treated.

ACB Yerba Santa Glycoprotein PF

A scratch assay was conducted to assess the wound healing properties of **ACB Yerba Santa Glycoprotein PF** treated in-vitro cultured human dermal fibroblasts. **ACB Yerba Santa Glycoprotein PF** 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. This assay demonstrates how **ACB Yerba Santa Glycoprotein PF** has excellent healing abilities as well as cell proliferation properties.

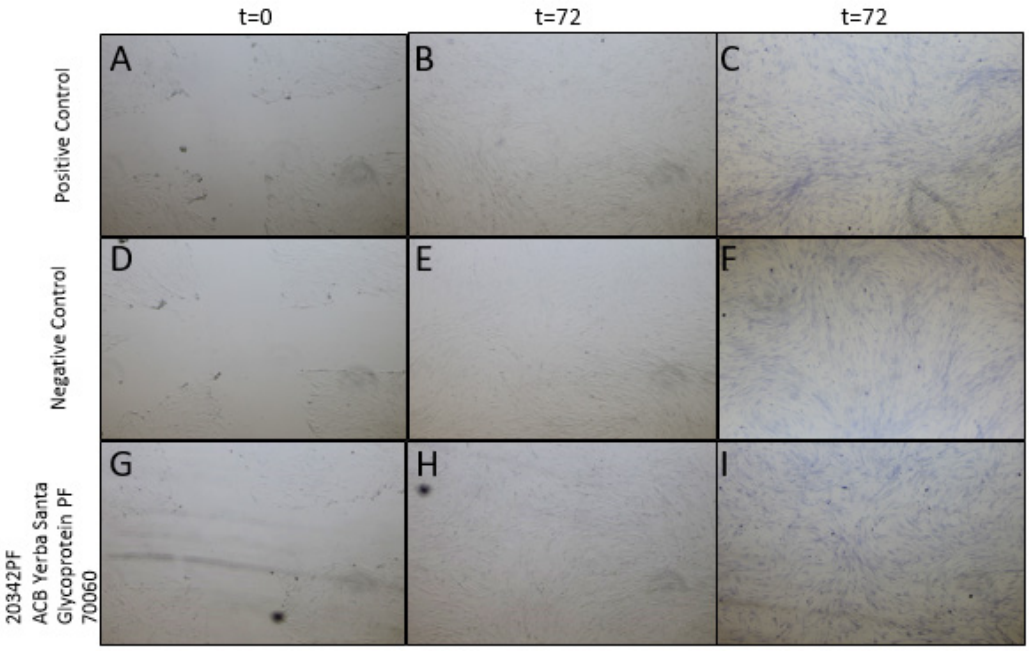

Figure 17. Images at t=0 hours (A, D, G) and t=72 hours (B, E, H) for ACB Yerba Santa Glycoprotein PF positive control (EGF-1), and negative control (SFM). At experiment completion (t=72 hours), cells were fixed in paraformaldehyde and stained with crystal violet (C, F, I).

References
1) Vega-Villa et al. 2008. Journal of Pharmaceutical and Biomedical Analysis. Stereospecific high-performance liquid chromatographic validation of homoeriodictyol serum and Yerba Santa. 46(5): 971-974
2) Reichelt et al. 2010. Journal of Agricultural and Food Chemistry. Bisprenylated Benzoic Acid Derivatives from Yerba Santa (Eriodictyon ssp.) Using Sensory-Guided Fractionation. 58(3): 1850-1859
3) Liu et al. 1992. Journal of Natural Products. Isolation of Potential Cancer Chemopreventive Agents Eriodictyon californicum. 55(3): 357-363
4) Ley et al. 2005. Journal of Agricultural and Food Chemistry. Evaluation of Bitter Masking Flavanones from Herba Santa (Eridictyon californicum). 53(15): 6061-6066

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