

# AC CytoPure PF



inner beauty, outer health **cellular purifier**  
**functional active**  
the key to cellular longevity  
defend from within  
moisturizing, **antioxidant**  
**wound healing**

## BACKGROUND

Glutathione is the most important molecule your skin needs, yet you've probably never even heard of it until now! This naturally occurring peptide has been hailed a "master antioxidant" that improves the health of the skin – literally detoxifying and cleansing the cells – to prevent the principle cause of aging. **AC CytoPure PF** is a revolutionary ingredient that activates the specific oxidant and toxin cleansing power of glutathione in the skin to slow down the rate of the aging process from within the cell. Purify from the inside out with this powerful anti-aging breakthrough that works to reverse the deleterious effects of cellular pollution.

**AC CytoPure PF** was developed from our investigations of the protective mechanism of sulfated polysaccharides produced by unicellular dinoflagellate microalgae. Following an underwater volcanic eruption, vibrant blue sea water transforms to a deep crimson. This extraordinary phenomenon is caused by a bloom of dinoflagellates. The crimson sea water is due to the high concentration of dinoflagellate cells numbering up to 20 million cells per liter. The abundant dinoflagellates are able to survive in some of the most toxic and polluted areas of water because of sulfur-rich polysaccharide plates layering the exterior of their cell membrane. These plates serve as armor and provide intracellular pollution protection, allowing dinoflagellates to proliferate in a hostile environment.<sup>1</sup>

Addressing pollution protection at a cellular level represents a revolutionary shift, as typically anti-pollution products focus on the skin surface. A number of environmental pollutants, including ultraviolet radiation and atmospheric particulates, have the ability to reduce cellular glutathione levels.<sup>2</sup> Free radicals are the predominant intracellular pollutant and mitochondria are responsible for approximately 80% of intracellular free radicals. The Mitochondrial Free Radical Theory of Aging states that the accumulation of oxidative damage in the mitochondria is the main driving force in the aging process.<sup>3</sup>

**Code Number: 20757PF**

**INCI Name:** Cryptocodinium  
Cohnii Extract

**INCI Status:** Conforms

**REACH Status:** Complies

**CAS Number:** 999999-99-4

**EINECS Number:** 310-127-6

**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 to Slightly Hazy,  
Semi-Fluid Gel

**Soluble/ Miscible:** Water Soluble

**Ecological Information:**

92.5% Biodegradability

**Microbial Count:** <100 CFU/g,  
No Pathogens

**Suggested Use Levels:** 1.0 - 5.0%

**Suggested Applications:**

Cellular Detoxification,  
Anti-Pollution, Anti-Aging,  
Wound Healing

## Benefits of AC CytoPure PF:

- Cellular Detoxification
- Wound Healing
- Enhances Cellular Viability
- Intense Antioxidant
- Pro-Collagen Synthesis

# AC CytoPure PF

Oxidative damage can change our skin's appearance, producing fine lines and visible signs of aging, as well as disturb the process of wound healing. Mitochondrial glutathione is the main line of defense to prevent and repair oxidative modifications that lead to cellular dysfunction.<sup>4</sup> Sulfur biology is a relatively untapped method for controlling mitochondrial activity, holding true potential for brand differentiating anti-aging claims. Select sulfur-rich compounds play essential roles in combating signs and symptoms of aging via upregulation of glutathione.<sup>5</sup> By maintaining normal levels of glutathione, the mitochondria may effectively prevent oxidative stress that causes aging.

## SCIENCE

Glutathione is a low molecular weight, thiol-bearing, free-radical scavenger that decreases within the epidermis of aged and damaged skin. In order to reverse this imbalance, it is imperative to restore glutathione levels. Improving and increasing glutathione levels can help convert the oxidized molecules back to their reduced state.<sup>6</sup> Glutathione plays a key role in cellular defenses against reactive oxygen species via limiting cell damage, boosting white blood cell production, and supporting other antioxidants within the body. Elevating cellular glutathione levels can help combat inflammation, preserve overall cell health, and slow the signs and symptoms of aging.

At physiological pH, glutathione's zwitterionic structure hinders the compound's ability to penetrate through lipophilic barriers such as the stratum corneum and cell membrane.<sup>6</sup> Therefore, the simple, topical application of glutathione is ineffective at increasing glutathione levels because it cannot be readily absorbed. To harness the anti-aging benefits of glutathione, Active Concepts isolated sulfated polysaccharides from dinoflagellate microalgae. These sulfated polysaccharides act as sulfide donors, playing a role in the up-regulation of glutathione, thus providing an innovative anti-aging pathway and subsequent effects on wound healing.

While the normal physiology of wound healing depends on low levels of reactive oxygen species and oxidative stress, an overexposure to oxidative stress leads to impaired wound healing. During the inflammatory response associated with tissue damage, the cell produces oxidants that act as reactive oxygen species. Electrons from nearby molecules are taken by these reactive oxygen species, resulting in damage within the healthy cells of a tissue.<sup>7</sup> Glutathione can reduce this oxidative stress and reestablish the necessary environment for wound healing by donating electrons to the free radicals, sparing the damaging effects of oxidation.

## BENEFITS

**AC CytoPure PF** activates the power of glutathione to cleanse cellular pollution and detoxify skin from within. **AC CytoPure PF** minimizes effects of oxidative stress and accelerates wound healing. A novel approach to anti-aging drawn from the research of sulfur biology, **AC CytoPure PF** revitalizes the skin and provides protection against cellular and external environmental pollution. **AC CytoPure PF** is ideal for skin and scalp care formulations aimed to detoxify aging cells, thus allowing consumers to defend their purified cells against new aging stressors.

## EFFICACY

The Glutathione Assay was conducted to assess the changes in glutathione concentration in **AC CytoPure PF** -treated *in-vitro* cultured human dermal fibroblasts. As shown in Figure 1, 1.0% **AC CytoPure PF** exhibited increased concentrations of glutathione in human dermal fibroblasts. This increase in glutathione indicates an increase in antioxidant capacity that is known to reduce toxins and oxide species in the intracellular environment. Working to void toxins from the cell to increase overall cellular health can have a positive effect on cellular viability and attenuating the signs and symptoms of aging by regulating DNA synthesis. It can therefore be concluded that at normal use concentrations, **AC CytoPure PF** promotes anti-aging via glutathione enhancement that in turn increases overall cell health and function.

# AC CytoPure PF

## Increase in Glutathione Concentration

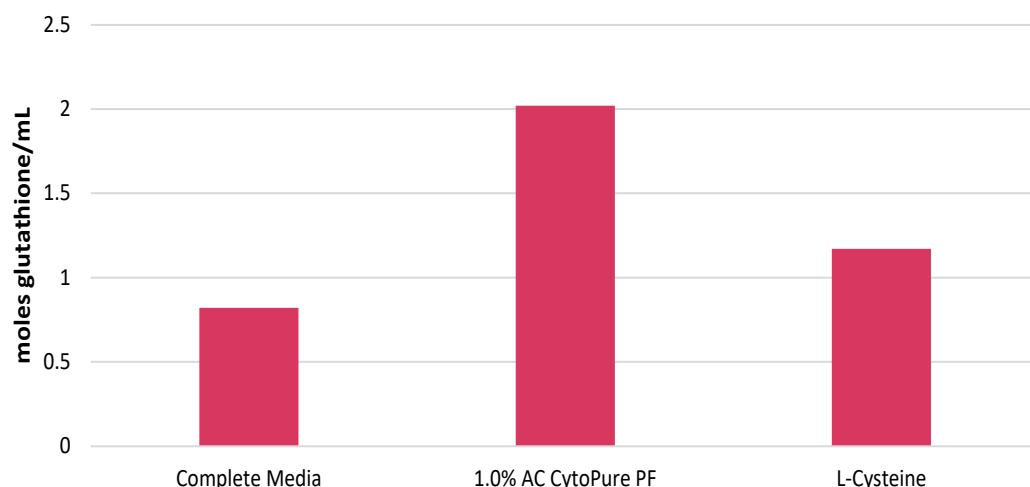


Figure 1. 1.0% **AC CytoPure PF**-treated fibroblast glutathione concentrations compared to complete media and L-Cysteine

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 **AC CytoPure PF**-treated *in-vitro* cultured human dermal fibroblasts.

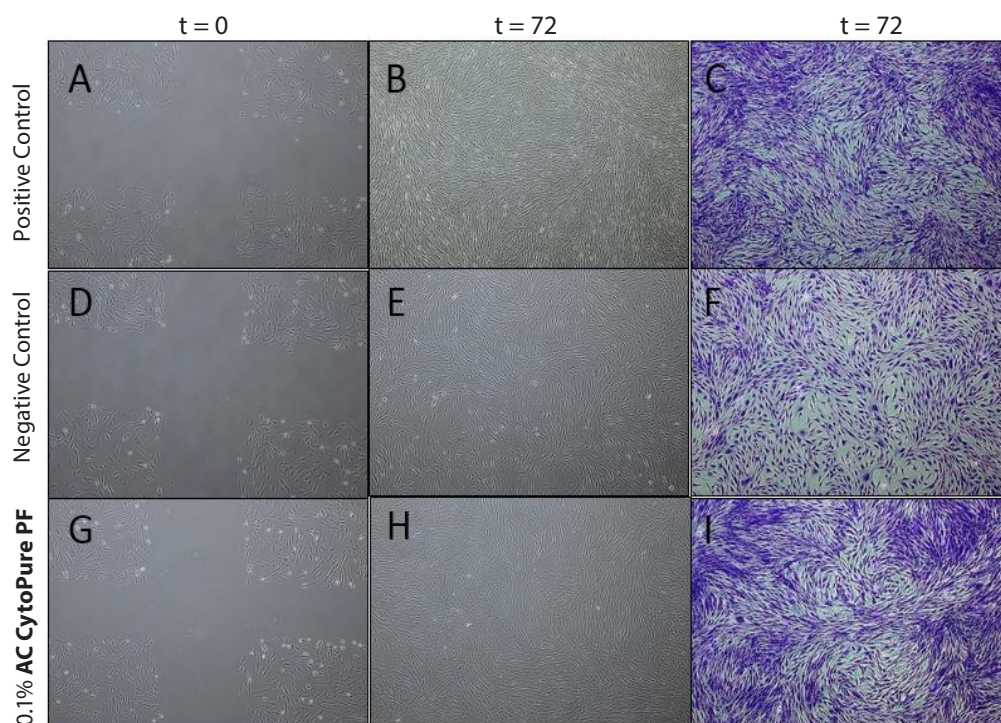


Figure 2. Images at t=0 hours (A, D, G) and t=72 hours (B, E, H) for **AC CytoPure PF**, positive control (EGF-1), and negative control (SFM). At experiment completion (t=72 hours), cells were fixed in paraformaldehyde and stained with crystal violet (C, F, I).



# AC CytoPure PF

From the results illustrated in Figure 2, **AC CytoPure 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. Results from this assay suggest that the product has wound healing abilities and cell proliferation properties.

An *in-vivo* moisturization assay was conducted over a period of four weeks to evaluate the moisturizing ability of **AC CytoPure PF**. Initial readings were taken, followed by measurements after 24 hours, one week, two weeks, three weeks, and four weeks respectively, using an Impedance Meter. This piece of equipment employs an impedance-based electronic sensing system to evaluate conductance. Results in Figure 3 demonstrate that when comparing the emulsion containing 2.0% **AC CytoPure PF** to the untreated skin site, moisture levels increased by 64.2% after 24 hours and remained elevated by 74.3% at the end of the four week testing period. Additionally, after four weeks of application **AC CytoPure PF** moisturized the skin 12.9% more effectively than the base lotion alone. Results indicate that **AC CytoPure PF** is capable of increasing moisturization when compared to both the untreated control as well as the base lotion.

## Comparative Moisturization

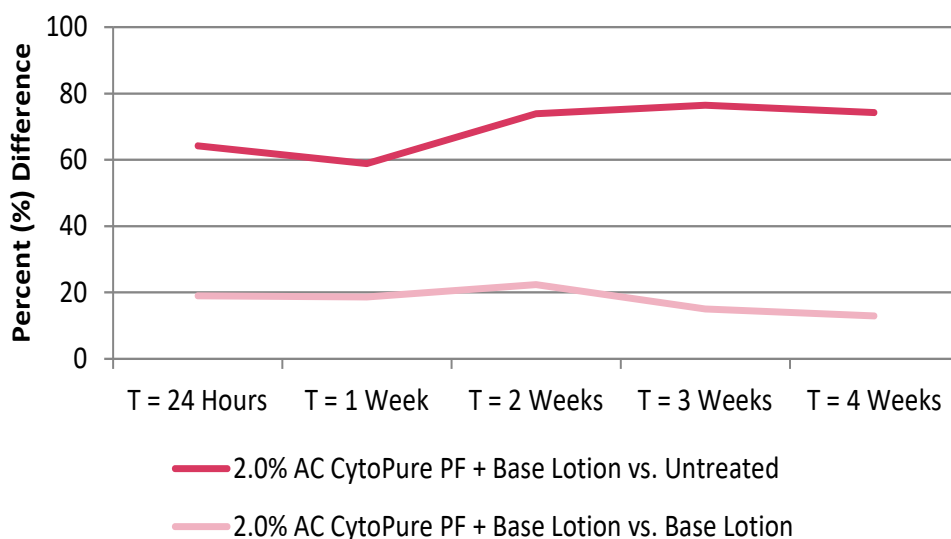


Figure 3. Improvements in moisturization

Another *in-vivo* study was conducted to measure Transepidermal Water Loss (TEWL). TEWL is a test that accurately assesses the skin's barrier function. This characteristic is evaluated with an open chamber probe that measures the vapor diffusion gradient, or the amount of water that evaporates from the skin. Therefore, the lower the TEWL values, the better the skin's barrier function. As shown in Figure 4, results indicate continuous improvements in the barrier of the skin throughout the 4 week test period. When compared to the base cream, **AC CytoPure PF** was shown to decrease transepidermal water loss by 11.15% and by 32.05% when compared to the untreated control after four weeks. Results indicate that **AC CytoPure PF** is capable of reducing TEWL, which allows for moisture retention.

# AC CytoPure PF

## TEWL Comparision Over Time

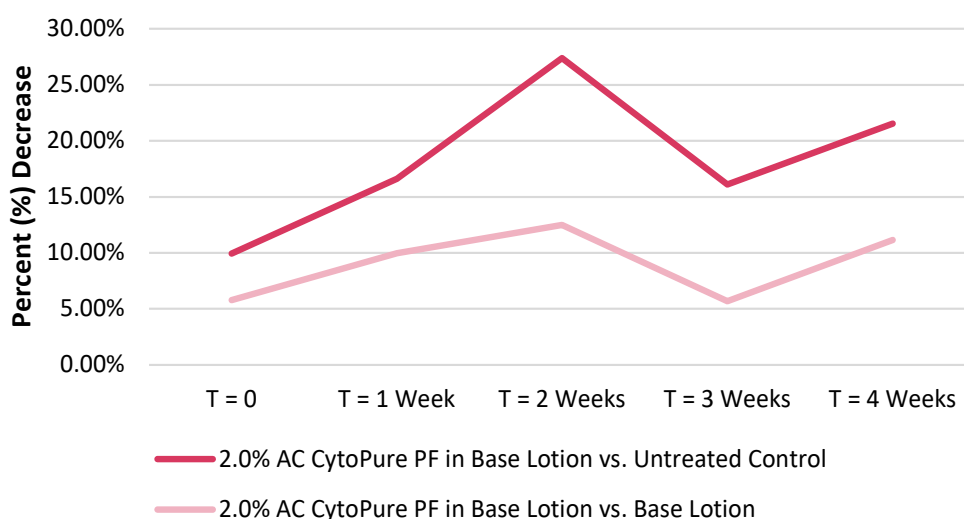


Figure 4. Improvements in barrier function

As shown in Figure 5, **AC CytoPure PF** exhibits a positive effect on skin's density. In a four week efficacy study of **AC CytoPure PF** on skin, skin density was improved by 22.53% after 24 hours and by 26.54% after 4 weeks when compared to the untreated control. When compared to the base cream **AC CytoPure PF** improved skin density by 6.34% after two weeks and after 4 weeks **AC CytoPure PF** improved density by 8.40%. Results indicate that **AC CytoPure PF** is capable of improving skin density when compared to both the untreated control as well as the base lotion. **AC CytoPure PF** has a positive effect on skin's density when used at recommended use levels.

## Comparative Difference in Skin Density

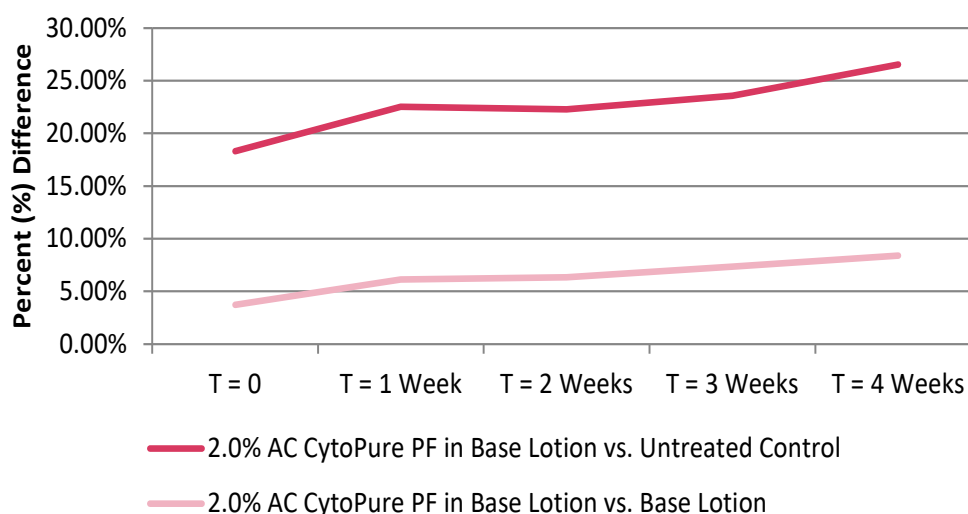


Figure 5. Collagen ultrasound results

# AC CytoPure PF

An Oxygen Radical Absorbance Capacity (ORAC) assay was conducted to assess the antioxidant capacity of **AC CytoPure PF**. As shown in Figure 6, **AC CytoPure PF** exhibited antioxidant activity comparable to 200µM Trolox®. The antioxidant capacity of **AC CytoPure PF** increased as the concentration increased. As a result we can assure that its ability to minimize oxidative stress is dose dependent and that **AC CytoPure PF** is capable of providing antioxidant properties.

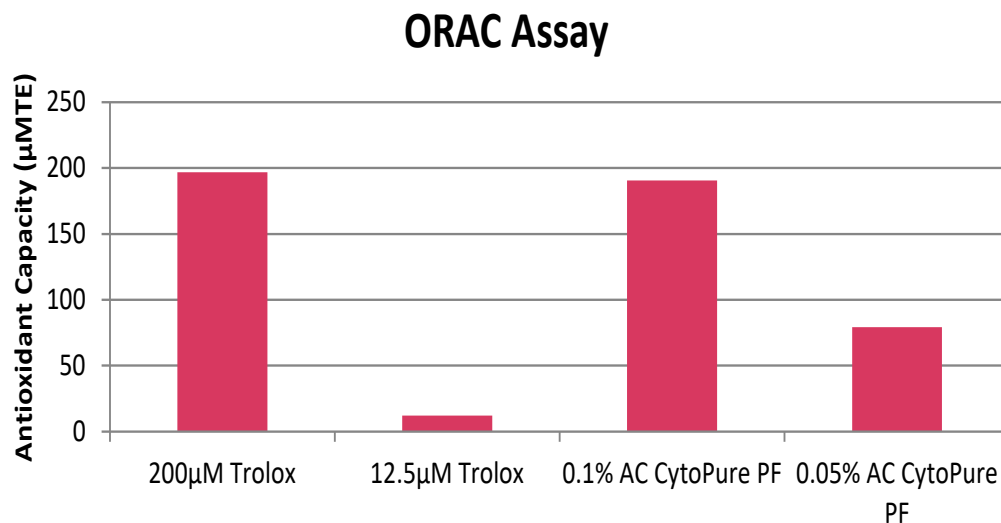


Figure 6. Antioxidant capacities

## References

- 1) Laurienzo, P. Journal of Marine Drugs. Marine polysaccharides in pharmaceutical applications: an overview. 2010. 8(9):2435-2465.
- 2) Silva, R. et al. Journal of Marine Drugs. A sulfated-polysaccharide fraction from seaweed Gracilaria birdiae prevents naproxen-induced gastrointestinal damage in rats. 2012. 10(12):2618-2633.
- 3) Vina, J. et al. IUBMB Life. Theories of aging. 2008. 59(4-5):249-254. <http://onlinelibrary.wiley.com/doi/10.1080/15216540601178067/pdf>
- 4) Raposo, M. et al. Journal of Marine Drugs. Bioactivity and applications of sulphated polysaccharides from marine microalgae. 2013. 11(1):233-252.
- 5) Hu, L. et al. Evidence-Based Complementary and Alternative Medicine. Polysaccharide extracted from Laminaria japonica delays intrinsic skin aging in mice. 2016. 5(13):73-86.
- 6) Rahman, K. Clinical Interventions in Aging. Studies on free radicals, antioxidants, and co-factors. 2007. 2(2):219-236.
- 7) Kopal, C. et al. Annals of Plastic Surgery. Effects of topical glutathione treatment in rat ischemic wound model. 2007. 58(4):449-55.