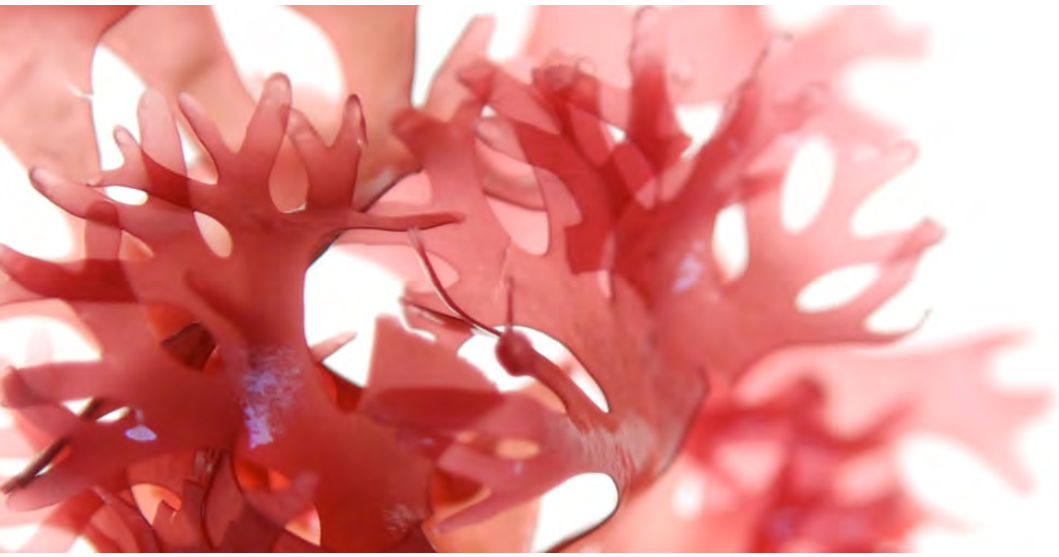
AC CytoSulf PF



Cosmetic Technology
Age Defying Beauty
Water Soluble,
Cutting Edge Research, Cytostasis, Skincare
Healthy, Vibrant, Exotic

Code Number: 20793PF

INCI Name: Plankton Extract
INCI Status: Conforms
REACH Status: Complies
CAS Number: 91079-57-1
EINECS Number: 293-445-7

Origin: Botanical
Processing:
GMO Free
No Ethoxylation
No Irradiation
No Sulphonation
Additives:
Preservatives: None
Antioxidants: None
Other additives: None
Solvents Used: Water
Appearance: Clear to Slightly Hazy Liquid
Soluble/ Miscible: Water Soluble
100% Biodegradability
Microbial Count: <100 opg, No Pathogens

Suggested Use Levels: 1.0-5.0%
Suggested Applications:
Anti-Aging, Skincare

BACKGROUND

How we experience the passage of time is the essence of aging. Our cells age according to a clock described by biologists as the cell cycle. The passage from one phase to the next marks the progression of the lifespan of a cell. The slower the cell moves through this cycle, the slower it ages and reaches its eventual senescence.

Studies have confirmed that certain organisms living in extreme conditions can become quiescent for extended periods of time, an ability that humans lack. It's theorized that the quiescence seen by these certain species of extremophiles may be linked to cell cycle interruptions via sulfur-rich enzymes.[1] The discovery of a new class of gasotransmitter has allowed scientists to achieve what was once solely the realm of science fiction – the suspension of the aging process.

The intersection of these ground breaking discoveries coupled with our expertise in bacterial fermentation has allowed us to capture specific sulfide donors from extreme prokaryotes such as *Sulfolobales*. These sulfide rich peptides in topical applications are able to slow the cellular aging process and deliver unique proaging benefits. For example, the Hayflick limit, or the number of times a cell can divide before its telomeres become too short for replication, is an excellent marker of aging. By prolonging a cell's lifecycle, you are effectively delaying aging which could result in perceivably less wrinkles, more taught, supple, or even softer skin.

SCIENCE

Current heart and lung tissue research focused on internal gasotransmitters (small gaseous molecules capable of signaling cells to induce both physical or chemical changes) suggests that sulfide donors can reduce damage in these tissues by decreasing the rate of cell cycle transition, specifically via sulfur dioxide. Internally, SO_2 plays a key role in the cross talk and regulation between pathways involved in cell stasis, such as cAMP/PKA and Erk/MAPK.[2, 3]

Benefits of **AC CytoSulf PF**

- Anti-Aging
- Slows Cellular Aging
- Next Generation Claim

AC CytoSulf PF

That research found that SO_2 inhibited vascular smooth muscle cell division by preventing cell cycle progression from G1 to S phase and by DNA synthesis. Also important to note, findings supported that internal SO_2 did not influence vascular smooth muscle cell death in any way. Reducing it suspended the tissue in a type of stasis via suppression and control of the Erk/MAPK pathway mediated by cAMP/PKA signaling, without causing cell death.[2] As with the endogenous gasotransmitter SO_2, the Fucci cell cycle assay proves that this product can also halt the cell cycle of human skin cells, specifically in both the G2-M and G1 phase compared to the untreated controls. It is suspected that the oxidized sulfur from thermophilic cells act in the same fashion as internal SO_2, suspending human keratinocytes in a state of cytostasis.

By prolonging the cell cycle and reducing the rate of cell division, the potential for a new pathway and approach to anti-aging is here! One of the initial problems with utilizing sulfur as a method for inducing cell stasis is its assumed toxicity. By harnessing sulfide donors from *Chlorobium tepidum*, we have successfully eliminated the characteristic odor and cytotoxicity associated with sulfur based cosmetics. Using the formulaic components of elemental sulfur (sulfide donors), naturally derived from *Chlorobium tepidum*, **AC CytoSulf PF** was engineered to increase cellular cyto-stasis while remaining procedurally simplistic to formulate with.

BENEFITS

AC CytoSulf PF is the cutting edge of age defying beauty. The induction of cellular stasis through plankton derived sulfide donors is the perfect solution for permanently youthful skin. Without inducing cellular death, or overstimulating cell production, **AC CytoSulf PF** is capable of suspending cells in a semi-permanent, drawn out stage of rest. For skin that defies aging through practical and understood science, **AC CytoSulf PF** is the solution.

EFFICACY DATA

As shown in Figure 1, **AC CytoSulf PF** was able to induce cytostasis of HaCaT keratinocytes. By suspending the cell cycle, **AC CytoSulf PF** was able to decrease telomere shortening and prevent mutations to the cellular genome. **AC CytoSulf PF** was able to primarily arrest cells in the G2/M phase (1315.5 MFU) followed by the G1 phase (206 MFU), as shown by increased fluorescence (MFU) from the transduced fluorophore-containing gene constructs (GFP and RFP), as seen in Figure 1. These results are compared to the untreated control which showed little to no effect on cell cycle progression. The results of this assay indicate that **AC CytoSulf PF** has a positive effect on cell cycle progression, perturbing HaCaT keratinocytes primarily in the G2-M phase.

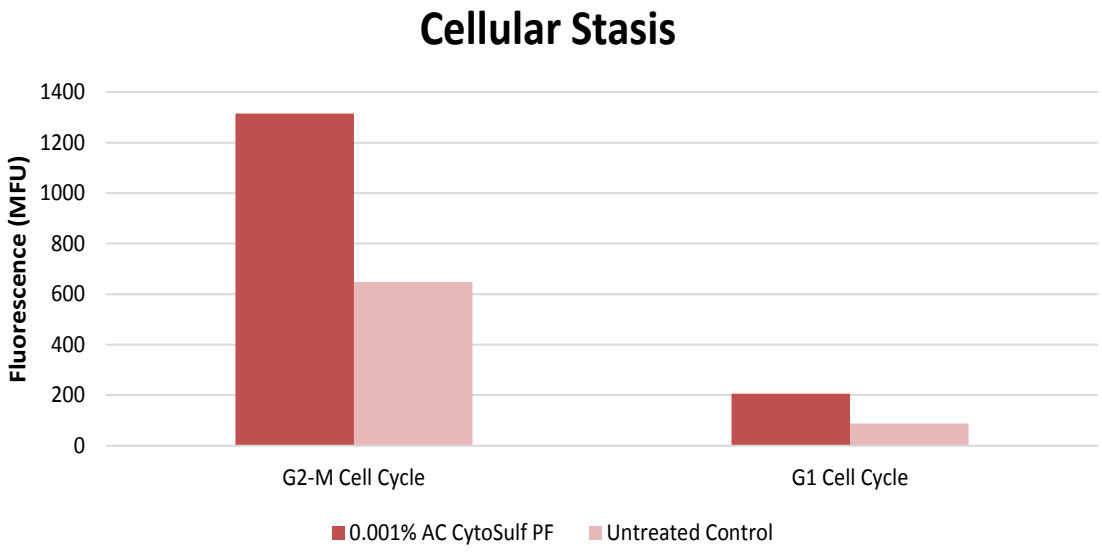


Figure 1. Change in Cell Cycle Transition

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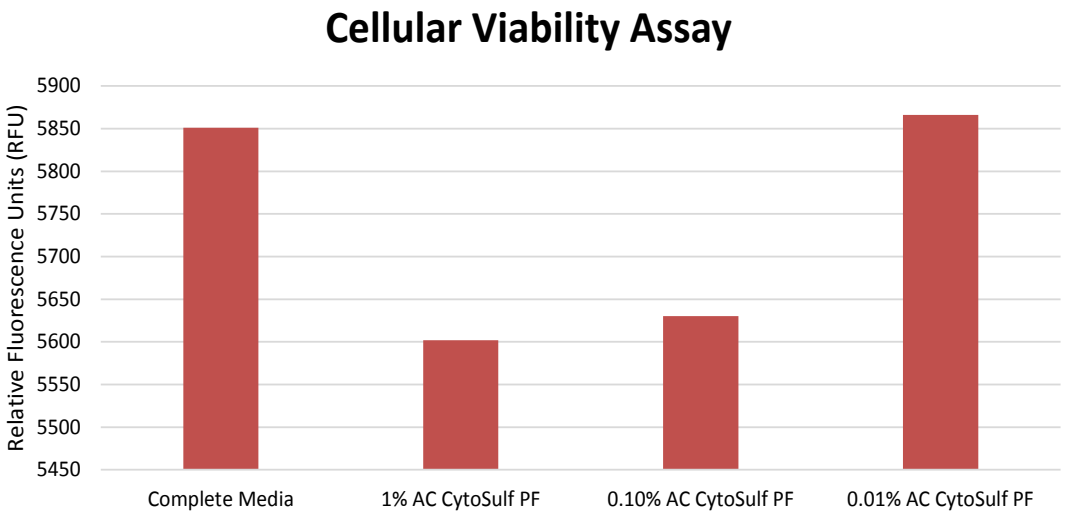

Figure 2. Effect on Cellular Viability

In this study, **AC CytoSulf PF** was tested to evaluate its effects on the viability of normal human dermal fibroblasts (NDHF). At concentrations of 0.10%, 0.01%, and 1.0% **AC CytoSulf PF**, nor the preservatives contained therein exhibited any inhibition of cell viability. It can therefore be concluded that at normal use concentrations **AC CytoSulf PF** enhances cellular viability.

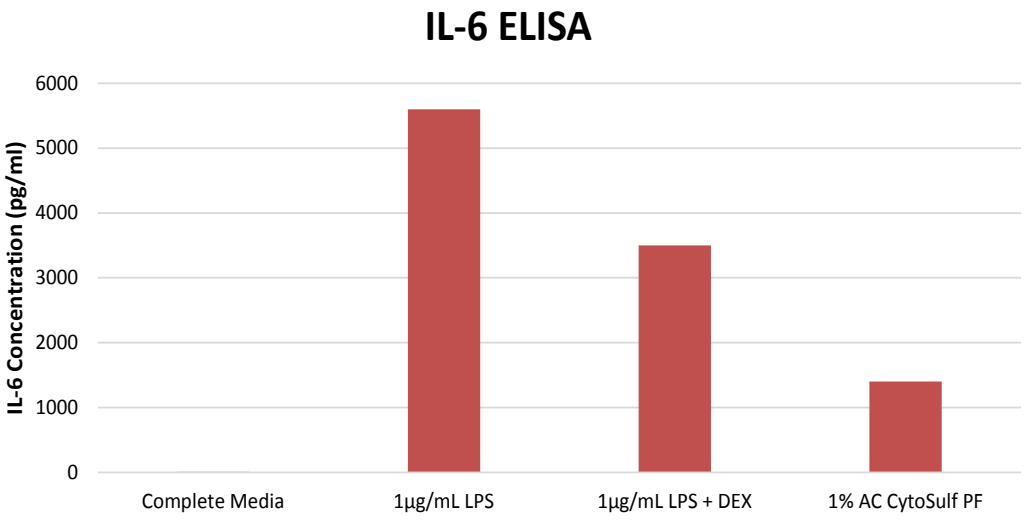

Figure 3. AC CytoSulf PF-treated fibroblasts IL-6 concentrations

As shown in Figure 3, **AC CytoSulf PF** 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. Therefore, we can conclude that at normal use concentration **AC CytoSulf PF** either enhances soothing and anti-aging properties or has no significant effect on inflammation.

AC CytoSulf PF

As shown in Figure 4, **AC CytoSulf PF** exhibited antioxidant activity comparable to 200µM Trolox®. The antioxidant capacity of **AC CytoSulf PF** increased as the concentration increased. As a result, we can assure that its ability to minimize oxidative stress is dose dependent. This demonstrates that **AC CytoSulf PF** is capable of providing antioxidant properties.

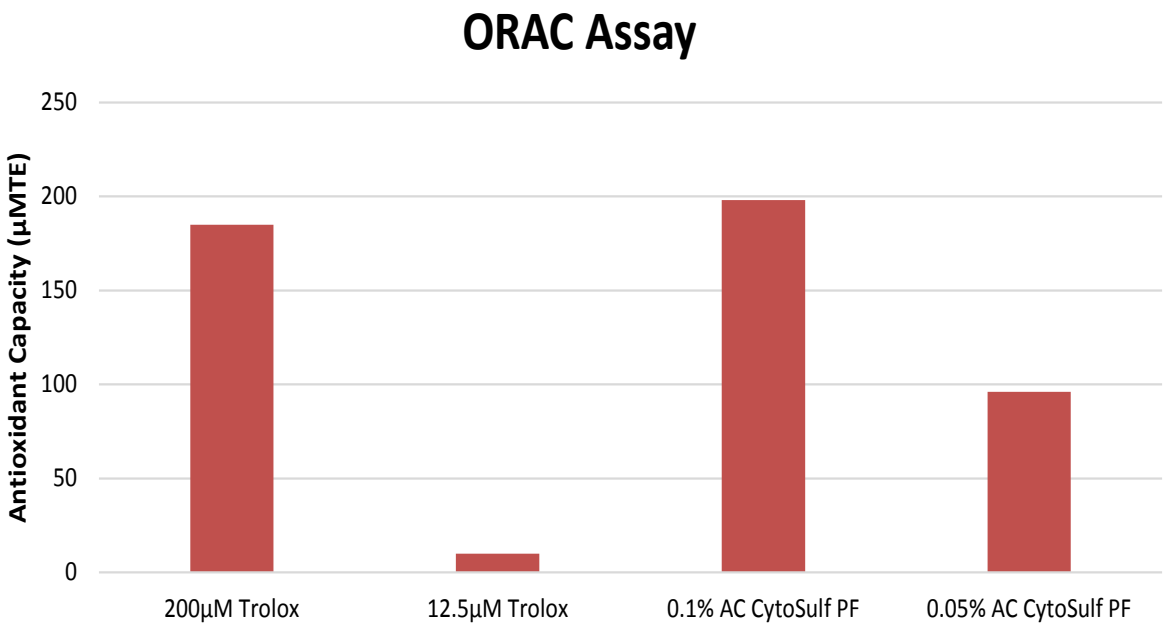

Figure 4. Antioxidant Capability of **AC CytoSulf PF**

As evidenced in a 4 week efficacy study of **AC CytoSulf PF** on skin, moisture levels were improved by 24% after 24 hours and by 47% after 4 weeks when compared to the untreated control. Comparisons of the base lotion to the Experimental Lotion containing **2.0% AC CytoSulf PF** demonstrate the experimental material moisturized the skin 6.8% better after 24 hours. After four weeks, the base lotion containing **2.0% AC CytoSulf PF** moisturized skin 15% better than the base lotion alone. Results indicate that **AC CytoSulf PF** is capable of increasing moisturization when compared to both the untreated control as well as the base lotion.

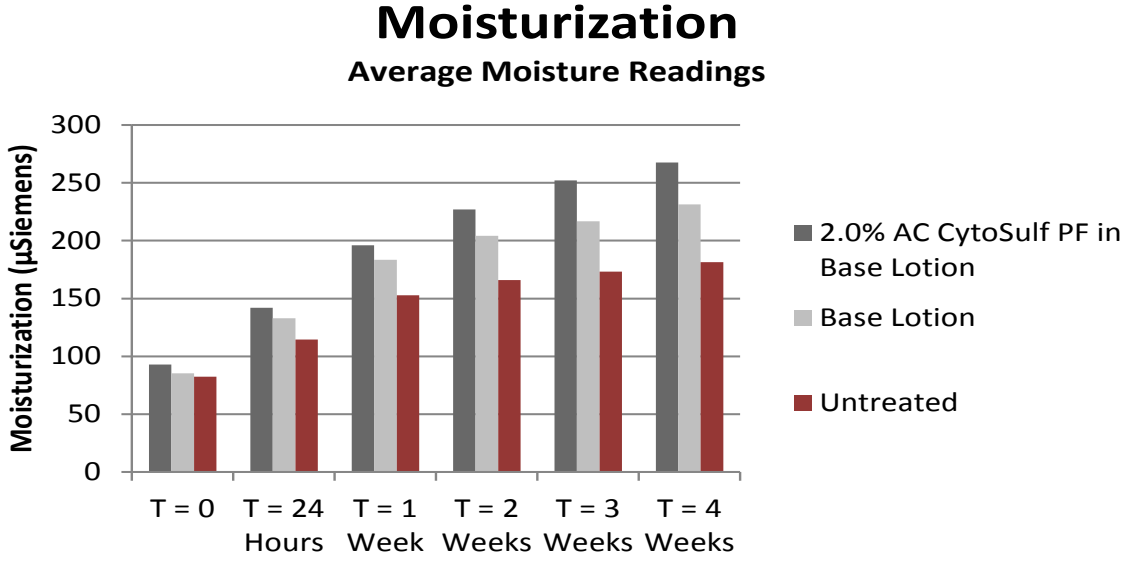

Figure 5. Moisturizing capability of **AC CytoSulf PF**

AC CytoSulf PF

Furthermore, when examining the moisture levels on the skin after application of test materials stopped, it was determined that **AC CytoSulf PF** is capable of sustaining increased skin moisturization when compared to the skin site that remained untreated through the duration of the study. After 24 hours, the site testing **2.0% AC CytoSulf PF** + Base Lotion was approximately 55% more moisturized than the site which did not receive treatment. After one week, the experimental test site was still yielding moisturization results that were 36% higher than the untreated site.

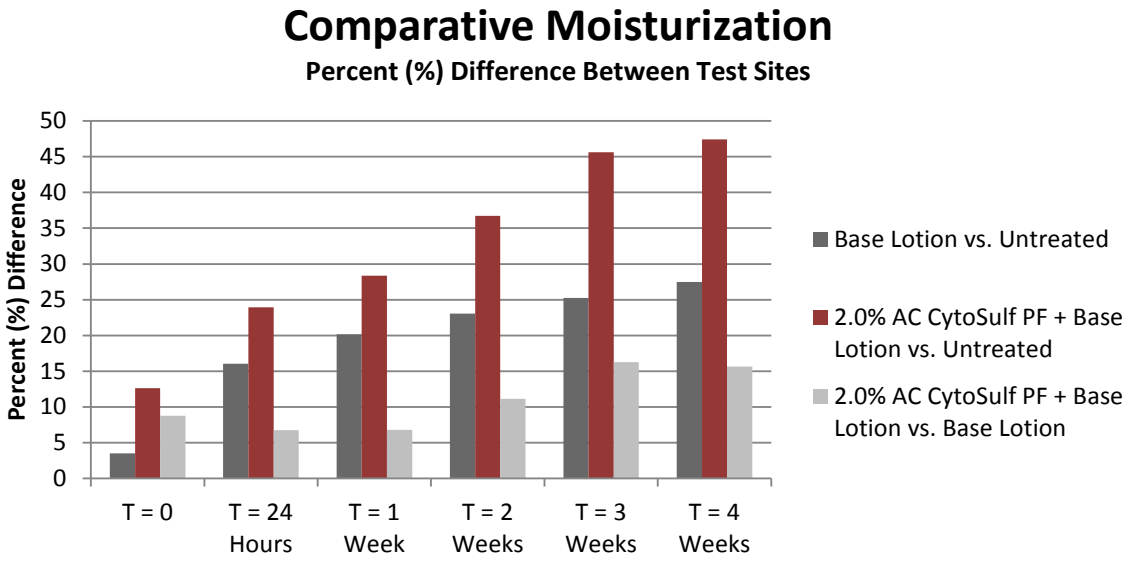

Figure 6. Comparative Moisturization of **AC CytoSulf PF**

In comparison to the site tested with the base lotion alone, the site treated with **2.0% AC CytoSulf PF** + Base Lotion moisturized the skin 41% better after 24 hours after and was still 5.2% more effective in moisturizing the skin when readings were taken one week after the applications of both test materials ceased. **AC CytoSulf PF** was designed to provide moisturization benefits, however with the present study we can confirm that this ingredient is not only capable of providing protective benefits, but also ideal for moisturizing and skin hydrating personal care applications.

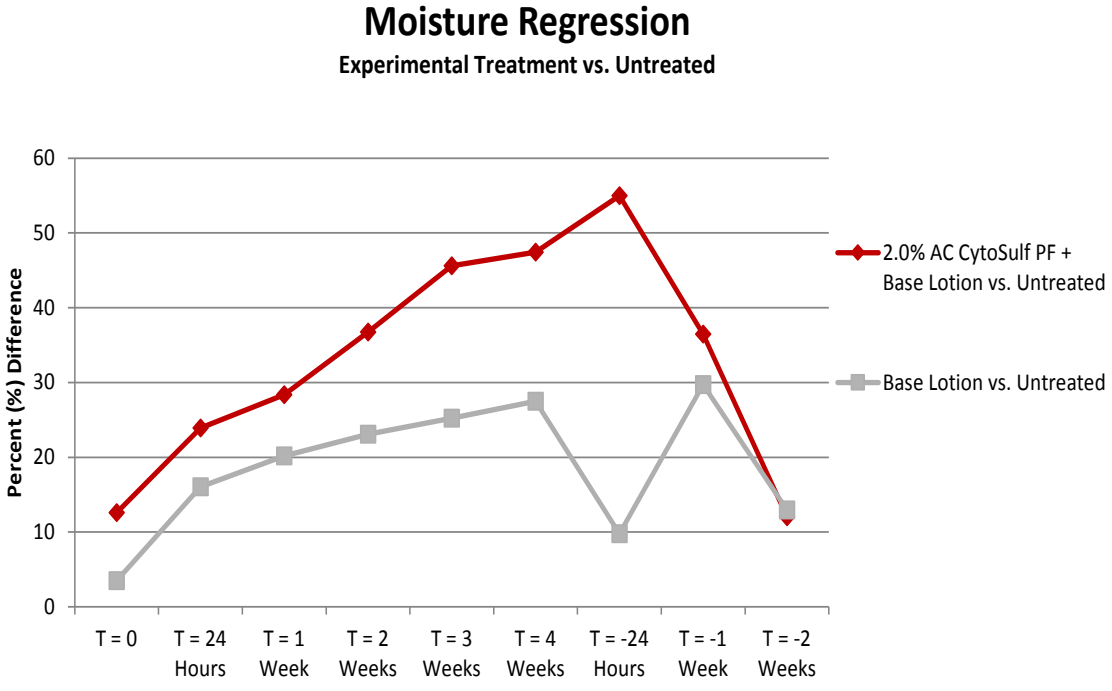

Figure 7. Moisture Regression

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As evidenced in a four week efficacy study of **AC CytoSulf PF** on the skin, it can be used to effectively reduce transepidermal water loss with better results over time. When compared to the base cream, **AC CytoSulf PF** was shown to decrease transepidermal water loss by 23.06% and by 32.05% when compared to the untreated control after four weeks. Results indicate that **AC CytoSulf PF** is capable of reducing TEWL, which allows for moisture retention.

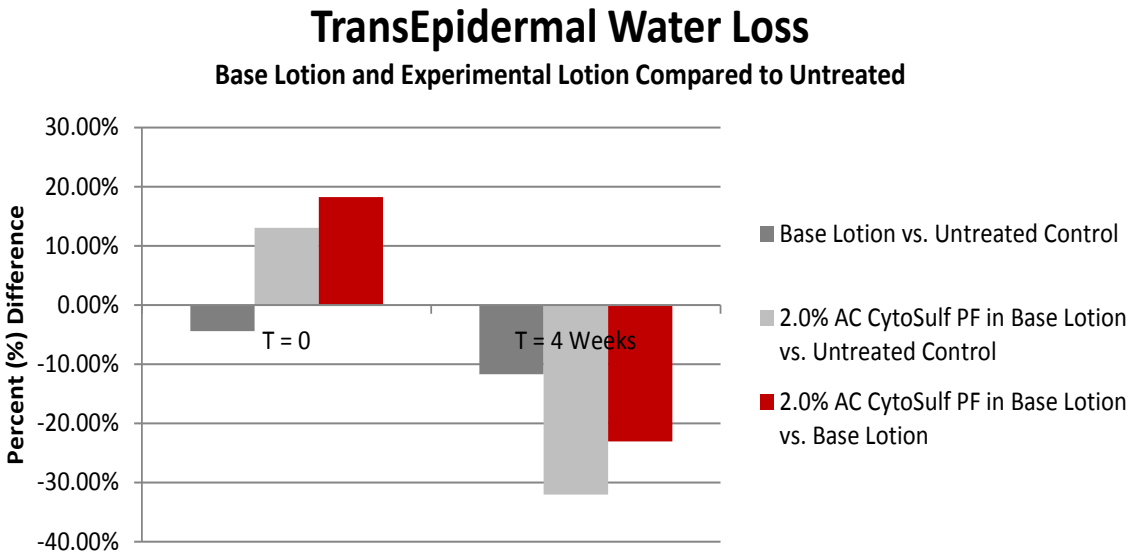

Figure 8. TEWL measurements taken at individual test sites

AC CytoSulf PF was designed to provide moisture retention benefits, however with the present study, we can confirm that this unique ingredient is not only capable of providing functional benefits, but also capable of providing a decrease in transepidermal water loss. Therefore aiding in the skins moisture retention when used in cosmetic applications.

As evidenced in a 4 week efficacy study of the effects **AC CytoSulf PF** had on collagen levels, findings indicate that skin density improved by 16.95% after one week and by 26.35% after 4 weeks when compared to the untreated control. When compared to the base cream, **AC CytoSulf PF** improved skin density during each week of the trial, working 6.62% better than the base lotion after two weeks and 7.09% better than the base lotion after four weeks. Results indicate that **AC CytoSulf PF** is capable of improving skin density when compared to both the untreated control as well as the base lotion.

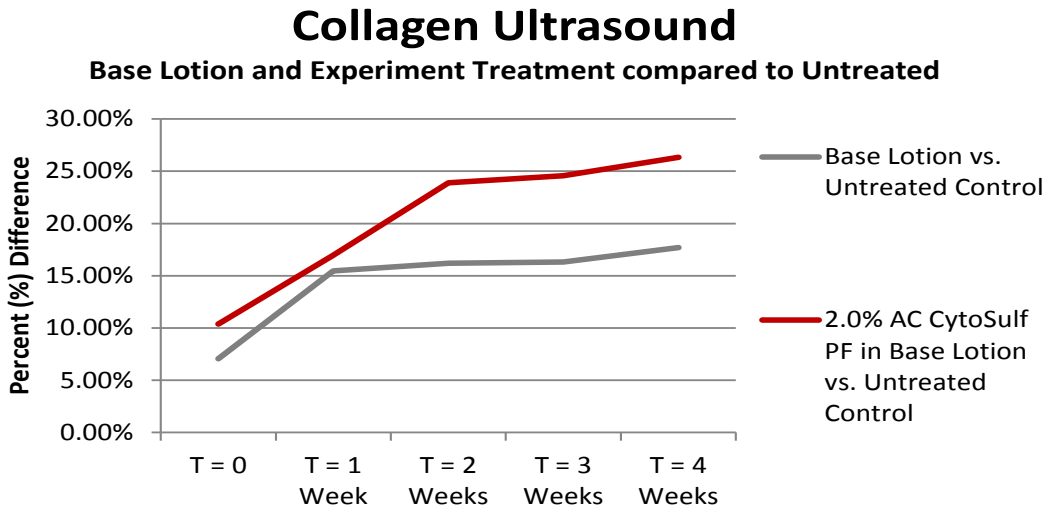

Figure 9. Ultrasound Results Comparing Test Sites to Untreated Control

AC CytoSulf

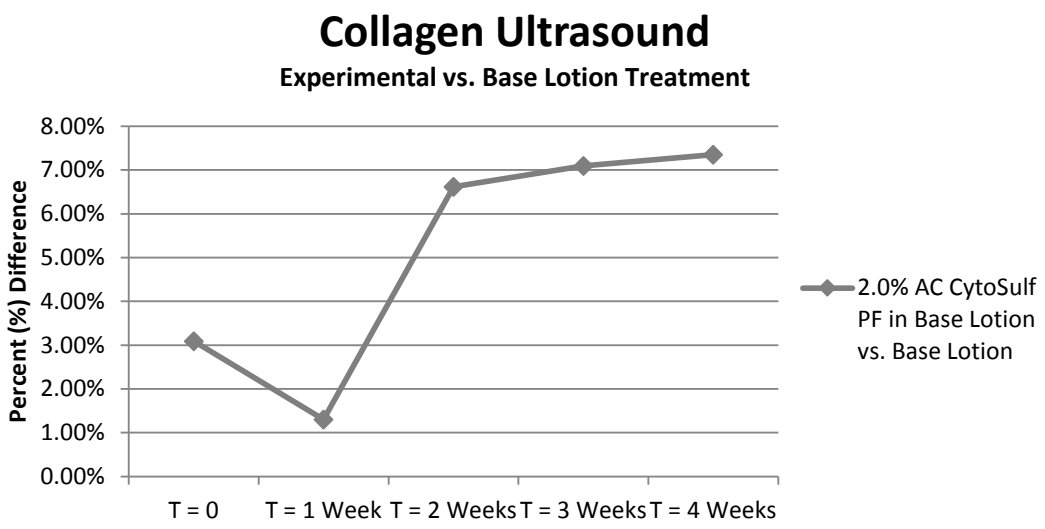

Figure 10. Ultrasound Results Comparing the Difference between the Test Site and the Control Site.

References

1) M, Greener. et al. 2004. Now You're Signaling, With Gas. The Scientist. 26: 105-131.
2)D, Liu. et al. 2014. Sulfur dioxide inhibits vascular smooth muscle cell proliferation via suppressing the ERK/MAP kinase pathway mediated by cAMP/PKA signaling. Cell Death and Disease. 5 (1251).
3) M, Nughes. et al. 2009. Making and working hydrogen sulfide, The chemistry and generation of hydrogen sulfide in vitro and its measurement in vivo: a review. Free Radical Biology & Medicine.1346-1353.

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