# 20829. **ProCutiGen® Bond**

PROTEINS



Active Concepts

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### THE FEATURES.

**P**roCutiGen<sup>®</sup> Bond is a water-soluble ingredient developed by Active Concepts to provide rejuvenating benefits to cosmetic and personal care formulations. This ingredient utilizes the concept of synthetic biology to self assemble into a biomimetic neocuticle on the hair. The formation of this biomimetic cuticle helps to retain style while offering protection from chemical damage to promote healthy hair. Utilizing a combination of *Salvia hispanica* and *Leuconostoc/*radish root ferment filtrate, this ingredient offers protection from harsh chemical treatments to promote healthy cuticles and is an ideal ingredient for use in a wide range of hair care applications.

Salvia Hispanica Seed Extract & Leuconostoc/Radish Root Ferment Filtrate

Actions

Cuticle Protection Increases Tensile Strength Hair Pollution Protection Improves Hair Integrity

## **ProCutiGen® Bond**



**SPECIFICATION** INCI. Salvia Hispanica Seed Extract & Leuconostoc/ Origin. Botanical/Bacteria **REGULATION** Radish Root Ferment Filtrate Natural Antimicrobial. Leuconostoc/Radish CAS. 93384-40-8 & 1686112-10-6 (or) 84775-94-0 Root Ferment Filtrate\* (or) 9015-54-7 Preservatives. None EINECS. 297-250-8 & N/A (or) 283-918-6 (or) Solvents Used. None 295-635-5 Soluble/Miscible. Water Soluble **EUROPE.** Compliant Appearance. Clear to Slightly Hazy Liquid, M **USA.** Compliant Yellow to Amber CHINA. Compliant Use Level. 1-10 %

\* Please note this product contains Leuconostoc/Radish Root Ferment Filtrate (Tradename: M15008-Leucidal® Liquid) - produced by Active Micro Technologies, LLC - containing 18.0–22.0% Phenolics (tested as Salicylic Acid). Please refer Leucidal® Liquid product literature for additional information.



Chia seeds, scientifically known as Salvia hispanica, have a rich history dating back to ancient Mesoamerica. They were originally cultivated by the Aztecs and Mayans, where they were considered a staple food source. Chia seeds were highly valued for their nutritional content. They were often consumed as a dietary staple and used for their energy boosting properties. These tiny seeds are rich in essential nutrients like omega-3 fatty acids<sup>1</sup>, vitamins and an abundance of proteins, which contribute to healthy hair growth and maintenance. Chia seeds have gained recognition not only for their abundant nutritional content but their potential benefits in hair care.

The "Plex Phenomenon" has swept the global hair care industry, resulting in a myriad of products focused on bond multiplying or re-bonding. As the market is currently saturated with formulations claiming to re-bond the hair, Active Concepts has taken a proactive approach towards technology that protects the hair. Active Concepts is shifting the focus to proactively protect the hair shaft through "ProBonding." ProCutiGen® Bond prevents the chemical damage that breaks the protein bonds of your hair<sup>2</sup>, making it porous, weakened and more prone to breakage. Rather than focusing on repairing broken bonds that occur during chemical stress, ProCutiGen® Bond consists of bivalent cationic peptides that create a *de novo* cuticle on the hair to prevent damage from happening in the first place.

Furthermore, cuticle preservation is essential to prevent hair damage<sup>3</sup>. The cuticle is the outermost layer of the hair, composed of overlapping cells that shield the cortex, while holding moisture and protecting hair from the environment. Damage to the cuticle compromises the structural integrity of the hair shaft, making hair prone to breakage. Utilizing the concept of synthetic biology, ProCutiGen® Bond is a bivalent cationic lipopeptide that self-assembles into a neocuticle on the hair. The formation of this biomimetic cuticle offers protection from harsh chemical treatments to promote healthy hair4.

## *THE SCIENCE.*

Damage that occurs to hair after chemical treatment is a result of the structural integrity of the cuticle being compromised. When the structure of the hair cuticle is degraded, hair is more susceptible to breakage<sup>5</sup>. Hair needs a solid foundation to prevent damage, and the building block of hair is protein. Our hair is full of protein, which is necessary to strengthen and restore the hair fiber. "Chia" is the ancient Mayan word for "strength"<sup>6</sup> and chia seeds are a nutritional powerhouse composed of 23% protein, which can help restore the strength of the hair. ProCutiGen® Bond is a lipopeptide derived from chia protein, harnessing the natural strength of the seed for hair protection.

Additionally, the bivalent cation of ProCutiGen® Bond is the anchor to secure the neo-cuticle, as hair is naturally anionic. The specific amino acid composition, which is the structural material of the anchor, allows these properties which differentiate the bio-films formed by the ProCutiGen® line. Film-forming properties are a popular claim in hair care, however, usually misleading. A "film" can loosely be defined as an unspecified thin layer, while "bio-film" is more specific. A bio-film is a polymeric chain forming a conglomeration of proteins, amino acids, and polysaccharides to create a complex that is interwoven in the matrix on the hair cuticle<sup>7</sup>. A major benefit of the bio-film is its action as a scaffolding rather than a true barrier. Able to support and protect hair, this scaffolding allows small molecules in via its semi-permeable facade. It is this bio-film and its semi-permeable membrane that promotes the exhibition of properties such as moisturization, pH balance, barrier protection, and additionally, protection from hair weakening after exposure to chemical processes.



### *THE* BENEFITS.



Tensile Strength Tensile Strength Hair Data

Hair Pollution Hair Pollution **Protection** Protection Assay



Challenge Testing Broad-Spectrum Cuticle Protection Scanning Electon

Antimicrobeal Properties Microscopy Assay

Hydrogen Peroxide Hair Integrity Stability via Infrafred Spectroscopy

## THE EFFICACY.



#### Tensile Strength Hair Data.

Tensile strength is defined as the resistance of a material to break under tension. Elongation at break, also known as fracture strain, is the ratio between changed length and initial length after breakage of the test specimen expressing the capability of a material to resist changes of shape without crack formation, how much a hair fiber will stretch before it breaks. Fibers that are weaker and less resistant to breakage have a greater elongation at break (%). Both the results for 40V and 30V treated hair with ProCutiGen® Bond exhibited and improved elongation at break compared to bleached hair alone.



ProCutiGen® Bond exhibited and improved elongation at break compared to bleached hair alone. (at 2.0%)

## **Tensile Strength.**

Stronger S Healthier Hair

#### Hair Pollution Protection Assay.

In this study, ProCutiGen® Bond was tested to evaluate its effects on the inhibition of lipid peroxidation of hair samples exposed to air pollution after various treatments. At a concentration of 5.0%, ProCutiGen® Bond demonstrated lower levels of MDA than the untreated control for both of the treatment groups, most notably when saturated in 5.0% ProCutiGen® Bond without rinse. It can therefore be concluded that at normal use concentrations, ProCutiGen® Bond can be used as an effective hair pollution protection ingredient, particularly when used in leave-in products.





Mimimizes Oxidative Stress





Standard Electron Microscopy (SEM) imaging shows high resolution images of the hair cuticles of each hair swatch. The SEM images depict how the outermost layer of the hair, the cuticle, is effected by chemical treatments (bleach & relaxer). The SEM imaging demonstrates that untreated virgin hair is clearly more prone to damage from everyday aggressors, showing characteristic signs of breakdown pre chemical treatment. The bleached imagery results depict an extensively damaged cuticle. When the bleached images are compared to both the ProCutiGen® Bond-treated swatches, a significant decrease in cuticle damage is exhibited. Better yet, the ProCutiGen® Bondtreated SEM images depict the creation of a *de novo* cuticle on the damged cuticle. Additionally, protection from hair weakening after exposure to bleach rendering makes ProCutiGen® Bond the ideal addition to repair and protect against everyday stressors.



Untreated Virgin



Protection.

Heat + Barrier Protection & Moisturization



Bleached Hair, 30v



Bleached Hair, 30V + ProCutiGen<sup>®</sup> Bond



Bleached Hair, 40v



Bleached Hair, 40V+ ProCutiGen<sup>®</sup> Bond



#### Hydrogen Peroxide Stability Study.

This study was conducted to demonstrate that the addition of ProCutiGen® Bond does not neutralize the peroxide in a developer solution, indicating its ability to effectively work in systems designed to lighten or lift the hair. This assay compares FTIR spectra collected from solutions of ProCutiGen® Bond at different timepoints to determine if there are any peak changes over time. The results indicate that ProCutiGen® Bond does not degrade in the presence of H<sub>2</sub>O<sub>2</sub> even with time, and is an appropriate addition to a developer solution or system intended to lighten or lift the hair. Therefore, the addition of this ingredient allows for preemptive protection of the hair while it recieves chemical treatments.





References

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