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ProCutiGen® Vegan Thermal Shield

Heat Protection

ProBonding

Hair Integrity



VEGAN



SEPHORA
CLEAN



CREDO
CLEAN



GLOBALLY
COMPLIANT



COSMOS
COMPLIANT



ISO 16128



THE FEATURES.

ProCutiGen® Vegan Thermal Shield utilizes the concept of synthetic biology to self-assemble into a biomimetic neocuticle on the hair. The formation of this biomimetic cuticle offers protection from heat styling and other thermal treatments to promote healthy hair cuticles. ProCutiGen® Vegan Thermal Shield is an ideal ingredient for use in a wide range of hair care applications to protect hair from thermal styling damage. Incorporate ProCutiGen® Vegan Thermal Shield into shampoo, conditioner, and styling applications to offer revolutionary ProBonding protection!

INCI: Saccharomyces Cerevisiae Extract

TECHNICAL DATA SHEET.

ProCutiGen® Vegan Thermal Shield



THE STORY.

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 saturated with formulations claiming to re-bond the hair, Active Concepts has taken a proactive approach towards technology that protects the hair through “ProBonding.” ProCutiGen® Vegan Thermal Shield is a scientific breakthrough that is slated to shake the foundations of how the market considers preventative hair care – repair beyond the bond.

ProCutiGen® Vegan Thermal Shield prevents the thermally induced damage that breaks the cysteine bridges of the hair, making it porous, weakened, and more prone to breakage. Rather than focusing on repairing broken bonds that occur during thermal stress, ProCutiGen® Vegan Thermal Shield consists of bivalent cationic peptides that create a *de novo* cuticle on the hair to prevent damage from happening in the first place.

Utilizing the concept of synthetic biology, ProCutiGen® Vegan Thermal Shield is a bivalent cationic lipopeptide that self-assembles into a neo-cuticle on the hair. The formation of this biomimetic cuticle offers protection from high temperature styling to promote healthy hair.



THE SCIENCE.

Damage that occurs to hair following heat styling is largely attributed to the compromise of cuticle structural integrity. Thermal tools such as blow dryers and flat irons strip moisture from the cuticle, leading to cracking, increased porosity, and a rigid, brittle, and dry appearance of the fiber.¹ Because the cuticle serves as the hair’s first line of defense, maintaining a strong structural foundation is essential to preventing thermal damage.

Hair fibers are predominantly composed of protein, which is critical for maintaining strength and restoring integrity after environmental or mechanical insult. The primary functional proteins within hair are keratins, which, along with keratin-associated proteins (KAPs), are concentrated within the cortex. The cortex constitutes the majority of the hair mass and is responsible for much of the fiber’s mechanical strength and resilience.² In cosmetic applications, keratin-based particles and biomimetic systems have been developed to reinforce the hair fiber and improve its mechanical and thermal stability, particularly in virgin and over-bleached hair.²

ProCutiGen® Vegan Thermal Shield is a yeast-derived lipopeptide designed to mimic the structure and function of keratin, providing targeted thermal protection to the hair fiber. This technology is inspired by the inherent thermotolerance mechanisms of *Saccharomyces cerevisiae*. Yeast cells acquire increased resistance to thermal stress through prior exposure to sublethal heat conditions, a process known as heat preconditioning. This adaptive response is mediated by activation of heat-shock factor (HSF) and stress response element pathways, which regulate the synthesis of heat-shock proteins (HSPs) – key contributors to cellular thermotolerance.³

Additionally, studies have demonstrated that DNA damage in yeast can serve as a signaling mechanism for inducing thermal and radiation resistance, with the degree of resistance correlating to the extent of DNA stress experienced.⁴ Heat-shock protein synthesis is tightly controlled by heat-shock transcription factors, which, upon activation, bind to heat-shock elements within the genome to modulate gene expression. In *Saccharomyces cerevisiae*, this interaction between heat-shock factor and heat-shock elements is central to the development of stress resistance.^{3,4}

THE TECHNICAL DETAILS.

INCI. Saccharomyces Cerevisiae Extract

CAS. 84604-16-0

EINECS. 283-294-5

EUROPE. Compliant

USA. Compliant

CHINA. Compliant

Origin. Yeast/Botanical

Natural Antimicrobial. Leuconostoc/Radish Root Ferment Filtrate*

Preservatives. None

Solvents Used. None

Appearance. Clear to Slightly Hazy Liquid

THE FORMULATION TIPS.

pH Stability. 4 - 7

Temperature Stability. Prevent exposure above 25°C as exposure may cause darkening.

Use Level. 1 - 10%

Ionic State. Anionic

Alcohol Compatibility. Compatible with up to 40% alcohol at 10%

Solubility. Water Soluble

Pro Tips. It is recommended that this product is added to the batch in cooldown to maintain appearance

* 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.

THE BENEFITS OVERVIEW.

Pollution Protection Airborne Pollution Hair Protection Assay



Heat Protection Hirox 3D Imaging



Neo-Cuticle Formation Scanning Electron Microscopy



Heat Protection of Dyed Hair Thermal Protection Assay - Flexabrasion

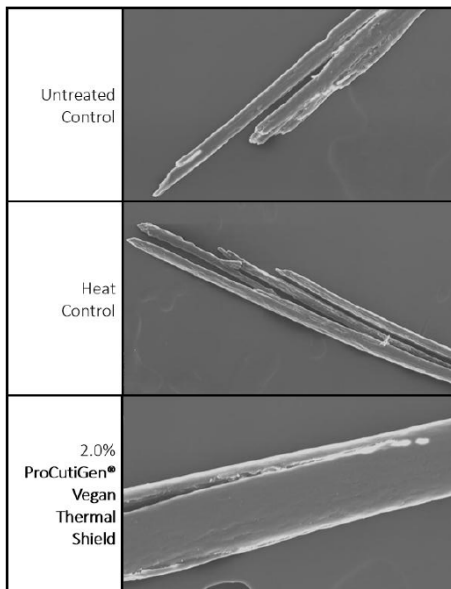


THE EFFICACY.

Neo-Cuticle Formation

Heat styling at high temperatures can significantly damage hair cuticles, leading to brittleness, breakage, and surface irregularities. To assess thermal protection, a Scanning Electron Microscopy (SEM) assay was conducted using virgin human hair tresses treated with either deionized water, 2.0% ProCutiGen® Vegan Thermal Shield, or left untreated. Treated tresses were blow-dried and subjected to repeated passes of a ceramic straightener set to maximum heat, after which hair fibers were imaged by SEM. Surface morphology was qualitatively evaluated to compare cuticle integrity, with preserved smoothness and reduced fragmentation indicating effective thermal protection.

SEM Imaging of Brunette Hair Fibers

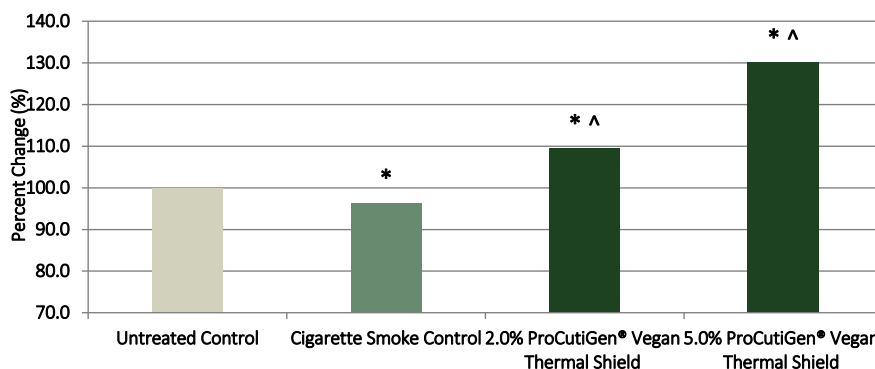


Visually improves cuticle texture against heat

Pollution Protection

An ex vivo Airborne Pollution Hair Protection Assay was conducted to evaluate the ability of ProCutiGen® Vegan Thermal Shield to protect hair fibers from pollution-induced protein oxidation. Virgin human hair tresses treated with water or ProCutiGen® Vegan Thermal Shield (2.0% or 5.0%) were exposed to standardized cigarette smoke in a controlled chamber as a model for severe airborne pollution. Following exposure and shampooing, hair damage was quantified by measuring tryptophan degradation via fluorescence, with decreased fluorescence indicating greater protein oxidation. Preservation of tryptophan relative to untreated and smoke-exposed controls was used as a proxy for protection against pollution-induced hair damage.

Protein Content After Smoke Exposure



Demonstrated +33.7% more tryptophan

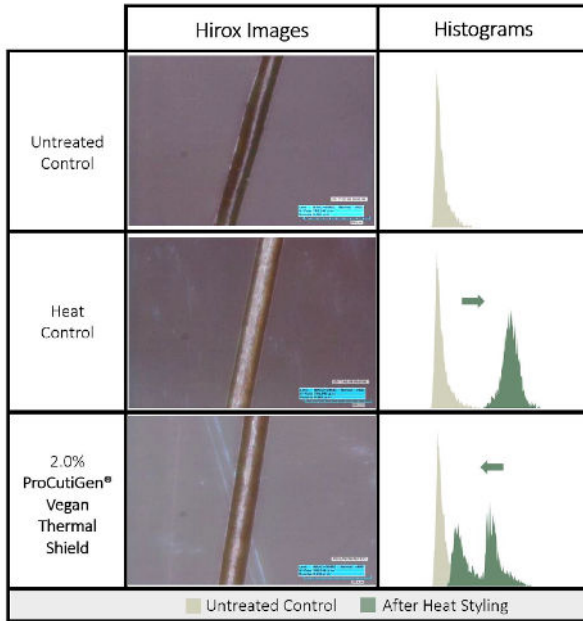
ProCutiGen® Vegan Thermal Shield

THE EFFICACY CONTINUED.

Heat Protection

A Hirox 3D Imaging Analysis was conducted to evaluate the ability of ProCutiGen® Vegan Thermal Shield to protect hair fibers from heat styling damage. Virgin human hair tresses were treated with water or 2.0% ProCutiGen® Vegan Thermal Shield, then blow-dried and flat ironed at 450°F to simulate real-world styling conditions, with an untreated tress serving as a control. Post-styling, hair fibers were analyzed using Hirox 3D microscopy, and damage was quantitatively assessed through image-based light intensity changes. Reduced intensity shifts relative to the heat control indicated preservation of cuticle integrity and effective thermal protection.

Hirox 3D Imaging

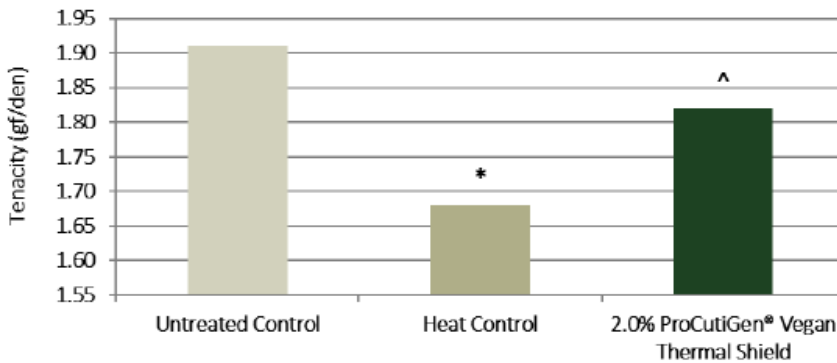


Decreased fiber damage by -18%

Heat Protection of Dyed Hair

A Thermal Protection Flexabrasion Assay was conducted to evaluate the ability of ProCutiGen® Vegan Thermal Shield to preserve hair strength following repeated heat styling. Chemically treated human hair tresses were washed multiple times with either a base shampoo and conditioner or the same system containing 2.0% ProCutiGen® Vegan Thermal Shield, then subjected to high-temperature flat ironing at 450°F. Following styling, individual hair fibers were analyzed using an Instron tensile tester to measure tenacity and elasticity as indicators of fiber strength and resistance to deformation. Maintenance of tensile properties relative to untreated controls indicated effective protection of hair structural integrity under thermal stress.

Tenacity of Dyed Blonde Hair



Increased tenacity by +8%

References:

1. Tinoco, Ana, et al. "Ohmic heating as an innovative approach for the production of keratin films." International journal of biological macromolecules 150 (2020): 671-680.
2. Malinauskite, Ernesta, et al. "Effect of equilibrium pH on the structure and properties of bleach-damaged human hair fibers." Biopolymers 111.11 (2020): e23401.
3. Guyot, Stephane, Eric Ferret, and Patrick Gervais. "Responses of Saccharomyces cerevisiae to thermal stress." Biotechnology and bioengineering 92.4 (2005): 403-409.
4. Boreham, D. R., and R. E. J. Mitchel. "Regulation of heat and radiation stress responses in yeast by hsp-104." Radiation research 137.2 (1994): 190-195.

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