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PHYTOCARE-HA™

Silver Ear Mushroom Extract





SUPER HYDRATING CHINESE HERBAL ACTIVE

INCI NAME:

Tremella Fuciformis Sporocarp (Silver Ear Mushroom) Extract

Applechem is proud to introduce PhytoCare-HA™, the result of melding modern science with the accumulated wisdom from two millenia worth of Chinese herbal medicine.

Enrich your natural formulations with PhytoCare-HA™'s clinically proven performance in:

Moisture Retention

PhytoCare-HA™ holds up to 500 times its own weight of water, creating a natural flexible hydration film on skin that restores the dry skin to its optimally hydrated and supple state, enabling it to develop elasticity and healthy appearance.

Anti-Oxidation Efficacy

PhytoCare-HA™ reduces the peroxidation of cell lipids and spurs the concentration of Super Oxide Dismutase (SOD) in cells. SOD is the body's natural antioxidation enzymes, which break down the superoxide radical into harmless compounds, preventing the ravaging anti-aging effects of free radicals on skin health and appearance.

Anti-Aging Benefit

Because of its strong moisturization and antioxidation properties, PhytoCare-HA™ can significantly relieve the drying and oxidative stresses placed on your skin every day, which helps to slow down the skin aging process to keep it healthy and beautiful.

Film Forming Integrity

Unlike the fermented hyaluronic acid products, the viscoelastic film formed by PhytoCare-HA™ on skin is very flexible and experiences very little shrinkage over time, which translates into better sensory, more substantive moisturizing, and anti-oxidation effectiveness.

Consumer Skin Sensory Appeal

Clinical trials show that more than 60% of testers preferred the light, silky sensory of PhytoCare-HA™ lotions over those made with traditional hyaluronic acid.

Formulation Flexibility, Developmental Cycle Efficiency

PhytoCare-HA™ has stronger tolerance for a wider range of temperature, pH levels, and salt concentration.



THE STORY BEHIND THE CHINESE “SILVER EAR” MUSHROOM

PhytoCare-HA™ is the extracted essence of the tremella fuciformis sporocarp mushroom, otherwise known to the Chinese as “Silver Ear”. It has played a prominent role in Chinese history as a celebrated ingredient in herbal, cosmetic, and culinary applications.

Chinese herbal medicine practitioners have been using Silver Ear mushrooms for the past two thousand years. It is used to treat ailments of the lung, heart, and nervous system.

In the past, Silver Ear mushrooms could only be found in the wild, and was such a rare commodity that only the Chinese noble and royal families could afford its use in soups and desserts.

The Chinese also believed that Silver Ear mushrooms were highly effective in reducing wrinkles and age spots on the skin. Yang Gui Fei, Concubine of Tang Dynasty Emperor Hsuan-Tsung, is considered to be the most beautiful woman in China's storied history. It is said that she ingested Silver Ear mushrooms and used it for both facial and body washes to preserve the storied glow of her alabaster skin.

THE SCIENCE BEHIND PHYTOCARE-HA™

In 2001, a team of distinguished scientists at Shanghai Wenda Biotech Inc in China began a systematic scientific investigation into the versatile Chinese Silver Ear mushroom. These scientists were experts in their respective fields, assembled from a diverse range of horticultural backgrounds: plant cell physiology, plant and pharmaceutical chemistry, Chinese traditional medicine, and botanical science.

They were able to identify the key actives and molecular structure of the Silver Ear mushroom, conducting systematic in-vitro and in-vivo clinical studies to verify both its benefits and safety. They also made great strides in horticultural science, developing the optimum conditions to grow and harvest this rare and unique mushroom on an industrial scale.

PhytoCare-HA™ CG 1M was finally released to the commercial market in 2006. Today, they continue to explore new and creative applications for PhytoCare-HA™ in the cosmetic, skincare, nutraceutical, and pharmaceutical markets.

WHAT IS PHYTOCARE-HA™?

PhytoCare-HA™'s main component is a complex polysaccharide composed of five sugar units - alpha-mannose, beta-glucuronic acid, beta-xylone, fucose, and beta-mannose. Its molecular structure is a polymer backbone comprised primarily of 1,3-mannose sugar monomer, along with many short branches or side chains of xylose and glucuronic acid. The total amount of glucuronic acid within PhytoCare-HA™ comes out to around 20%. By comparison, traditional hyaluronic acid is composed of disaccharide units of glucuronic acid and N-actylglucosamine, with around 50% glucuronic acid. It used to be extracted from rooster crowns, but the technology has advanced to the point where we can now synthesize it through bacterial fermentation.

This difference in chemical composition confers some special benefits of PhytoCare-HA™: forms a more flexible and softer hydration film on skin with preferred sensory, delivers long-term hydration and anti-oxidation benefits, makes it easier to dissolve into water phase, and provides stronger tolerance for a wider ranges of temperature, pH, and salt.

PUTTING PHYTOCARE-HA™ TO THE TEST

The following pages are dedicated to the intensive clinical studies done to validate the strong features and benefits of PhytoCare-HA™. For starters, take a look at the simple experiment below demonstrating how PhytoCare-HA™ can hold up to 500 times its own weight in water!

We prepared a solution of 0.2% PhytoCare-HA™ CG 1M in pure water and poured over a filter paper in a funnel (Fig. 1).

Remarkably, no solution goes through the filter paper under the influence of gravity. In contrast, pure water goes through completely and rapidly. This demonstrates the tremendous power of PhytoCare-HA™ in retaining moisture, which allows it to continuously replenish the moisture barrier covering the upper layers of the skin.

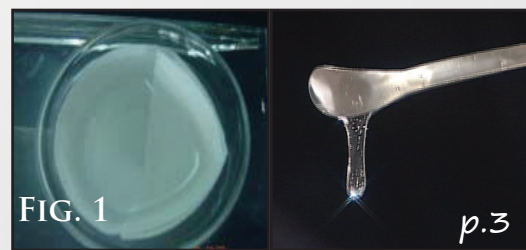


FIG. 1

Comparison of Film Integrity and Flexibility

Fig. 5A shows the films from both PhytoCare™-HA and traditional HA, formed by drying 0.1% solution of each on OHP film. TiO₂ powder was sprinkled over the film to act as a visual aid.

THE RESULTS

There were no visible cracks on the PhytoCare-HA™ film, whereas the traditional HA film sported many cracks and fissures. This clearly illustrates that PhytoCare-HA™ forms a more resilient hydration film, which helps keep your skin properly nourished over longer periods of time.

Fig. 5A Film Integrity of PhytoCare-HA™ vs Traditional HA

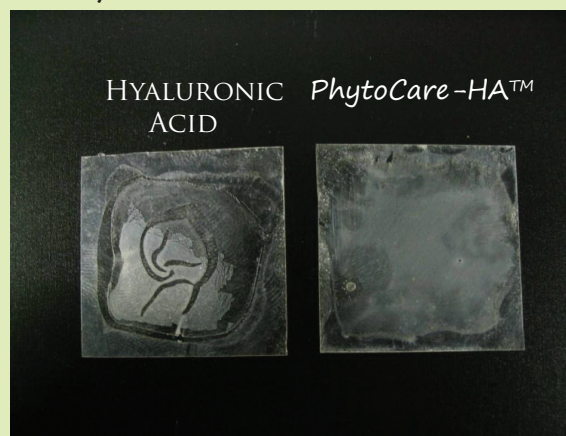
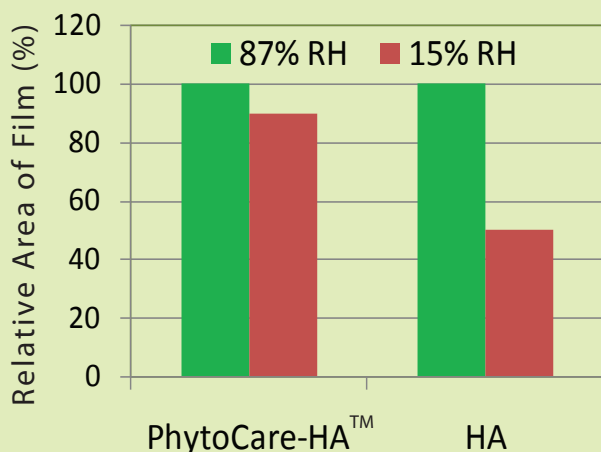


Fig. 5B Film shrinkage comparison



A second investigation was conducted to measure film shrinkage under the stress of drying from 87% relative humidity (RH) to 15% RH, simulating its performance on skin under extreme dry climate conditions. The same films were cast on Teflon instead of OPH plastic, and their areas were measured after 24 hours at 87% RH, and then once more after 8 hours at 15% RH.

THE RESULTS

Fig 5B on the left showed that PhytoCare-HA™ film shrank only by 10% whereas traditional HA film shrank by 50%. This illustrates that PhytoCare-HA™ is intrinsically more flexible than the traditional HA, conforming more easily to skin movement without inducing uncomfortable stress.

This combination of flexibility and film integrity translates to more effective moisture retention underneath PhytoCare-HA™'s hydration film, resulting in better long-term moisturization benefits. This correlates well with the previous clinical skin hydration study.

Consumer Sensory Preference

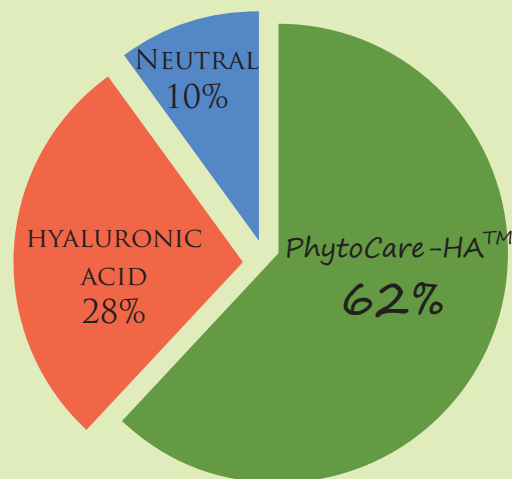
Effective clinical benefits only make up half of the equation when you're trying to build up a loyal and happy customer base. It all comes down to your customers sensory impressions when applying your product to their skin.

To test this, we carried out an in-vivo blind sensory panel test with 13 subjects, using 0.2% aqueous solutions of PhytoCare-HA™ and the traditional HA applied to each side of the face.

THE RESULTS

Results in Fig. 6 show that over 60% of panelists clearly preferred the feel of PhytoCare-HA™ over that of traditional HA. This is due to its superior film flexibility and low shrinkage.

Fig. 6 Consumer Sensory Panel Results



Comparision of Moisture Retention Capacity

A. Skin Treatment Protocol

1. 13 healthy adults were treated twice each day on the forearms with 0.2% aqueous solutions of PhytoCare-HA™ CG 1M and of traditional HA, respectively.
2. This treatment continued for four weeks.
3. Skin hydration was measured by Skincon-200 at day one, two weeks, and four weeks using the protocol detailed below.

B. In-vivo water absorption/desorption protocol (See Figure 2)

1. Mark 2 cm in diameter on the forearm.
2. Wash the forearm mildly in warm water.
3. After conditioning in a 20C/40% relative humidity (RH) room for 30 minutes, measure conductance to obtain Pre-Hydration Value.
4. Place a drop of distilled water over the test area.
5. Right after 10 seconds, blot the site with a gauze and measure conductance immediately, then repeat it every 30 sec for 2 minutes.

Source: Tagami et al, J. Investigative Dermatology, 78, 425 (1982)

The main benefit of sodium hyaluronic acid (HA) is its well-known skin moisturization ability. This four weeks clinical study compares the capacity between Phytocare-HA™ and HA in improving the skin hydration and moisturization. The forearms of 13 healthy adults were treated with 0.2% solutions of Phytocare-HA CG 1M and HA twice each day for four weeks (also see skin treatment protocol above). Their skin hydration condition was measured using the in-vivo water absorption/desorption protocol described above (also see Figure 2) to monitor the improvement from treatment. The pre-hydration skin conductance value measures the amount of moisture in the skin or skin hydration state. The skin conductance integration value (A_w) measures skin's capacity to retain this moisture.

Young and healthy skin has a strong skin barrier that retains high amounts of moisture inside, while aged and dry skin has a weak skin barrier that allows water to evaporate off the skin easily. Therefore, young and healthy skin exhibits high pre-hydration skin conductance values as well as skin conductance integration values.

THE RESULTS

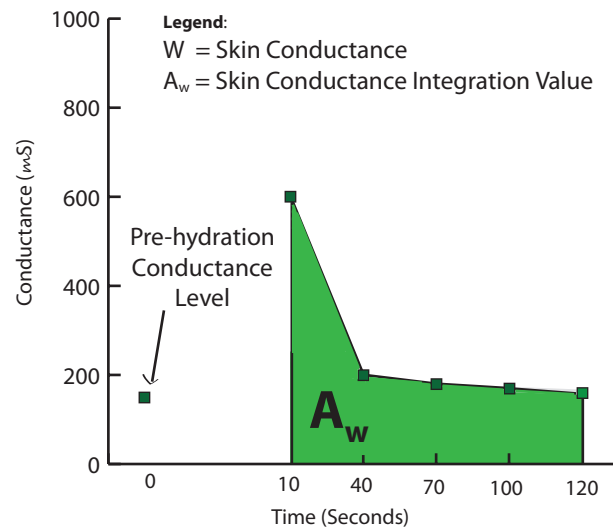
Fig. 3A and 3B show the results of the four-week clinical study. The skin hydration, as indicated by the pre-hydration value, nearly doubled after only two weeks treatment with PhytoCare-HA™, and 2.6 times after four weeks of treatment (Fig. 3A). In other words, the skin became healthier and younger because it retained 2.6 times more moisture from the Phytocare-HA™ CG 1M treatment, whereas the treatment from the traditional HA only improved 1.6 times after four weeks.

The skin's capacity to absorb and retain moisture, as indicated by the skin conductance integration value, also improved about 2.5 times after 4 weeks treatment with PhytoCare-HA™ (Fig. 3B), whereas the traditional HA only improved it by about 1.6 times.

There are a number of possible reasons for PhytoCare-HA™'s superior moisturization performance over regular hyaluronic acid. For one, it's hydration film on the skin is more flexible. Secondly, this film has stronger integrity than HA. This is further illustrated in Fig. 5A and 5B (Page 6).

The results also show that PhytoCare-HA™'s benefit on skin is a cumulative process, gradually improving the optimum skin hydration state where skin cells can differentiate more efficiently to regenerate fresh, healthy and young skin over the long term ; it is not simply limited to a temporary, short-term relief of dry skin.

FIG. 2 IN-VIVO WATER ABSORPTION/DESORPTION PROTOCOL



PhytoCare-HA™
 Sodium Hyaluronate

Figure 3A: Pre-Hydration Level

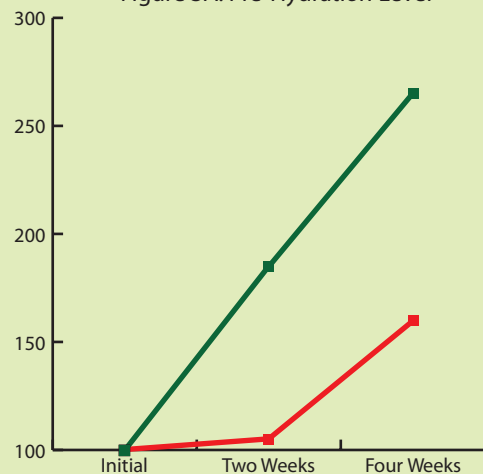
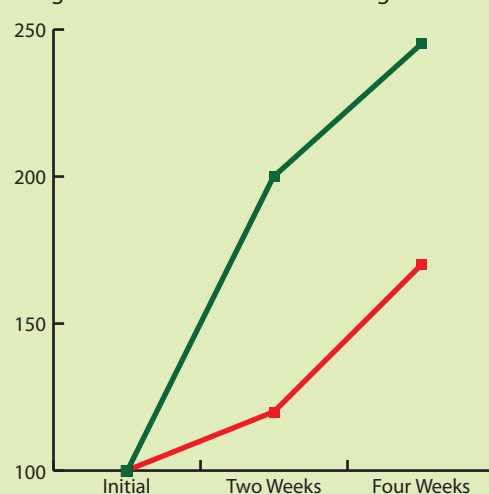


Figure 3B: Skin Conductance Integration Value



Anti-Oxidation and Anti-Aging Benefits

One of the biological processes shared by nearly all lifeforms on Earth is oxidative phosphorylation, a metabolic mechanism that creates the energy needed to keep our bodies functional. However, an unfortunate side effect of this process is the generation of 'superoxide' free radicals that subject our skin cells to increased oxidative stress, which damages the skin lipid, collagen, elastin cells that help keep our skin healthy. Too much oxidative stress results in pre-mature aging symptoms like wrinkles and age spots, and that's even before you factor in environmental exposure to UV rays and toxic chemicals, all of which contribute to the degradation of healthy skin cells.

One of the body's primary ways of combating this stress is to produce a variety of natural anti-oxidants. We conducted the following experiments to explore how PhytoCare-HA™ helps support your body's natural defense mechanisms in its daily battle against oxidative stress.

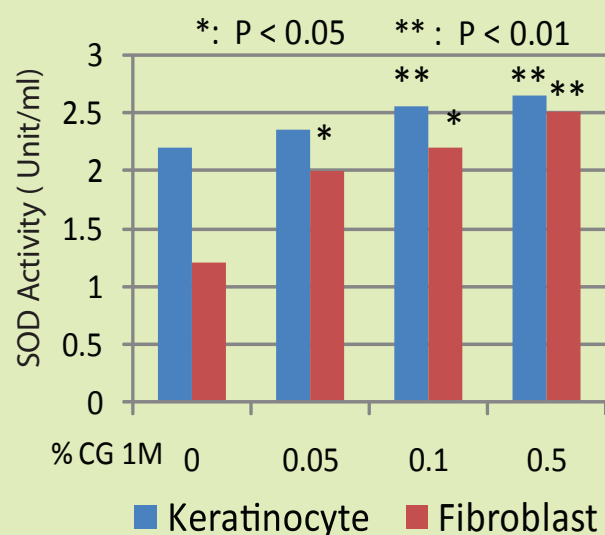
Two in-vitro experiments were conducted by placing specific concentrations of PhytoCare-HA™ in keratinocyte and fibroblast cultures. Keratinocyte cells reside in the epidermis layer of skin; it manufactures keratin (protein microfilaments) and lipids, both of which are important in the formation of a healthy skin barrier. Fibroblast cells reside in the dermis layer of skin; it manufactures both collagen and the extracellular matrix, which help the structural integrity of the skin stay intact.

In-vitro Anti-Oxidation Experimental Conditions:

1. PhytoCare-HA was added into each of the culture mediums of keratinocyte and fibroblast.
2. After cultivating 24 hrs, at 37C in 5% CO₂, measured the Super Oxide dismutase (DOS) activity and Malodialdehyde (MDA) concentration.

THE RESULTS

Fig. 4A Anti-oxidation by enhancing SOD



Malodialdehyde (MDA) is a by-product created by degradation of lipids from superoxide radicals and is highly toxic to cells. It is used as a biomarker to measure the oxidative stress in an organism.

Fig.4B showed that PhytoCare-HA™ CG 1M decreased MDA level in keratinocyte and fibroblast cells significantly at 0.1% and 0.5%, respectively. This result clearly demonstrates that PhytoCare-HA™ has strong anti-oxidation benefits by relieving oxidative stress on skin.

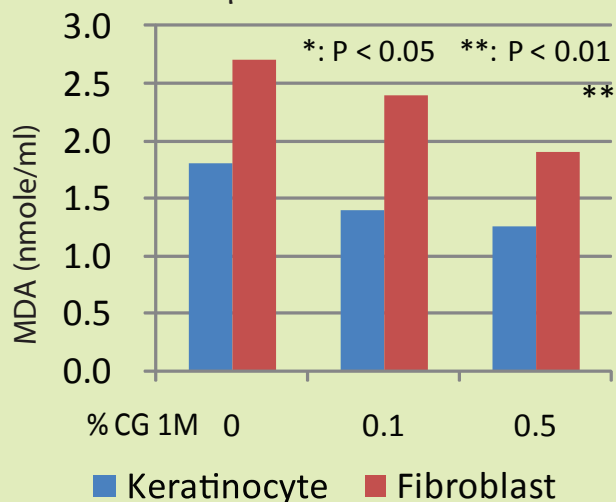
This kind of oxidative stress relief is an important factor in your skin's natural renewal process, especially when it comes to combating premature age-related wrinkles.

Super Oxide Dismutase (SOD) is a natural enzyme in cell that decomposes reactive superoxide radicals into harmless hydrogen peroxide and oxygen. It is one of the most important natural anti-oxidants in body.

Fig. 4A showed that PhytoCare-HA™ CG 1M significantly increased SOD activity in keratinocyte cell culture and fibroblast cell culture at 0.1% and 0.05%, respectively. Higher SOD activity means that PhytoCare-HA™ treatment has helped enhance the cell's self anti-oxidation defense against damage from harmful superoxide radicals.

The mechanism believed to be involved here is that Phytocare-HA complexes the receptors outside the cells, sending a signal into the cells and thereby stimulating its SOC production. Its anti-oxidation action is biological in nature, not chemical.

Fig. 4B Anti-Oxidation by decreasing lipid peroxidation



Safety Profile

PhytoCare-HA™ is very safe in external applications, as well as in oral ingestion. It meets the safety protocols for a wide range of quality control tests, ensuring that this product meets your customer's safety expectations.

All production follows the guidelines for HACCP (Food Safety Management System) and ISO 22000 (Quality Management System). No pesticides were used in the cultivation of the Silver Ear mushroom. Every year, the product has to pass a trace residue test for 434 pesticides through a credited independent laboratory in Japan.

Acute Eye Irritation Test	Non-Irritant
Repeated Patch Insult Test	Non-Irritant and Non-Sensitizer
Pesticide Residue (434 chemicals)	Pass (tested annually)

Range of PhytoCare-HA™ Products

CG 1M	<i>Tremella Fuciformis Sporocarp</i> (Silver Ear Mushroom) Extract	This grade is a powder for cosmetic and personal care products. Its molecular weight is over 1 million.
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Applications

PhytoCare-HA™ delivers multiple benefits critical to consumer beauty and health, and is a wonderful ingredient for both topical and nutraceutical applications. In addition to its unique anti-oxidation benefit, It has better moisture retention, film forming integrity, and skin sensory than the traditional Sodium Hyaluronic Acid. PhytoCare-HA™ is a natural alternative to replace all or part of the sodium hyaluronic acid in the formulation.

In the skin and beauty care market, it has been used in serums, toners, lotions, creams, eye gels, shower gels, facial cleansers, bar soap, foundation, and lipstick. Major brands, such as SK-II in Japan and Oil of Olay in China, have incorporated this unique active in their formulations. In the fast-growing nutraceuticals market, it has been formulated into health foods, drinks, and dietary supplements.

Dosage for topical applications:

1. Phytocare-HA™ CG 1M and 0.5M
2. Phytocare-HA™ CG S1.5

0.02 % to 0.2 % in the total formulation.
1 % to 10 % in the total formulation.



All studies shown in this brochure were provided by Shanghai Huiwen Biotech and Nippon Fine Chemical.

How to use PhytoCare-HA™

PhytoCare-HA™ CG 1M is a water-soluble powder, so it is best incorporated into the water phase of the final products at the beginning of the processing. The recommended procedure is as follows:

1. Blend PhytoCare-HA™ 1M powder and butylene glycol or glycerine together at room temperature
2. Mix it until homogenous (below 50C) with a propeller
3. Add the remaining water phase ingredients, and mix at 50 - 85° C into a homogenous solution
4. Continue with the remaining processes of the normal cosmetic manufacturing.

The powder can also be added directly into the water phase without using butylene glycol or glycerin as a carrier, however, this does slightly increase the processing time. You can then add in other water soluble ingredients, followed by mixing or homogenizing to dissolve it.

Formulation Example

Anti-Aging Moisturizing Cream with Silver Ear Mushroom Extract, 95% Natural SC-F 0010			
#	INCI Name, (Trade Name)	Wt, %	Functions
Phase A			
1	Water	54.60%	Carrier
2	Disodium EDTA	0.05%	Stabilizer
3	Glycerine	3.00%	Skin moisturizer
4	Tremella Funciformis Sporocarp (Silver Ear mushroom) Extract (PhytoCare-HA™ CG 1M)	0.15%	Strong natural moisturizer and natural anti-oxidant
5	Sodium PCA	1.00%	Skin moisturizer
6	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.12%	Thickener
7	5% Veegum HV in aq. solution	7.00%	Thickener
Phase B			
8	Helianthus Annuus (Sunflower) (and) Carthamus Tinctorius (Safflower) Oil (and) Styrene/Butadiene Copolymer (NatureVgel EG 100™)	7.00%	Structure vegetable oil/waxes, providing unique texture/sensory and enhancing stability
9	Cocos Nucifera (Coconut) Oil	4.00%	Natural skin lip and nutrient
10	Helianthus Annuus (Sunflower) oil	1.00%	Natural skin lip and nutrient
11	Limnanthens Alba (Meadowfoam) Oil	1.00%	Natural skin lip and nutrient
12	Simmondsia Chinesis (Jojoba) Seed Oil	1.00%	Natural skin lip and nutrient
13	Butyrospermim Parkil (Shea Butter)	1.00%	Natural skin lip and nutrient
14	Ethylhexyl Palmitate	3.00%	Skin emollient derived from palm tree
15	Dimethicone (50 cP)	2.00%	Skin emollient
16	Cetearyl alcohol	1.50%	Consistency enhancer
17	Glyceryl Stearate (and) PEG-100 Stearate	1.00%	Primary Emulsifier
18	Triethanolamine	0.18%	Neutralizer
19	Tocopheryl Acetate (Vitamin E)	0.10%	Anti-oxidant
Phase C			
20	Water	10.00%	Carrier
21	Sodium Ascorbyl Phosphate	0.2%	Skin whitening active
22	Preservative	Q.S.	Preservative
23	Fragrance	Q.S.	Sensory

Ingredients highlighted in **green** are either natural or naturally-derived.

- Rich, lotion consistency
- Pleasantly silky, light sensory at rub-in, and melt into skin readily.
- Leaves skin feeling soft, supple, moisturized, and substantial.

Processing:

1. Blend ingredients #3, 4, and 6 together in a beaker with a spatula, add #1, 2, and 5, homogenize with Silverson at about 2000 rpm at RT for 10 minutes, and continue mixing at 45C to a homogenous solution.
2. Add #7, and raise the temperature to 70C.
3. Mix #8 – 19 with a propeller at 70-75 C to a homogenous solution.
4. Add Phase B into Phase A while homogenizing at 70-75 C at 3000 - 4000 rpm to form emulsion.
5. Add #20, turn off heat, and continue mixing at low speed down to room temperature
6. Add #21-23 when temperature reaches a 40C.

Features:

1. Viscosity: 21,000 cP at 5 rpm, and pH = 6.5