SALVONA
Unique&Easy Micro-Encapsulation Solutions

Product Overview - 8069-08

Natural HydroSal® Malodor Control (HS MOC)

Advanced Odor Control for a Cleaner, Fresher Life

Natural HydroSal™ Malodor Control (NHS MOC)

An advanced encapsulation system designed for long-lasting, nature-powered odor control.

Natural HydroSal™ Malodor Control uses naturally derived functional ingredients encapsulated within Salvona's HydroSal® system to deliver a rapid and long-lasting malodor neutralization.

Unpleasant body odors are produced by the human body, often as a result of microbial activity on sweat, skin, or secretions. These odors are typically caused by the breakdown of organic compounds by skin bacteria, which release volatile molecules that give rise to the odors.

The unique features of Natural HydroSal® Malodor Control that differentiate it from typical odor-masking solutions include:

1. Natural Active Complex
- Combining natural deodorizing agents that target sulfur, ammonia, and fatty acid-based malodors at the source.

2. Neutralization, Not Masking
- It does not rely on fragrance to mask odors, as it chemically neutralizes odor molecules through enzymatic and binding actions.

3. Advanced Encapsulation Delivery (HydroSal®)
- Allow for controlled release and longer-lasting effect (up to 24 hours).

4. **Skin-Friendly and Mild**
- Water-based, alcohol-free, and gentle for sensitive skin.
- Free from harsh chemicals and heavy masking agents.

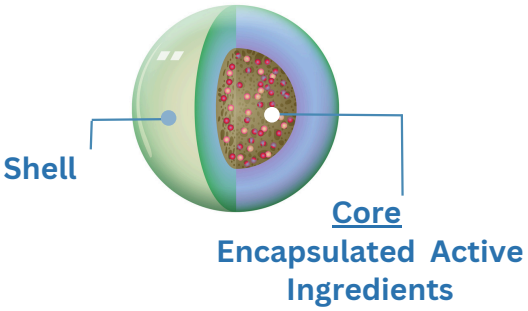

Figure 1: Scheme of Natural HydroSal® Malodor Control

Synergy of Functional Ingredients

- Prevent the formation of malodor at the microbial and chemical levels
- Neutralize existing odor molecules chemically
- Create an environment unfavorable to odor generation
- Deliver both immediate and sustained protection against body odor

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Common Types of Human Malodor

1. Axillary Odor (Underarm Odor):
- Caused by apocrine sweat glands.
- Bacteria (e.g., Corynebacterium, Staphylococcus) break down sweat lipids and proteins into volatile compounds.
- Key odorants: 3-methyl-2-hexenoic acid, sulfur-containing compounds, isovaleric acid.

2. Foot Odor:
- Caused by sweat and bacteria, often Brevibacterium.
- Key odorants: methanethiol, isovaleric acid.

3. Scalp Odor:
- Arises from excess oil/sebum and microbial imbalance.
- Often worsened by poor hygiene or certain fungal overgrowths.

4. Breath Odor (Halitosis):
- Caused by oral bacteria breaking down food particles and dead cells.
- Key odorants: volatile sulfur compounds (e.g., hydrogen sulfide, methyl mercaptan).

5. Genital or Body Fold Odor:
- Warm, moist environments can lead to the overgrowth of bacteria and fungi.
- Odors result from the breakdown of sweat, skin oils, and sloughed cells.

The Problem with Human Malodor

It is primarily social, psychological, and sometimes medical. Here's a breakdown of why it's a concern:

1. Social Impact
- Embarrassment & Stigma: Unpleasant body odor can lead to negative judgment, social avoidance, or ridicule.
- Affects relationships: It can create discomfort in close contact, both personally and professionally.
- Reduced confidence: People with malodor often report lower self-esteem and anxiety in public settings.

2. Psychological Effects
- Self-consciousness: Constant worry about odor can lead to stress, social withdrawal, or the development of obsessive hygiene habits.
- Quality of life: In severe cases (like in trimethylaminuria), it can result in depression or isolation.

3. Hygiene and Health Concerns
- Signals poor hygiene (even if untrue), which can be socially damaging.
- Can indicate health issues, such as:
  - Diabetes (sweet or fruity breath)
  - Infections (e.g., fungal, bacterial)
  - Liver/kidney disorders
  - Metabolic disorders (e.g., trimethylaminuria)

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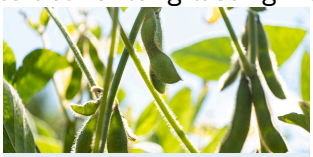
The Functional Ingredients

Natural HydroSal™ Malodor Control uses naturally derived functional ingredients encapsulated within Salvona's HydroSal® system to deliver long-lasting malodor neutralization.



SOYBEAN EXTRACT

Natural Odor Reducer from Soybeans

Soybean extract can help reduce malodor through several mechanisms that target the root causes of odor formation—namely, microbial activity, inflammation, and oxidation.

Soybean Extract Fights Malodor by:

1. Antimicrobial Action
   - Soybean extract contains isoflavones (e.g., genistein, daidzein) that exhibit antibacterial activity, particularly against odor-causing bacteria.
   - Inhibiting bacterial growth prevents the breakdown of sweat into volatile odor compounds.
2. Anti-Inflammatory Effects
   - Soy components reduce irritation and inflammation in sweat-prone areas, helping maintain a balanced microbiome and preventing odor-causing bacterial overgrowth.
3. Antioxidant Properties
   - Soy isoflavones reduce lipid peroxidation, limiting the formation of odor-causing compounds from bacterial reactions.
4. Skin Conditioning
   - Soy proteins hydrate and soothe skin, strengthening the barrier and limiting nutrients for odor-causing bacteria.

BEET EXTRACT

Natural Odor Reducer from Beets

Beet Extract can help reduce malodor through several skin-supporting and odor-neutralizing mechanisms:

1.Antioxidant Protection

Rich in betaines and polyphenols, beet extract reduces oxidative stress on the skin. This helps prevent lipid peroxidation, a key step in forming malodorous compounds.

2. Anti-inflammatory Action

Beet extract soothes irritated skin, reducing inflammation in sweat-prone areas and helping maintain a healthier skin microbiome.

3. Skin Barrier Support

Contains vitamins and minerals (like vitamin C, zinc) that strengthen the skin barrier, reducing breakdown of skin components that bacteria feed on.

4. Mild Antibacterial Properties

Some beet compounds exhibit broad antimicrobial activity, which may suppress odor-causing bacteria like Corynebacterium.

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MICROBIOME

Natural Microbiome Control from Bacteria Components

Bacterial Extracts can help reduce malodor by promoting a balanced skin microbiome and inhibiting the growth of odor-causing bacteria.

1. Microbiome Balancing (Probiotic-like Action)
Certain bacterial lysates or ferments (e.g., Lactobacillus or Bifida ferment) promote the growth of beneficial skin microbes, which outcompete malodor-producing bacteria like Corynebacterium.

2. Antimicrobial Peptides (AMPs)
Some bacterial extracts stimulate the skin's production of natural AMPs, helping defend against odor-causing bacteria.

3. pH Regulation
They can help stabilize skin pH, creating an environment less favorable to malodor-causing microbes.

4. Barrier Function Support
Bacterial extracts may boost skin immunity and barrier repair, reducing irritation and bacterial overgrowth.

PERSIMMON EXTRACT

Natural Odor Eliminator from Persimmon Tannins

Persimmon Extract is effective in reducing malodor due to its natural deodorizing, antibacterial, and antioxidant properties.

1. Odor Neutralization
Persimmon contains tannins, which chemically bind and neutralize odor-causing compounds like ammonia and aldehydes, rather than just masking them.

2. Antibacterial Activity
The extract helps inhibit odor-causing bacteria such as Corynebacterium and Staphylococcus, reducing the microbial breakdown of sweat.

3. Antioxidant Support
Rich in polyphenols and vitamin C, it helps reduce the oxidative degradation of sebum, which contributes to odor formation.

4. Skin Conditioning
Gently tones and conditions the skin, helping maintain a healthy barrier and reducing irritation that can promote malodor.

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The necessity for encapsulation technology to reduce malodor effectively

1. **Prolonged Efficacy**
Encapsulation allows slow, sustained release of actives (e.g., antimicrobials, deodorizers), ensuring odor control lasts for hours, not just minutes.

2. **Triggered Release**
Some encapsulated systems release their contents only when sweat, friction, or humidity is present, right when odor is forming.

3. **Stabilization of Sensitive Actives**
Protects volatile ingredients (like essential oils or tannins) from oxidation and degradation, preserving their efficacy.

4. **Targeted Delivery**
Delivers functional ingredients to specific skin zones (such as underarms, scalp, or feet) and minimizes waste and irritation elsewhere.

5. **Improved Sensory Experience**
Reduces stickiness or greasiness by encapsulating actives in lightweight carriers, improving consumer comfort and feel.

6. **Multifunctionality**
Can combine multiple ingredients (e.g., antibacterial + odor absorber + fragrance) in a single capsule for synergistic action.

The Composition of Natural HydroSal™ Malodor Control

Core Composition: The core is composed of Astragalus Gummifer Gum, a natural polymer matrix that forms the structural base of the microspheres. Within this matrix, several functional ingredients are encapsulated to target malodor:

- Soybean Extract – Antioxidant and antibacterial; helps inhibit odor-causing bacteria.
- Beet Extract – Reduces oxidative stress and supports skin health.
- Persimmon Extract – Rich in tannins; neutralizes malodorous compounds.
- Bacterial Ferment/Lysate – Supports microbiome balance, reducing overgrowth of odor-producing microbes.

The shell is composed of two biodegradable polymers:

- Hydroxypropyl Methylcellulose (HPMC)
- Hydroxypropyl Cellulose (HPC)

These materials form a hydrophilic, film-forming shell engineered to:

- Retain the integrity of the encapsulated functional ingredients over time
- Adhere to the skin, enabling localized and long-lasting action
- Release actives in response to sweating or rubbing, enabling smart, triggered delivery

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Mechanism of Action: Natural HydroSal® Malodor Control

Natural HydroSal® Malodor Control uses a dual-phase encapsulation system—core and shell—to deliver long-lasting odor protection through triggered and sustained release:

1. Triggered Release (On-Demand Activation)

- The outer shell becomes sensitive to moisture and friction after it dries out on the skin. It remains stable under dry conditions but dissolves when exposed to sweat, humidity, or rubbing.
- Upon activation, the shell releases the functional ingr
- r-fighting capabilities precisely when needed, such as during physical activity or in high temperatures.

2. Sustained Release (Long-Term Efficacy)

- The core, made of Astragalus Gummifer Gum, acts as a reservoir that encapsulates and protects natural deodorizing ingredients like soybean extract, beet extract, persimmon extract, and bacterial lysate.
- These ingredients are gradually released over time, even after initial activation, maintaining effectiveness throughout the day.

Benefits

- Prolonged protection from odor
- Reduced need for reapplication
- Enhanced performance compared to conventional deodorants
- Natural, biodegradable system compatible with clean-label formulations

Chemistry of the Functional Ingredients in Natural HydroSal® Malodor Control for Malodor Reduction

Soybean Extract

Soybean extract naturally contains sulfur-containing amino acids and metabolites that may contribute to its odor-neutralizing and antimicrobial effects. While it's not typically known for high sulfur content like garlic or onion, the key sulfur-related compounds in soy include:

Sulfur Compounds in Soybean Extract

1. **Cysteine & Methionin**e
   - These are sulfur-containing amino acids found in soy proteins.
   - They can contribute to redox activity and influence bacterial metabolism.
2. **Sulfhydryl** (-SH) groups in soy proteins
   - Present in the structure of some soy peptides and enzymes.
   - These groups can react with volatile sulfur compounds (e.g., hydrogen sulfide), thereby reducing their volatility.

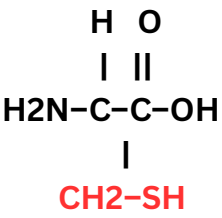

Figure 2: The sulfhydryl (-SH) group interacts with volatile sulfur compounds, helping reduce malodor.

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The Chemistry of Beet Extract

1. Preventing the oxidative breakdown of sweat/sebum
Rich in betalains and polyphenols, beet extract provides vigorous antioxidant activity by neutralizing reactive oxygen species (ROS). This prevents lipid peroxidation of sebum and **reduces the formation of volatile** organic compounds (VOCs) that contribute to body odor.

2. Neutralizing odor-causing sulfur compounds
Reduction of Volatile Sulfur Compounds (VSCs). Betalains can **chemically interact** with malodorous sulfur compounds (e.g., hydrogen sulfide, methyl mercaptan), converting them into less volatile, less odorous forms.

3. Supporting microbiome balance and skin health
Anti-inflammatory Effect. Reduces skin inflammation, which can lead to microbial imbalance and the production of unpleasant odors. A calmer skin environment discourages the overgrowth of odor-causing bacteria.

4. Chelating Activity. Betalains may bind to metal ions (like iron or copper) that catalyze oxidation reactions, thus inhibiting odor-generating chemical processes on the skin.

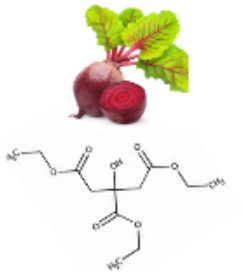

Figure 3: Betain binds to acidic or basic compounds rendering them **odorless**

The Chemistry of Persimmon Extract

Contains high levels of tannins, especially persimmon tannin, which bind chemically to odor molecules (like ammonia and aldehydes), neutralizing them through complexation rather than masking.

1. Odor Binding via Tannins

- Persimmon tannins have multiple hydroxyl (-OH) groups capable of forming hydrogen bonds and complexations with malodorous molecules such as:
  - Ammonia
  - Aldehydes
  - Volatile sulfur compounds (VSCs)
- This results in chemical neutralization, not just masking — the odor molecules are converted into non-volatile, odorless complexes.

2. Antibacterial Activity

- The astringent tannins can also disrupt bacterial membranes, helping reduce populations of odor-causing bacteria (e.g., Corynebacterium).

3. Antioxidant Action

- Persimmon extract contains polyphenols and vitamin C, which inhibit oxidative degradation of sweat and sebum, reducing the formation of VOCs that cause body odor.

Key Chemistry: Persimmon Tannins

- Mainly composed of proanthocyanidins (condensed tannins)
- High molecular weight, rich in galloyl and catechol groups
- Able to bind proteins, ammonia, and sulfur-containing volatiles.

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The Bio-Chemistry of Bacterial Ferment/Lysate

Saccharomyces Ferment Extract helps reduce ammonia, a key contributor to malodor, through biochemical and microbiome-related mechanisms.

1. Enzymatic Degradation of Odor Precursors
- Contains enzymes such as urease and deaminases, which can break down urea and amino acids before bacterial metabolism turns them into ammonia.
- This prevents ammonia buildup on the skin surface.

2. Microbiome Modulation
- Promotes the growth of beneficial skin microbes that do not produce ammonia.
- Suppresses ammonia-producing bacteria (e.g., Corynebacterium), which convert sweat components (like urea, amino acids) into volatile ammonia.

3. pH Balancing Effect
- Helps maintain the skin's acidic pH, which inhibits the enzymatic activity of odor-causing microbes.
- At lower pH, the conversion of nitrogenous waste into ammonia is reduced.

4. Chelation and Binding
- Fermentation by-products may bind or sequester ammonia ions, reducing their volatility and odor.

Synergistic Action of Four Natural Extracts in Malodor Control

1. Saccharomyces Ferment Extract:
- Balances the microbiome to suppress odor-causing bacteria
- Breaks down ammonia precursors enzymatically
- Maintains acidic skin pH, reducing malodor formation

2. Beet Extract
- Rich in betalains and polyphenols with strong antioxidant activity
- Prevents lipid peroxidation, reducing the formation of volatile odor compounds (VOCs)
- Supports skin health and reduces oxidative stress

3. Soybean Extract
- Contains sulfur-containing compounds and isoflavones
- Converts volatile malodor molecules into non-volatile forms
- Exhibits antibacterial activity, disrupting the cell membranes of odor-causing microbes

4. Persimmon Extract
- High in tannins that bind and neutralize ammonia and aldehydes
- Offers antibacterial and antioxidant effects
- Chemically neutralizes malodorous compounds through complexation

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Consumer Evaluation

Blind Panel Study: Odor Neutralization Performance
A double-blind panel study was conducted to evaluate olfactory perception (smell). The model malodor used was 3-methyl-3-sulfanylhexan-1-ol (3M3SH), a sulfurous thioalcohol known to simulate human malodor. The malodor (3 drops) was applied to a thick paper substrate used as a blotter.

Set 1: Evaluation of Natural HydroSal® Malodor Control
Malodor was applied to two separate paper blotters.

- Test blotter: Treated with a solution containing 5% Natural HydroSal® Malodor Control in water.
- Control blotter: No treatment applied.

Set 2: Comparison with Commercial Deodorizer (Febreze)
Malodor was applied to two additional paper blotters.

- Test blotter: Treated with Febreze, a commercially available deodorizing spray.
- Control blotter: No treatment applied.

After 15-30 minutes, panelists ranked the odor intensity on each surface, based on malodor potency.

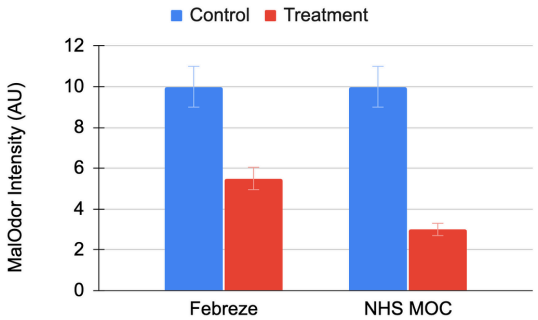

Figure 4: The positive and negative controls were used to establish baselines on a scale from 0-10, with 0 being the negative control and 10 being the positive control.

Results (Figure 3):

1. Natural HydroSal® Malodor Control demonstrated superior performance, achieving an **80% reduction in malodor** compared to the leading commercial deodorizer, Febreze.
2. Consistency, In a blind sensory test (n = 12), panelists' ratings showed a standard deviation of less than 7% of the mean, indicating high consistency among panelists.
3 Rapid Effect: Odor reduction was noticeable within 30 minutes and remained effective throughout the 4-hour test duration.
4. Duration: The experiment was conducted over a total period of 4 hours. The next set of experiments continued for 24 hrs.

Why Instant Malodor Reduction Matters

1. Immediate Trust: Rapid odor control fosters consumer confidence and enhances product credibility.
2. Social Comfort: Prevents embarrassment in everyday situations, especially after sweating, traveling, or exposure to heat.
3. Market Edge: Stands out from slow or fragrance-based products; supports premium positioning.
4. Dual Benefit: Combines instant relief with long-lasting protection for a stronger appeal.
5. First Impression: Delivers a memorable first-use experience, boosting repeat purchase potential.

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Long-term malodor protection

Why Long-Lasting Malodor Protection Matters?

1. Boosts Confidence: Persistent odor affects comfort and social interactions; long-lasting control keeps users feeling fresh all day.
2. Market Differentiation: Extended efficacy signals advanced technology and stands out from short-term solutions.
3. Neutralizes, Doesn't Mask: Technologies like Natural HydroSal® target odor molecules at the source for sustained control.
4. Convenience: Fewer applications improve ease of use and perceived value.
5. Effective in Demanding Conditions: Critical for sports, travel, and heat, where reapplication isn't always possible.

Long-term protection (24-hour).

The malodor intensity was rated over 24 hours in the same setup described earlier (Figure 4)

Natural HydroSal™ Malodor Control performed better than the current industry standard, Febreze, by two points or more in most time points tested.

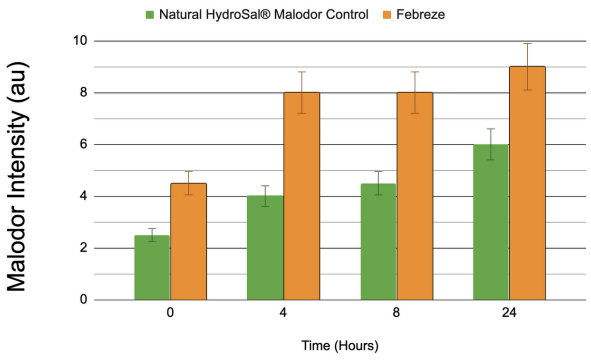

Figure 5: Malodor intensity over 24 hrs.

Masking Base Odors

Many cosmetic bases—especially those containing proteins, botanical extracts, sulfur-containing actives, or fermentation products—can have unpleasant natural odors. These off-notes may negatively affect consumer perception, even if the product is effective.

Natural HydroSal® can entrap and slowly neutralize unpleasant scents such as Sulfur-Based Acne Treatment (Figure 5):

Natural HydroSal® Malodor Control at 5% was incorporated into a colloidal sulfur lotion containing 7.5% sulfur for anti-acne application. In a sensory evaluation (n = 6), participants compared two samples, one with the technology and one without.

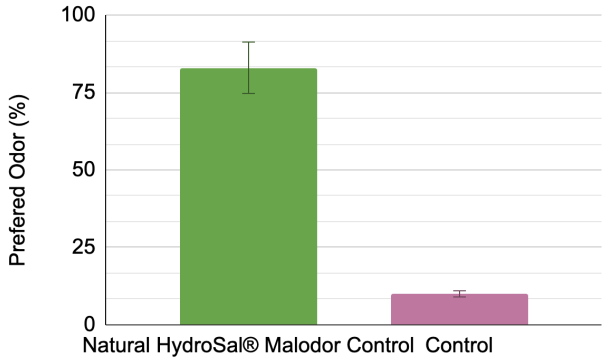

Figure 6: Malodor Coverage over 24 hours

Over 80% of participants reported that the sample containing Natural HydroSal™ Malodor Control had noticeably less sulfur odor than the untreated version.

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Active Deodorizing Complex

Table 1: Functional ingredients and major function

Ingredeint	Function
Beet extract (Triethyl Citrate)	Enzymatically breaks down odor-causing compounds
Saccharomyces Ferment Filtrate	Natural bio-deodorizer; enzymatically degrades ammonia and sulfur-based odorants.
Soyethyl Morpholinium Ethosulfate	Cationic deodorizer; binds and neutralizes negatively charged odor molecules (e.g., thiols, fatty acids).
Diospyros Kaki (Persimmon) Fruit Extract	Rich in polyphenols and tannins that absorb and neutralize malodors, especially sulfur-based compounds.

INCI: Water (Aqua/Eau), Astralagus Gummifer Gum, Propanediol, Glycerin, Triethyl Citrate, Saccharomyces Ferment Filtrate, Soyethyl Morpholinium Ethosulfate, Diospyros Kaki (Persimmon) Fruit Extract, Pentylene Glycol, Hydroxypropyl Methylcellulose, Caprylyl Glycol, Hydroxypropylcellulose, Ethylhexylglycerin, Sodium Benzoate, Potassium Sorbate, Citric Acid

Specifications

Table 2: Specifications of Natural HydroSal® Malodor Control

Property	Characteristic
Appearance at 20 ^{0}C	Clear Liquid
Color	Light Yellow to Yellow
Odor	Odorless to Slight Musky Odor
pH (1% aqueous)	4.0-5.0
Density (g/cm^3)	1.00-1.05

A. **B.** **C.**

Figure 7: Demo kit contains the following items:
A. Simulated Human Malodor
B. Natural Deodorizing Spray w Natural HydroSal® Malodor Control
C. Raw Natural HydroSal® Malodor Control

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Table 3: Deodorizing Lotion containing Natural HydroSal® Malodor Control

INCI	Weight (%)
Water/Aqua	80.0
Glycerin	3.00
Propanediol	3.07
Hydroxypropyl Guar	0.50
Cetearyl Alcohol (AND) Cetearyl glucoside	2.50
Isostearyl Isostearate	2.43
Cocos Nucifera (Coconut) Oil	1.40
Butyrospermum Parkii (Shea) Butter	0.10
Squalane	1.00
Natural HydroSal® Malodor Control	**5.00**
Phenethyl Alcohol (AND) Pentylene Glycol (AND) Propanediol	1.00
TOTAL	100.00

Table 4: Hair Conditioner with Natural HydroSal® Malodor Control

INCI	Weight (%)
Water/Aqua	73.50
Oryza Sativa (Rice) Extract	2.00
Glycerin	3.00
Behentrimonium Chloride	5.00
Cetearyl Alcohol	2.00
Glyceryl Stearate	0.50
Cocos Nucifera (Coconut) Oil	1.00
Squalane	3.00
Argania Spinosa Kernel Oil	1.50
Helieanthus Annuus (Sunflower) Seed Oil (AND) Rosmarinus Officinalis Extract	0.50
Aleurites Molaccanus Seed Oil	2.00
Natural HydroSal® Malodor Control	**5.00**
Phenetyl Alcohol (AND) Pentylene Glycol (AND) Propanediol	1.00

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Soybean Oil	Soybean Oil forms a complex with malodorous organic materials to neutralize them	https://www.ulprospector.com/en/na/PersonalCare/Detail/3476/735968/ColaQuat-SME
Beet Roots	Natural compound from beet roots to neutralize malodor	https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=d91314db4fee58ab6fc9a0f3576c73b37d973b01
Saccharomyces Ferment Extract	Natural Deodorizer that turns volatile material like ammonia into amino acids	https://incidecoder.com/ingredients/saccharomyces-ferment
Human Malodor (3M3SH)	One of the major causes of human malodor	https://pubchem.ncbi.nlm.nih.gov/compound/3-Methyl-2-hexenoic-acid
Malodor Control	Proprietary Blend of Malodor-Reducing ingredients	Salvona
HydroSal™	Proprietary Technology for encapsulation of cosmetic ingredients	Salvona