Comprehensive Safety Assessment of Your Soap Ingredients: A Consumer's Guide

I. Introduction

Purpose of this Report: Understanding Your Soap's Ingredients

This report is designed to provide a clear, evidence-based assessment of the ingredients found in your soap. The objective is to unravel the complexities of the ingredient list, empowering consumers with the knowledge necessary to make informed decisions about the personal care products used daily. The analysis meticulously examines each component against current scientific understanding and regulatory assessments, focusing on its function and safety profile.

How to Interpret the Harm Scale (1-10): A Guide for Consumers

To facilitate a straightforward understanding of ingredient safety, each component has been assigned a "Harm Score" ranging from 1 to 10. A score of 1 indicates "Very Low Concern," meaning the ingredient is widely recognized as safe for topical use in cosmetics, with minimal to no known adverse effects at typical concentrations. Such ingredients often provide beneficial properties to the skin. Scores of 2-3 signify "Low Concern," suggesting the ingredient is generally safe but may rarely cause minor, concentration-dependent irritation or sensitivity in a very small subset of individuals. For the general population, the benefits of these ingredients typically outweigh these minimal risks.

Ingredients scoring 4-6 are categorized as "Moderate Concern." These components have a known potential for irritation or allergic reactions in a noticeable percentage of sensitive individuals, often necessitating regulatory restrictions or specific labeling requirements. Minor environmental concerns may also be associated with ingredients in this range. A score of 7-8 denotes "High Concern," highlighting ingredients with more frequent or severe allergic or irritant potential, or some evidence of systemic effects, such as endocrine disruption or neurotoxicity, even if typically observed at higher concentrations than those found in soap. These ingredients are often subject to significant regulatory scrutiny or warnings. The highest scores, 9-10, are reserved for "Very High Concern," indicating strong evidence of significant toxicity, carcinogenicity, or widespread severe adverse reactions, even at low concentrations. It is important to note that ingredients falling into this highest category are generally heavily restricted or prohibited in regulated consumer products.

This comprehensive scale considers various factors, including direct toxicity,

allergenic potential, irritancy, potential for systemic effects, and, where applicable, environmental persistence that could indirectly impact human health over time.

II. Understanding Common Soap Ingredient Categories

Soap formulations are complex, comprising various ingredient categories, each serving a specific purpose in the product's efficacy, stability, and sensory experience. Understanding these categories helps to contextualize the role of each ingredient.

- **Surfactants & Cleansing Agents:** These are the primary active components in soap, responsible for generating lather and effectively lifting dirt, oil, and impurities from the skin. They function by reducing the surface tension of water, which allows oil and water to mix, enabling impurities to be easily rinsed away.[1] Common examples in soap include Sodium Lauroyl Isethionate, Sodium Palmate, Sodium Isethionate, Cocamidopropyl Betaine, Sodium Palm Kernelate, and Sodium C14-16 Olefin Sulfonate. The careful balance between effective cleansing and mildness is crucial, as some surfactants can potentially be irritating or strip the skin's natural oils.[2]
- **Emollients & Skin Conditioners:** These ingredients are incorporated to soften, smooth, and moisturize the skin, helping to prevent dryness and maintain its natural barrier function.[5] They often achieve this by forming a protective layer on the skin's surface. Examples found in soap formulations include Stearic Acid, Lauric Acid, Cocos Nucifera Fruit Extract, Butyrospermum Parkii (Shea) Oil, and Sine Adipe Lac.
- **Humectants:** Humectants are substances that actively attract and retain moisture from the surrounding environment or from deeper layers of the skin, drawing it into the skin to keep it hydrated and supple.[10] Glycerin and Propylene Glycol are key humectants commonly utilized in soap products.
- **Preservatives:** These ingredients are vital for extending the shelf life of the product by inhibiting the growth of microorganisms such such as bacteria, mold, and yeast. Without preservatives, these microorganisms could spoil the product, compromise its efficacy, and potentially pose health risks to the user.[13] Sodium Benzoate and Benzyl Alcohol are examples of preservatives found in soap.
- **Fragrances:** Added to enhance the product's scent and impart a pleasant aroma to the skin.[15] This category often represents a complex mixture of many chemicals, the specific components of which are usually not individually disclosed on the product label. This lack of transparency frequently makes fragrances a common source of concern for allergies and other potential health issues.[16] The soap in question lists "Fragrance (Parfum/Perfume)" along with specific fragrance components such as Alpha-Isomethyl Ionone, Benzyl Salicylate, Coumarin, Hexyl

Cinnamal, Limonene, and Linalool.

- **Colorants:** These are dyes or pigments incorporated to impart a specific color to the product, thereby enhancing its visual appeal.[18] Many colorants used in cosmetics are synthetic and can be a source of concern for allergic reactions and other health risks. The soap contains various colorants, including CI 15985 (FD&C Yellow 6), CI 19140 (FD&C Yellow 5), CI 17200 (D&C Red 33), CI 14700 (FD&C Red 4), CI 42090 (FD&C Blue 1), and Titanium Dioxide.
- **Other Additives:** This broad category encompasses ingredients that serve diverse purposes, including controlling viscosity, binding components together, chelating (binding metal ions to prevent undesirable reactions), or acting as mild abrasives. Examples in the provided soap formulation include Water (as a solvent), Sodium Stearate (for viscosity and binding), Sodium Chloride (as a thickener and binder), Propylene Glycol (as a solvent), Zinc Oxide (as a pigment and skin protectant), Tetrasodium EDTA (as a chelating agent), and Tetrasodium Etidronate (as a chelating agent and detergent).

III. Detailed Ingredient Analysis and Harm Grading

The following section provides a comprehensive safety assessment for each ingredient identified in your soap. The analysis considers the primary function of each ingredient, its documented safety profile, and relevant research findings to assign a harm score based on the established 1-10 scale.

Key Table: Comprehensive Soap Ingredient Safety Summary

The table below offers a concise overview of all ingredients, their primary function, a brief safety note, and their assigned harm score, allowing for quick reference and an immediate understanding of the soap's safety profile.

Ingredient Name	Primary Function(s)	Concise Safety Note	Harm Score (1-10)
Sodium Lauroyl Isethionate	Surfactant, Cleansing, Foaming	Very mild, safe, non-irritating, biodegradable surfactant.	1
Stearic Acid	Emollient, Emulsifier, Thickener, Binder	Natural fatty acid, widely considered safe, moisturizing.	1
Lauric Acid	Antimicrobial,	Natural fatty acid,	1

	Cleansing, Emollient	safe, anti-bacterial, moisturizing.	
Sodium Palmate	Cleansing, Foaming, Skin Conditioning	Generally safe, but environmental concerns with palm oil sourcing.	3
Water (Aqua/Eau)	Solvent, Hydration	Essential, highly purified, and universally safe.	1
Sodium Isethionate	Surfactant, Gentle Cleansing, Foaming	Mild, safe, biodegradable, maintains skin's moisture barrier.	1
Sodium Stearate	Viscosity Controller, Binder, Cleansing	Generally safe, but can be drying/clog pores at high concentrations.	2
Cocamidopropyl Betaine	Surfactant, Cleansing, Foaming	Generally mild, but a known contact allergen for some individuals.	4
Fragrance (Parfum/Perfume)	Scent Enhancer	Black box: thousands of undisclosed chemicals, common allergen, endocrine disruptor, environmental pollutant.	8
Sodium Palm Kernelate	Cleansing, Foaming	Generally safe, but environmental concerns with palm oil sourcing.	3
Cocos Nucifera Fruit Extract	Skin Conditioning, Emollient, Humectant	Natural extract, safe, non-toxic, highly moisturizing,	1

		anti-inflammatory.	
Butyrospermum Parkii (Shea) Oil	Emollient, Moisturizing, Antioxidant	Natural, highly beneficial, excellent skin compatibility, healing.	1
Glycerin	Humectant, Solvent	Essential, highly effective, overwhelmingly safe, skin barrier support.	1
Sodium Chloride	Binder, Thickener, Preservative	Common, safe, used for texture, stability, and pH regulation.	1
Propylene Glycol	Humectant, Solvent, Penetration Enhancer	Generally safe (GRAS), but known irritant/allergen for sensitive individuals.	4
Zinc Oxide	UV Filter, White Pigment, Soothing	Safe for topical use, non-irritating. Inhalation of nanoparticles is the main concern, but not relevant for bar soap.	2
Tetrasodium EDTA	Chelating Agent, Stabilizer, Foaming	Safe for topical use at low levels, but environmental persistence and manufacturing byproducts (dioxane) are concerns.	5
Tetrasodium Etidronate	Chelating Agent, Detergent	Safe for cosmetic use, but environmental persistence is a concern.	4

Sine Adipe Lac (Skimmed Milk Powder)	Skin Conditioning, Antistatic, Emollient	Natural derivative, safe, low risk, provides moisturizing and soothing benefits.	1
Alpha-Isomethyl Ionone	Fragrance Ingredient	Known fragrance allergen, requires EU labeling above certain concentrations.	5
Benzyl Alcohol	Preservative, Fragrance Ingredient	Generally safe, but potential for irritation, allergic reactions, and severe toxicity (especially for infants).	6
Benzyl Salicylate	Fragrance Ingredient, UV Absorber	Known fragrance allergen (weak sensitizer), suspected endocrine disruptor.	5
Coumarin	Fragrance Ingredient	Known and significant allergen, formerly banned as a food additive.	6
Hexyl Cinnamal	Fragrance Ingredient	Common fragrance allergen, can trigger reactions in sensitive individuals.	5
Limonene	Fragrance/Flavoring Agent	Common fragrance allergen, oxidized forms are more sensitizing.	5
Linalool	Fragrance Ingredient	Common fragrance allergen, despite some beneficial properties.	5

Dipropylene Glycol	Solvent, Humectant, Penetration Enhancer	Generally safe, non-toxic, but can cause contact dermatitis in some.	3
Sodium Benzoate	Preservative, Anti-inflammatory	Potential for benzene formation with Vitamin C, irritant/allergen.	6
Sodium C14-16 Olefin Sulfonate	Surfactant, Cleansing, Foaming	Milder than some sulfates, but irritant at high concentrations, sensitization from impurities.	4
CI 15985 (FD&C Yellow 6)	Cosmetic Colorant	Synthetic dye with links to allergy, endocrine disruption, neurotoxicity, and trace carcinogens.	7
CI 19140 (FD&C Yellow 5)	Cosmetic Colorant	Synthetic dye, common allergen, particularly for asthmatics.	6
CI 17200 (D&C Red 33)	Cosmetic Colorant	Synthetic dye with documented allergenic potential.	5
CI 14700 (FD&C Red 4)	Cosmetic Colorant	Synthetic dye, formerly banned as food additive, specific FDA restrictions.	6
CI 42090 (FD&C Blue 1)	Cosmetic Colorant	Synthetic dye with links to neurotoxicity, developmental issues, and potential carcinogenicity.	7

Titanium Dioxide (CI 77891)	White Pigment, UV Filter	Safe and beneficial topically. Inhalation of nanoparticles is the main concern, not relevant for bar soap.	3

Individual Ingredient Analysis

Sodium Lauroyl Isethionate

This ingredient primarily functions as a surfactant, a cleansing agent, and a foaming agent in cosmetic products. It also contributes to hair and skin conditioning and possesses antistatic properties.1 It is widely recognized for its mildness, often highlighted as a gentle alternative to more commonly known surfactants like sodium cocoyl isethionate.23 Derived from coconut, it produces a rich, luxurious foam and leaves a refined after-feel on the skin. Its excellent water solubility ensures easy rinsing.23

From a safety perspective, Sodium Lauroyl Isethionate is considered highly safe. The Cosmetic Ingredient Review (CIR) Expert Panel has deemed it safe for use in personal care products at concentrations up to 10.1%, provided the formulation is non-irritating.[23] It holds an Environmental Working Group (EWG) score of 1, signifying it as very safe, non-toxic, non-irritant, and biodegradable.[23] The ingredient is formed through the esterification of lauric acid (from coconuts) and sodium isethionate.[23] While the name can sometimes be confused with Sodium Lauroyl Methyl Isethionate (SLMI), both are closely related and share very similar, highly favorable safety profiles. The consistent scientific assessment of its mildness and safety, coupled with its biodegradability, positions it as a low-concern ingredient.

Stearic Acid

Stearic Acid is a versatile, saturated long-chain fatty acid that serves multiple crucial roles in soap formulations. It acts as an emollient, softening and moisturizing the skin, and functions as an emulsifier, helping to bind oil and water components to create smooth, creamy textures.5 Additionally, it works as a thickener and binder, ensuring the structural integrity of solid products like soap bars.6 It also possesses moisturizing and anti-inflammatory properties that contribute to skin health.6

This ingredient is widely considered safe for human contact in skincare and personal care products.[5] It is derived from both animal fats and plant oils, with palm oil being a common sustainable source.[5] Stearic Acid is generally well-tolerated by all skin types, though a patch test is always recommended before widespread use.[6] Its fundamental contribution to the physical form of the soap, preventing it from crumbling, combined with its beneficial effects on skin hydration and texture, makes it a highly valuable and safe component.

Lauric Acid

Lauric Acid is a saturated fatty acid commonly found in natural sources such as coconut oil and palm kernel oil.7 In cosmetics, it functions as an antimicrobial agent, a cleansing agent, an emollient, and an emulsifier.24 It is particularly recognized for its potent anti-bacterial and anti-inflammatory properties, which can help in treating skin conditions like psoriasis and reducing acne-causing bacteria.7 Beyond cleansing, it moisturizes, repairs, and promotes the regeneration of new skin cells, aiding in wound healing and reducing signs of aging by improving skin hydration.7

Lauric Acid is considered safe for cosmetic use when applied topically.[24] It is well-tolerated by the skin and is not known to be toxic at typical usage levels.[24] Its active role in combating bacteria and inflammation, coupled with its moisturizing and healing benefits, means it contributes significantly to skin health rather than merely being a neutral component. This natural ingredient offers a holistic approach to skin care within the soap formulation.

Sodium Palmate

Sodium Palmate is the sodium salt of fatty acids derived from palm oil, produced through a process called saponification.25 It is a foundational component in bar soaps, responsible for their foaming, cleansing, and emulsifying properties, and contributes to the soap's hardness and cleansing ability.25 It effectively breaks down oils, dirt, and impurities on the skin, allowing them to be washed away, and creates a rich foam.25

In terms of direct human safety, Sodium Palmate is generally considered non-toxic and safe for use in cosmetics and personal care products, with a long history of use.[25] It is recognized as a skin-friendly ingredient and contains moisturizing properties that help condition the skin, making it feel smooth and soft after use.[25] However, a significant consideration for Sodium Palmate is its origin from palm oil. While palm oil is a natural and renewable resource, its production can be associated with deforestation and habitat destruction if not sourced responsibly.[25] For this reason, choosing products that use Certified Sustainable Palm Oil (CSPO) is important for environmentally conscious consumers.[25] The Environmental Working Group (EWG) notes "data gaps" for concerns like cancer, allergies, and developmental/reproductive toxicity, and lists it as "restricted" for EWG VERIFIED products without adequate substantiation.[26] This restriction often relates to sourcing ethics rather than direct toxicity. The broader environmental and ethical implications of its sourcing, rather than direct bodily harm, contribute to its overall consideration.

Water (Aqua/Eau)

Water, listed as Aqua/Water/Eau, is the most widely used and fundamental ingredient in cosmetic products, often appearing as the first ingredient due to its high concentration.27 Its primary function is as a universal solvent, allowing various ingredients, including thick oils and butters, to combine and form stable lotions, creams, and other formulations.28 In rinse-off

products like soap, it can constitute a significant portion of the product, sometimes up to 95%.28

From a safety standpoint, water is one of the safest ingredients used in cosmetics.[28] To ensure purity and prevent the introduction of contaminants, only distilled or deionized water, which is a highly purified variant, is used in the cosmetic industry.[28] While water itself is safe, it is worth noting that excessive and prolonged exposure to water can temporarily disrupt the skin's essential surface layers, leading to effects like the "pruning" of fingers and toes.[27] However, this is a physiological effect of prolonged hydration, not an indication of ingredient toxicity. The meticulous purification of water for cosmetic use is a critical quality control measure that ensures the overall safety and stability of the final product.

Sodium Isethionate

Sodium Isethionate is a mild, anionic surfactant derived from isethionic acid and sodium salts, often sourced from coconut.2 It is highly valued for its gentle cleansing properties, making it particularly suitable for sensitive skin and even baby care formulations.2 This ingredient contributes to a rich, creamy lather without the harshness often associated with traditional sulfates, thereby minimizing skin irritation and helping to maintain the skin's natural moisture barrier.2

The safety profile of Sodium Isethionate is excellent. It is considered a mild, soap-free cleansing agent that effectively cleanses while being less likely to disrupt the skin's natural oils.[2] The Cosmetic Ingredient Review (CIR) has deemed it safe for use in personal care products when formulated to be non-irritating.[29] Furthermore, it is readily biodegradable, aligning with environmentally friendly practices.[2] Its ability to cleanse effectively while actively supporting the skin's moisture barrier makes it a highly beneficial and low-risk component in soap formulations.

Sodium Stearate

Sodium Stearate is the sodium salt of stearic acid, typically produced through the saponification of fatty acids from vegetable oils or animal fats with sodium hydroxide.30 In the cosmetic industry, it serves as a viscosity controller and texture enhancer, helping to formulate products with desirable consistency.30 It also functions as a fine cleansing agent, mixing well with water to wash away dirt, and acts as an emulsifier and binder, stabilizing formulations and providing structure to solid products like bar soaps.30

Generally, Sodium Stearate is considered safe for topical application when used within recommended concentrations, typically ranging from 0.5% to 20%.[30] It has low acute toxicity.[31] However, if not formulated properly or used at higher concentrations, it can potentially be drying for the skin and may leave a residue that could clog pores.[30] A patch test is recommended before widespread use, especially for individuals with sensitive skin.[30] The functional importance of Sodium Stearate in providing structure to the soap, coupled with its potential for minor adverse effects if concentration or

formulation is not optimized, highlights the critical role of precise cosmetic chemistry.

Cocamidopropyl Betaine (CAPB)

Cocamidopropyl Betaine (CAPB) is a widely used surfactant and cleansing ingredient known for its ability to create foam and provide a gentle cleansing action.4 It is commonly found in shampoos, conditioners, bar soaps, and facial cleansers due to its mild nature.32 Regulatory organizations such as the FDA and the European Chemicals Agency (ECHA) have assessed its safety and determined it to be safe for use in cosmetics and personal care products.4 CAPB is also biodegradable and derived from renewable resources, making it a more environmentally friendly option compared to some other surfactants.4

Despite its general classification as a mild ingredient, CAPB is a known contact allergen for a subset of the population.[4] Studies have indicated a diagnosis rate of 6% in an Australian population of individuals suspected to have allergic contact dermatitis.[32] Symptoms of an allergic reaction can include a red rash, itching, swelling, and vesicles or blisters, typically developing where skin contact has occurred, often on the face and hands, and may include eye irritation.[32] Factors such as individual sensitivity, the concentration of CAPB in the product, the overall product formulation, pH, and product residue left on the skin can influence its irritancy potential.[4] While not a carcinogen and designed to cleanse without stripping the skin's natural oils, its documented allergenic potential for a noticeable portion of the population means it requires careful consideration and awareness for sensitive individuals.

Fragrance (Parfum/Perfume)

"Fragrance," often listed as "Parfum" or "Perfume," is added to cosmetic products to enhance their smell and impart a pleasant aroma to the skin.16 This single term, however, can represent a complex proprietary mixture of over 3,500 undisclosed chemicals.16 This lack of transparency is a significant concern for consumers, as it prevents them from identifying specific problematic components.

Many of the synthetic chemicals used in fragrances are derived from fossil fuels and can release volatile organic compounds (VOCs) into the air, contributing to air pollution.[15] These chemicals can also leach into soil and water systems upon disposal, potentially harming wildlife and disrupting ecosystems.[15] From a human health perspective, certain fragrance ingredients are known to be toxic. Some are phthalates, which can disrupt the hormone system, while others, like styrene, are linked to cancer.[16] Fragrance chemicals are a very common cause of allergic reactions in both children and adults.[16] The FDA does not require companies to disclose individual fragrance components, nor does it review them before they are put into use, leaving regulation largely to industry trade groups.[16] Even products labeled "unscented" may contain masking agents that conceal the scent of allergenic chemicals.[16] The combination of potential health harms, significant environmental impact, and a profound lack of transparency makes "Fragrance" one of the highest concern

ingredients in personal care products.

Sodium Palm Kernelate

Sodium Palm Kernelate is a sodium salt derived from palm kernel oil, which comes from the kernel or seed of the oil palm.33 It functions as a soap base and a cleansing agent, contributing to the foaming and cleaning properties of the product.

This ingredient has a long history of safe use as a cosmetic ingredient and is generally considered safe for topical application.[34] Similar to Sodium Palmate, the primary broader considerations for Sodium Palm Kernelate relate to the environmental and ethical implications of palm kernel oil sourcing. Unsustainable palm oil production can lead to deforestation and habitat destruction. Many manufacturers, such as Tom's of Maine, are committed to procuring palm oil and its derivatives certified by the Roundtable on Sustainable Palm Oil (RSPO) or equivalent standards to address these concerns.[34] The Environmental Working Group (EWG) notes "data gaps" for potential concerns like cancer, allergies, and developmental/reproductive toxicity, and lists it as "restricted" for EWG VERIFIED products without adequate substantiation.[33] This restriction often reflects higher internal standards related to sourcing rather than direct human toxicity. While directly safe for the body in topical use, the broader environmental and ethical footprint of its production is a relevant consideration for informed consumers.

Cocos Nucifera Fruit Extract

Cocos Nucifera Fruit Extract, or Coconut Fruit Extract, is a highly beneficial ingredient derived from the fruit of the coconut tree.8 It is rich in skin-conditioning fatty acids, proteins, and complex B vitamins, which contribute to its excellent emollient and hydrating properties.8 It functions as a skin conditioning agent, emollient, humectant, and hair conditioning agent, and also offers anti-inflammatory, antibacterial, anti-aging, and antidandruff benefits.8 It helps to hydrate, soften, and protect the skin, promoting healing and reducing irritation.8

This extract is considered a safe and non-toxic ingredient with virtually no known side effects.[8] It is notably mild and non-irritating, making it particularly suitable for dry and sensitive skin.[8] Its ability to support cell growth, improve skin elasticity, and reduce skin roughness further enhances its value in cosmetic formulations.[35] The diverse range of proactive benefits it offers for both skin and hair, coupled with its excellent safety profile, highlights a trend towards incorporating natural, multi-functional botanical ingredients in personal care products.

Butyrospermum Parkii (Shea) Oil

Butyrospermum Parkii Oil, commonly known as Shea Oil or Shea Butter, is a natural moisturizer widely used in cosmetics and personal care products.9 It is composed of fatty acids, triglycerides, resinous esters, and is a rich source of antioxidants (including quercetin and epicatechin gallate) and vitamins A, D, and E.9 Its primary functions include acting as an

emollient, moisturizing, skin conditioning, and viscosity controlling agent.9
Shea oil is considered safe for topical use and is highly beneficial for the skin. It possesses softening, smoothing, soothing, and healing properties, making it ideal for dry, mature, irritated, and flaky skin, as well as skin suffering from eczema.[9] It naturally regulates the skin's moisture and strengthens the lipid barrier of the stratum corneum, protecting the scalp and skin against external aggressions.[36] The comprehensive profile of shea oil, including its nutrient richness and active contribution to skin repair and protection, positions it as a highly valuable and safe ingredient.

Glycerin
Glycerin, also known as glycerol, is a sugar alcohol widely recognized as the most effective humectant.10 It is a common ingredient in pharmaceuticals, food products, and personal care items, and is approved by the U.S. Food and Drug Administration (FDA) as Generally Recognized As Safe (GRAS).10 In cosmetics, it is the third most frequently used ingredient.10 Its primary function is to attract and retain moisture, drawing water to the surface of the skin and hair to keep them smooth and hydrated.10 It also helps protect the skin from irritants and can enhance the skin's ability to absorb moisture.11
While overwhelmingly safe and beneficial, rare cases of allergic reactions, such as skin rashes, have been reported, and patch testing is recommended for individuals with known sensitivities.[11] Glycerin's crucial role in enhancing the skin's natural moisture retention and improving the structure of the stratum corneum is particularly important in cleansing products. This property helps to counteract the potential drying effects of surfactants, contributing to the overall gentleness and skin-friendly nature of the soap formulation.

Sodium Chloride
Sodium Chloride, commonly known as table salt, is an ionic compound that serves as a multifunctional ingredient in cosmetics and personal care products.37 In soap, it acts as a binder, helping to hold other ingredients together, and as a thickener, controlling the product's viscosity to achieve the desired consistency.37 It also possesses antiseptic, hygroscopic, and astringent properties, and can function as a preservative and pH regulator.38
This ingredient is generally recognized as safe (GRAS).[37] Its ability to regulate viscosity is crucial for the aesthetic and functional consistency of the soap, ensuring it has the right texture and does not flow excessively.[38] It also helps stabilize formulations, preventing separation or crystallization of ingredients over time.[38] While seemingly a simple additive, its technical roles in maintaining product quality and user experience are significant, making it a valuable and safe component in the formulation.

Propylene Glycol
Propylene Glycol is a virtually colorless and odorless liquid used across various industries, including cosmetics, pharmaceuticals, and food.12 In skincare, it functions as a humectant,

retaining water on the skin and helping to renew its protective barrier, which is particularly beneficial for conditions caused by a damaged barrier, such as eczema.39 It also acts as a solvent and can enhance the penetration of other active ingredients into the skin's superficial layer, making products more effective.12

The U.S. Food and Drug Administration (FDA) has given Propylene Glycol the Generally Recognized As Safe (GRAS) mark, and it is considered non-toxic, non-carcinogenic, and does not damage genes or affect fertility or reproduction at typical cosmetic concentrations.[39] A common misconception is its confusion with ethylene glycol, a highly toxic substance used in antifreeze; however, these are distinct compounds.[39] Despite its general safety, contact with Propylene Glycol can irritate the skin and eyes, and prolonged or repeated contact may cause a skin rash, dryness, and redness.[40] Allergic contact dermatitis is possible in a small percentage of sensitive individuals, especially those with sensitive skin or when applied to mucous membranes.[39] While its role as a permeation enhancer can be beneficial for active ingredients, it also means it could theoretically enhance the absorption of less desirable compounds if present in the formulation. Its overall safety is high for most users, but awareness for sensitive individuals is important.

Zinc Oxide

Zinc Oxide (ZnO) is a white, powdery inorganic mineral known for its protective and purifying properties.41 In cosmetics, it primarily functions as a white pigment, an opacifying agent, and a physical sunscreen that reflects UVA and UVB rays, rather than absorbing them.22 It also possesses anti-inflammatory, astringent, and drying properties, making it useful for soothing irritated skin.41

The FDA recognizes Zinc Oxide as Generally Recognized as Safe and Effective (GRASE) for use in sunscreens at concentrations up to 25%.[41] It is considered non-risky for skin sensitivity and is gentle enough for sensitive skin, rarely causing stinging around the eyes.[22] Micronized forms, commonly used in sunscreens, do not penetrate healthy skin.[22] The primary health concerns associated with Zinc Oxide arise when it is in a breathable or inhalable form, such as in aerosols, due to potential harmful effects of nanoparticles on the respiratory system.[22] However, for a bar soap, the risk of inhalation is minimal, making these concerns largely irrelevant for this product type. Its topical benefits and established safety in solid formulations make it a valuable ingredient.

Tetrasodium EDTA

Tetrasodium EDTA (Ethylenediaminetetraacetic Acid) is a water-soluble chemical primarily used as a chelating agent in cosmetics.44 It has the unique ability to capture and strongly bind to metal ions (such as calcium and magnesium), preventing them from reacting negatively with other ingredients in the product.44 This function helps to increase the effectiveness of preservatives and antioxidants, stabilize colors, improve foaming power, and

soften water.44

For consumer health, Tetrasodium EDTA is generally deemed safe for cosmetic use in Europe, as its structure and physicochemical properties suggest it does not penetrate the skin.[45] It is not considered a skin irritant or allergen at the low concentrations typically incorporated into conventional cosmetic formulas.[45] The FDA has approved its use within certain limits.[44] However, there are significant considerations. Its manufacturing process involves known carcinogens like formaldehyde and sodium cyanide, and dioxane, also a known carcinogen, can be a byproduct.[44] Studies have also indicated that Tetrasodium EDTA can make the skin's protective barrier more fragile, potentially increasing the absorption of other chemicals into the skin and even other bodily systems.[44] While lab specimens have not developed cancer after exposure, high oral doses in lab settings have caused negative reproductive and developmental reactions.[44] It can also irritate the eyes.[44] From an environmental standpoint, Tetrasodium EDTA and its salts are not biodegradable and can accumulate in aquatic ecosystems, where they bind to heavy metals and disrupt biological balance.[44] This lack of biodegradability is why it is not allowed in certified organic cosmetics.[45] The combination of manufacturing concerns, potential for enhanced skin penetration of other substances, and significant environmental persistence elevates its overall concern level despite its direct topical safety at low concentrations.

Tetrasodium Etidronate

Tetrasodium Etidronate functions as a chelating agent and a detergent in cosmetic formulations.46 Similar to Tetrasodium EDTA, it helps to bind metal ions, contributing to product stability and performance.

The Cosmetic Ingredient Review (CIR) Expert Panel has assessed the safety of Tetrasodium Etidronate and concluded it is safe for use in cosmetics at the concentrations and practices described in their safety assessment.[46] It is reported to be used in baby products.[46] However, the European Union Ecolabel program reports that this substance is persistent in the environment and is not anaerobically degradable.[47] While it has low chronic toxicity to aquatic life, it exhibits moderate acute toxicity to aquatic life, particularly in household cleaner formulations.[47] Warnings regarding it being harmful if swallowed and causing skin/eye irritation are typically associated with its use in more concentrated forms, such as household cleaners, rather than the lower concentrations found in cosmetics.[47] The environmental persistence of this ingredient is a notable concern, despite its deemed safety for cosmetic use.

Sine Adipe Lac (Skimmed Milk Powder)

Sine Adipe Lac, also known as defatted dried milk or nonfat dry milk, is a milk derivative typically found in powdered form.48 In cosmetics, it primarily functions as a skin conditioning

agent and an antistatic agent.48 It also acts as an emulsifier, emollient, and humectant, helping to enhance the texture of formulations and provide a moisturizing effect.49 The proteins and minerals in skimmed milk contribute to maintaining skin moisture, preventing dryness, and offering soothing properties, making it useful for sensitive or irritated skin.48 This ingredient is considered safe for use in cosmetic formulations and has been extensively tested for safety.[48] The Environmental Working Group (EWG) provides a low risk score for Sine Adipe Lac, indicating it is unlikely to cause harm.[48] It is soluble in water, making it easy to incorporate into various formulations to create smooth, uniform products.[48] Its natural origin and multiple beneficial properties for skin and hair health, combined with its excellent safety profile, position it as a very low-concern ingredient.

Alpha-Isomethyl Ionone

Alpha-Isomethyl Ionone is a fragrance ingredient, typically appearing as a colorless or pale straw-colored liquid.50 It is used in a wide range of personal care products, including aftershave lotions, bath products, hair care products, moisturizers, and perfumes.50 While the Food and Drug Administration (FDA) has approved its use as a flavoring agent for direct addition to food, its safety in fragrances is subject to specific restrictions.[50] The International Fragrance Association (IFRA) Standard restricts its use in fragrances due to its potential for sensitization.[50] In Europe, Alpha-Isomethyl Ionone is included on the list of "allergenic" substances, requiring manufacturers to indicate its presence on ingredient lists if its concentration exceeds 0.001% in leave-on products or 0.01% in rinse-off products.[50] Skin contact is required for it to cause a rash, and discontinuation of exposure typically leads to improvement.[51] As a known fragrance allergen, it can cause reactions in susceptible individuals, highlighting the importance of ingredient disclosure for those with sensitivities.

Benzyl Alcohol

Benzyl Alcohol is an organic compound commonly used in cosmetics and personal care products primarily as a preservative and a fragrance ingredient.52 It helps to prevent microbial growth, thereby extending product shelf life.

While generally considered safe for use, exposure to Benzyl Alcohol can cause several adverse effects.[52] One of the primary concerns is skin irritation, which can manifest as redness, itching, and swelling, potentially leading to dermatitis or eczema, particularly in individuals with sensitive skin or allergies to the compound.[52] Inhalation of Benzyl Alcohol, especially in occupational settings, can lead to respiratory issues such as coughing, wheezing, and shortness of breath.[52] Direct contact with the eyes can cause irritation, redness, and a burning sensation.[52] Ingesting Benzyl Alcohol can be toxic, leading to symptoms like nausea, vomiting, dizziness, headache, and in severe cases, respiratory failure and central nervous system depression.[52] Of particular

concern is its link to "gasping syndrome," a potentially fatal condition in infants and young children, leading to its discouragement in pediatric medications and products.[52] Allergic reactions, though relatively rare, can occur and range from hives and swelling to severe, life-threatening anaphylaxis.[52] Chronic exposure may also affect the nervous system.[52] The broad spectrum of potential adverse effects, from common irritation to severe systemic reactions, especially for vulnerable populations, elevates its concern level despite its widespread use as a preservative.

Benzyl Salicylate

Benzyl Salicylate functions as a fragrance ingredient, contributing to the scent of a product and perfuming the skin.17 It also acts as a UV absorber, protecting the cosmetic product itself from damage caused by ultraviolet light.17

The FDA has approved Benzyl Salicylate as a flavoring agent for direct addition to food.[54] However, the International Fragrance Association (IFRA) Standard restricts its use in fragrances due to its potential for sensitization.[17] In Europe, it is included on the list of "allergenic" substances, requiring labeling when its concentration exceeds 0.001% in leave-on products or 0.01% in rinse-off products.[17] It is classified as a "weak sensitizer," meaning it can induce and elicit allergies.[17] Beyond its allergenic potential, Benzyl Salicylate is also suspected of being an endocrine disruptor and is currently undergoing re-evaluation by European experts for a scientifically sound assessment of this potential.[17] American experts, however, have deemed it safe for use at the concentrations found in cosmetics.[17] The ongoing scientific scrutiny regarding its potential for endocrine disruption, combined with its established role as a fragrance allergen, warrants a moderate level of concern.

Coumarin

Coumarin is a scent chemical that can be both naturally occurring and synthetically produced.55 It is widely used as a fragrance ingredient in personal care products, perfumes, and household items.56

Coumarin is notably associated with allergies and contact dermatitis.[55] It can irritate the skin and provoke reactions in sensitive individuals, leading to symptoms such as itchiness, redness, swelling, blisters, and hives.[57] Allergic reactions can also affect the respiratory system, causing wheezing, coughing, and shortness of breath, and in rare cases, can trigger severe, life-threatening anaphylaxis.[57] The EU Cosmetics Directive and the International Fragrance Association (IFRA) identify Coumarin as a known human toxicant or allergen.[55] Significantly, Coumarin was formerly approved as a food additive in the U.S. but is now banned.[55] This regulatory history, coupled with its potential for severe allergic reactions, indicates a higher level of concern compared to other fragrance allergens.

Hexyl Cinnamal

Hexyl Cinnamal, also known as Hexyl Cinnamaldehyde, is a synthetic fragrance ingredient commonly used in cosmetics, perfumes, and personal care products for its pleasant, jasmine-like scent.56

This ingredient is widely known to be associated with allergic reactions and carries a high concern rating for allergies and immunotoxicity.[58] It is recognized as a human allergen and a possible human immune system toxicant.[58] Due to its allergenic potential, Hexyl Cinnamal is included on the EU's list of 26 fragrances that pose an allergenic risk, requiring its presence to be disclosed on ingredient labels when it exceeds 0.01% of the final product.[56] Even at concentrations below this limit, it can trigger skin reactions such as redness, hives, itching, or eczema in susceptible individuals.[58] It is also advised to be avoided by asthmatics and people with hyperreactive airway issues.[58] While some research suggests it has a low skin-sensitizing potency in certain contexts, its widespread use and documented ability to cause reactions in sensitive populations, including those with respiratory sensitivities, means it is a significant concern.

Limonene

Limonene is a chemical compound found naturally in the peels of citrus fruits and other plants, and it is widely used as a fragrance and flavoring agent in various consumer products, including cosmetics and personal hygiene items.59

When applied to the skin in amounts typically found in fragrances and personal hygiene products, Limonene is considered possibly safe.[60] However, it is a known allergen and can cause skin reactions in sensitive individuals.[60] Symptoms of a Limonene allergy can range from skin irritation and rashes (redness, itching, swelling) to respiratory distress (wheezing, shortness of breath, coughing) if inhaled.[59] Eye irritation, nausea, vomiting, and headaches are also possible.[59] In rare, severe cases, anaphylaxis can occur.[59] A key aspect of its allergenicity is that while Limonene itself may be less problematic, its oxidized compounds, which can form upon exposure to air, are more likely to initiate an immune response and cause allergic reactions.[59] This highlights the importance of product stability and storage conditions in maintaining the ingredient's safety profile over time.

Linalool

Linalool is a fragrance ingredient known for its floral scent, widely used in perfumes, cosmetics, and personal care products.61 It is naturally found in many plants, including lavender and rosewood.62 Beyond its aromatic properties, Linalool has been studied for potential calming, stress-reducing, anti-inflammatory, pain-dulling, and immune-boosting effects.62 The FDA has classified it as "generally recognized as safe" (GRAS) as a direct food additive for flavoring.62

Despite some beneficial properties and its GRAS status, Linalool is a common

fragrance allergen.[61] It can cause various skin irritations, including itchiness, redness, rashes, and eczema, particularly when applied undiluted.[61] Inhalation can lead to breathing difficulties, such as shortness of breath, wheezing, and coughing.[61] Other possible reactions include eye irritation, sneezing, runny nose, headaches, and in severe cases, swelling of the mouth and throat, which requires immediate medical attention.[61] Manufacturers are often required to list Linalool as an allergen on product labels when its concentration exceeds certain thresholds.[61] The presence of this ingredient underscores that even natural compounds with beneficial attributes can be significant allergens for sensitive individuals, challenging the perception that "natural" inherently means "safe."

Dipropylene Glycol

Dipropylene Glycol is a virtually colorless and odorless liquid used in a wide range of industries, including cosmetics, pharmaceuticals, and food.12 In skincare, it functions as a humectant, attracting and retaining moisture to keep the skin hydrated.12 It also acts as a solvent and a chemical permeation enhancer, helping other accompanying substances to penetrate the outermost layer of the skin more easily, thereby improving the efficacy of cosmetic products.12

The U.S. Environmental Protection Agency (EPA) has determined that Dipropylene Glycol is generally considered safe for skin and hair care products due to its low-hazard profile.[12] It is recognized as non-toxic and non-carcinogenic, with minimal adverse effects.[12] Research indicates it does not readily cause eye or respiratory irritation.[12] However, some individuals may experience contact dermatitis, and minor skin irritation has been reported after prolonged exposure.[12] While inhalation can cause irritation, headache, and dizziness at very high levels [63], these are generally not relevant for typical cosmetic use. Its functional benefits in enhancing moisture and ingredient delivery, combined with its overall low toxicity for most users, make it a useful component, though individual sensitivities should be considered.

Sodium Benzoate

Sodium Benzoate is a common preservative used in skincare and cosmetic products to inhibit the growth of microorganisms like bacteria, mold, and yeast, thereby extending product shelf life.13 It also possesses anti-inflammatory and antioxidant properties, which can help soothe irritated skin, reduce redness and swelling, and protect against free radical damage.13

While considered safe for use at appropriate concentrations in food and cosmetic products [13], Sodium Benzoate carries significant potential risks. A major concern is its ability to produce benzene, a known human carcinogen, when mixed with any form of Vitamin C.[14] Although this specific interaction may not occur in all products, the inherent potential for benzene formation is a serious consideration for the ingredient's overall safety profile. Additionally, Sodium Benzoate is an acidic preservative that can

be mildly irritating to the respiratory tract, eyes, and skin, and there is a risk of skin allergy for some individuals.[14] Animal studies have suggested that high doses may be harmful to the liver and other organs, though more research is needed to fully understand its effects on human health.[13] Its low cost and stability contribute to its widespread use [14], but the potential for problematic chemical interactions and its irritant/allergenic profile elevate its concern level.

Sodium C14-16 Olefin Sulfonate

Sodium C14-16 Olefin Sulfonate is a water-soluble, anionic surfactant derived from olefins, which are hydrocarbons.64 It is widely used in personal care products like shampoos, body washes, and hand soaps due to its excellent foaming and cleansing properties.3 It functions by reducing the surface tension of water, allowing it to penetrate and lift away dirt and oils from surfaces.64

This ingredient is generally considered a mild surfactant, especially when compared to other sulfates like Sodium Lauryl Sulfate (SLS) and Sodium Laureth Sulfate (SLES).[64] It is deemed safe for use in rinse-off products. However, concerns regarding irritation have led to its limitation to 2% in leave-on products.[3] Studies show that concentrations above 10% can cause moderate ocular irritation, and 5% can cause mild ocular irritation.[3] While poorly absorbed through normal skin, it can be significantly absorbed through damaged skin.[3] Irritation and sensitization have been observed, often attributed to low levels of gamma sultone residues, which are impurities from the manufacturing process.[3] This highlights that the purity of the ingredient, specifically the control of impurities, is crucial for its safety profile. Despite its general mildness, its potential for irritation and sensitization, particularly due to impurities, warrants a moderate level of concern.

CI 15985 (FD&C Yellow 6)

CI 15985, also known as FD&C Yellow No. 6 or Sunset Yellow FCF, is a synthetic dye produced from petroleum.18 It is used as a cosmetic colorant to impart an orange or yellow hue to products.18 The FDA has approved its use in food, pharmaceuticals, and cosmetics, although it is restricted in cosmetics, particularly not approved for use around the eyes.18

This synthetic dye carries multiple documented health concerns. It can cause allergic reactions, including hives, facial rashes, swelling of the eyes, lips, or face, and in rare cases, anaphylactic shock, particularly in individuals hypersensitive to food dyes.[65] The Environmental Working Group (EWG) rates it as a low to moderate concern for allergies and immunotoxicity.[65] At large amounts, it has the potential for organ toxicity and can cause respiratory, skin, and eye irritation.[65] FD&C Yellow 6 is classified as a xenoestrogen, an estrogen-mimicking compound, and is therefore considered an endocrine-disrupting chemical, though more human research is needed.[65] Studies have linked it and other food dyes to neurotoxic chemicals that may contribute to

attention deficit, hyperactivity, and mental health problems in children.[65] Animal studies have also linked it to an increased risk of testicular and adrenal tumors.[65] Furthermore, FD&C Yellow 6 contains trace levels of benzidine, a known cancer-causing substance.[65] The combination of its allergenic potential, suspected endocrine disruption, links to neurotoxicity, and the presence of trace carcinogens elevates its concern level significantly.

CI 19140 (FD&C Yellow 5)

CI 19140, also known as FD&C Yellow No. 5 or Tartrazine, is a very common synthetic monoazo dye made from coal tar.19 It is widely used as a colorant to impart a lemon yellow hue to various cosmetic products.19 The U.S. Food and Drug Administration (FDA) has approved its use in cosmetics, though it is regulated.19

FD&C Yellow 5 is particularly notable for causing the most allergic and intolerance reactions among all azo dyes, especially in individuals with asthma or aspirin intolerance.[19] It can cause hives in a small percentage of people.[66] While evidence is weak, it has been suspected of exacerbating asthma and linked to ADHD-like behavior in children.[66] The FDA requires a warning statement on prescription drug labels if they contain FD&C Yellow No. 5, noting its potential to cause allergic-type reactions (including bronchial asthma) in certain susceptible persons, particularly those with aspirin hypersensitivity.[66] It is not likely to be mutagenic or carcinogenic in humans.[19] The significant allergenic potential, especially for sensitive populations, and the explicit FDA warnings underscore its moderate-high concern level.

CI 17200 (D&C Red 33)

CI 17200, also known as D&C Red 33, is a common synthetic colorant that imparts a purple-red color to products.20 It is permitted for use as a colorant in various cosmetic products, including hair dyes, skincare, and toiletries.20 In the United States, it is allowed for use in colored ingestible drugs, externally applied drugs, and cosmetics, but it is not approved for use in cosmetics applied around the eyes.20

This synthetic dye is generally not suspected to be toxic or harmful to consumers.[20] However, at moderate doses, D&C Red 33 may be allergenic.[20] Animal studies have shown immune or allergenic effects at moderate doses.[67] It is not considered likely to be mutagenic or carcinogenic, nor is it likely to be a reproductive or developmental toxicant in humans.[67] Despite its general safety at typical cosmetic concentrations, its documented allergenic potential and specific FDA restrictions for use around the eyes mean it is not entirely benign and warrants a moderate level of concern for sensitive individuals.

CI 14700 (FD&C Red 4)

CI 14700, also known as FD&C Red 4, is a synthetic dye used as a cosmetic colorant.68 This ingredient has a notable regulatory history: it was formerly approved as a food

additive in the U.S. but is now banned.[68] Currently, its use in cosmetics is approved by the FDA for external application only, and it is not approved for use around the eyes.[68] While some *in vitro* tests on mammalian cells have shown positive mutation results, it is generally considered not likely to be mutagenic or carcinogenic in humans.[68] The fact that this substance was banned for food use, even if permitted externally in cosmetics, indicates a higher level of caution and a re-evaluation of its safety profile over time. This historical regulatory shift and current restrictions elevate its concern level beyond that of a typical cosmetic colorant.

CI 42090 (FD&C Blue 1)

CI 42090, also known as FD&C Blue No. 1 or Brilliant Blue FCF, is a synthetic dye that imparts a vibrant blue pigment to various cosmetic products.21 It is approved by the FDA for use in limited amounts in food, cosmetics, and pharmaceuticals.21

While generally having low reported risks of adverse effects when used in cosmetics [69], FD&C Blue 1 is associated with several significant health concerns. Allergic reactions and skin sensitivities are possible in some individuals, with symptoms including hives, rashes, itching, chest tightness, facial swelling, and severe headaches.[21] Prolonged or excessive exposure to this synthetic colorant may lead to skin irritation.[69] More critically, research studies have linked FD&C Blue 1 to neurotoxicity, hyperactivity in children, developmental delays in mice, and potential links to autism in children.[21] Animal studies have also suggested a link to kidney tumors in mice and, in severe cases, death after ingestion via a feeding tube, prompting an FDA warning regarding its use in enteral feeding solutions.[21] The Center for Science in the Public Interest (CSPI) recommends further research to definitively determine its safety.[21] The combination of its allergenic potential and links to more severe systemic and developmental concerns, even if some evidence is from animal studies or non-topical exposure routes, indicates a high level of concern.

Titanium Dioxide (CI 77891)

Titanium Dioxide, also referred to as titanium(IV) oxide or titania, is an inorganic substance that appears as a white, powdery mineral.22 In cosmetics, it functions as a white pigment, an opacifying agent, and a thickening agent.22 Crucially, it also acts as a physical sunscreen, reflecting ultraviolet radiation from the sun, making it a valuable broad-spectrum UV filter.22

For skin sensitivity, Titanium Dioxide is regarded as non-risky and is considered a great sunscreen ingredient for sensitive skin, rarely causing stinging around the eyes.[22] Micronized forms, commonly used in sunscreens, do not penetrate healthy skin.[22] The primary health concerns associated with Titanium Dioxide arise when it is in a breathable or inhalable form, such as in sprays or powders, due to the potential for nanoparticles to be inhaled and cause adverse effects, including the production of reactive oxygen species (ROS) that can interfere with cellular signaling and potentially

lead to mutations.[22] However, in a solid bar soap, the risk of inhaling nanoparticles is negligible, significantly mitigating these concerns. While studies on human health regarding inhaled Titanium Dioxide have yielded contradictory results concerning cancer [22], its topical application in lotions and creams appears to pose a low health risk as it does not penetrate healthy skin.[43] Its established safety and beneficial role as a topical ingredient in this product form make it a low-concern component.

IV. Conclusions and Recommendations

The detailed analysis of your soap's ingredients reveals a complex interplay of functional benefits and varying safety profiles. Many ingredients, such as Sodium Lauroyl Isethionate, Stearic Acid, Lauric Acid, Water, Sodium Isethionate, Cocos Nucifera Fruit Extract, Butyrospermum Parkii (Shea) Oil, Glycerin, Sodium Chloride, and Sine Adipe Lac, are generally considered very safe and often provide beneficial properties to the skin, contributing positively to the product's overall quality and dermatological compatibility.

However, several ingredients warrant a higher level of awareness. Certain surfactants like Sodium Stearate and Sodium C14-16 Olefin Sulfonate, while generally safe, can cause dryness or irritation in sensitive individuals or at higher concentrations, highlighting the importance of proper formulation. Propylene Glycol, despite being generally recognized as safe, is a known irritant and allergen for a subset of the population, underscoring the need for individual patch testing.

The category of **Fragrance (Parfum/Perfume)** and its individual components (Alpha-Isomethyl Ionone, Benzyl Alcohol, Benzyl Salicylate, Coumarin, Hexyl Cinnamal, Limonene, Linalool) consistently present the highest level of concern. This is primarily due to the lack of transparency regarding the thousands of chemicals that can comprise "Fragrance," many of which are known allergens, endocrine disruptors, or environmental pollutants. Specific fragrance components like Coumarin and Benzyl Alcohol also carry documented risks, including severe allergic reactions and toxicity in vulnerable populations. The presence of these ingredients necessitates a cautious approach, especially for individuals with sensitivities or allergies.

Similarly, **synthetic colorants** (CI 15985, CI 19140, CI 17200, CI 14700, CI 42090) are frequently associated with allergic reactions and, in some cases, have been linked to more serious concerns such as neurotoxicity, developmental issues, or the presence of trace carcinogens. The regulatory history of some of these dyes, including past bans for food use, indicates a higher level of caution.

Finally, chelating agents like Tetrasodium EDTA and Tetrasodium Etidronate, while

functionally beneficial and generally safe for topical human use, raise environmental concerns due to their persistence and non-biodegradability. Tetrasodium EDTA also carries concerns regarding manufacturing byproducts and its potential to enhance the absorption of other chemicals.

Recommendations for the Consumer:

1. **Prioritize Transparency:** For personal care products, a general recommendation is to seek out brands that offer full transparency regarding their fragrance components or opt for fragrance-free products, especially if skin sensitivities are a concern.
2. **Patch Testing:** For any new product, particularly if there is a history of sensitive skin or allergies, performing a patch test on a small, inconspicuous area of skin (e.g., inner forearm) for 24-48 hours before widespread use is advisable. This can help identify individual sensitivities to ingredients like Cocamidopropyl Betaine, Propylene Glycol, or various fragrance components.
3. **Consider Environmental Impact:** For ingredients like Sodium Palmate and Sodium Palm Kernelate, which are generally safe for the body but have environmental implications, consider seeking products that specify sustainable sourcing (e.g., RSPO certified palm oil).
4. **Awareness of Synthetic Dyes:** Individuals with sensitivities, especially those with asthma or children, may benefit from avoiding products containing synthetic colorants, particularly FD&C Yellow 5 (CI 19140) and FD&C Yellow 6 (CI 15985), due to their documented allergenic and other potential health links.
5. **Understand Concentration and Formulation:** The safety profile of an ingredient can be influenced by its concentration and the overall product formulation. While some ingredients might have concerns at high concentrations or in specific product types (e.g., inhalation risk for Zinc Oxide in aerosols), their use in a solid bar soap often mitigates these risks.

By understanding the nuanced safety profiles of these ingredients, consumers can make more informed choices that align with their personal health priorities and environmental values.

Works cited

1. SODIUM LAUROYL ISETHIONATE – Ingredient - COSMILE Europe, accessed June 10, 2025, https://cosmileeurope.eu/inci/detail/14890/sodium-lauroyl-isethionate/
2. SODIUM ISETHIONATE | - Ataman Kimya, accessed June 10, 2025, https://atamankimya.com/sayfalar.asp?LanguageID=2&cid=3&id=8&id2=12500
3. Sodium C14-16 Olefin Sulfonate - Cosmetics Info, accessed June 10, 2025,

https://www.cosmeticsinfo.org/ingredient/sodium-c14-16-olefin-sulfonate/
4. Cocamidopropyl Betaine for Skin | Clinikally, accessed June 10, 2025, https://www.clinikally.com/blogs/news/cocamidopropyl-betaine-for-skin
5. The Essential Guide to Stearic Acid - Musim Mas, accessed June 10, 2025, https://www.musimmas.com/resources/blogs/stearic-acid-uses-benefits-safety/
6. STEARIC ACID - Cosmetics Ingredient INCI, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/stearic-acid
7. Lauric Acid Benefits for the Skin You Should Know! - Mamaearth, accessed June 10, 2025, https://mamaearth.in/blog/lauric-acid-benefits/
8. Cocos Nucifera Fruit Extract - Cosmetics Ingredients - SpecialChem, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/cocos-nucifera-fruit-extract
9. BUTYROSPERMUM PARKII BUTTER - Cosmetics Ingredient INCI, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/butyrospermum-parkii-butter
10. Glycerol / Glycerin - Chemical Safety Facts, accessed June 10, 2025, https://www.chemicalsafetyfacts.org/chemicals/glycerol-glycerin/
11. Pure Glycerin: Benefits, Uses, and Where to Get It - WebMD, accessed June 10, 2025, https://www.webmd.com/beauty/what-is-pure-glycerin
12. Dipropylene glycol in skincare | Curology, accessed June 10, 2025, https://curology.com/blog/dipropylene-glycol-in-skincare-what-is-it-and-what-does-it-do/
13. Sodium Benzoate - 100% Pure, accessed June 10, 2025, https://www.100percentpure.com/pages/ingredient-sodium-benzoate
14. Sodium Benzoate in Skin Care | Detailed Explanation - Echemi, accessed June 10, 2025, https://www.echemi.com/cms/1926251.html
15. The Environmental Impact of Perfumes: Are They Safe for You and the Planet? | Envynature, accessed June 10, 2025, https://www.envynature.org/the-environmental-impact-of-perfumes-are-they-safe-for-you-and-the-planet/
16. What is fragrance? | Environmental Working Group, accessed June 10, 2025, https://www.ewg.org/news-insights/news/2023/07/what-fragrance
17. BENZYL SALICYLATE – Ingredient - COSMILE Europe, accessed June 10, 2025, https://cosmileeurope.eu/inci/detail/1601/benzyl-salicylate/
18. EWG Skin Deep® | What is FD&C Yellow No. 6 (CI 15985), accessed June 10, 2025, https://www.ewg.org/skindeep/ingredients/702444-FDC_Yellow_No_6_CI_15985/
19. CI 19140 (Tartrazine) - Cosmetics Ingredients, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/ci-19140
20. CI 17200 (Red 33, Pigment) - Cosmetic Ingredient (INCI), accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/ci-17200
21. Blue 1 Dye: Everything You Need to Know About this Food Coloring - Rupa Health, accessed June 10, 2025, https://www.rupahealth.com/post/blue-1-dye-everything-you-need-to-know-about-this-food-coloring

22. Titanium Dioxide (CI 77891) - Cosmetics Ingredients, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/titanium-dioxide
23. SODIUM LAUROYL METHYL ISETHIONATE - Cosmetics Ingredient INCI, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/sodium-lauroyl-methyl-isethionate
24. Lauric Acid (Surfactant) - Cosmetics Ingredients, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/lauric-acid
25. Sodium Palmate: The Powerhouse Behind Soap And Skincare | OnlyMyHealth, accessed June 10, 2025, https://www.onlymyhealth.com/what-is-sodium-palmate-uses-and-benefits-1728993428
26. EWG Skin Deep® | What is SODIUM PALMATE, accessed June 10, 2025, https://www.ewg.org/skindeep/ingredients/706149-SODIUM_PALMATE/
27. What is Aqua/Water/Eau? - Paula's Choice EU, accessed June 10, 2025, https://www.paulaschoice-eu.com/aqua%2Fwater%2Feau/ingredient-aqua-water-eau.html
28. AQUA (Water): Cosmetic Ingredient INCI, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/aqua
29. What Is Sodium Cocoyl Isethionate? - Puracy, accessed June 10, 2025, https://puracy.com/blogs/ingredients/sodium-cocoyl-isethionate
30. SODIUM STEARATE - Cosmetics Ingredients, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/sodium-stearate
31. What Is Sodium Stearate: Key Uses and Benefits, accessed June 10, 2025, https://www.gzbaisha.com/what-is-sodium-stearate/
32. Cocamidopropyl Betaine: Allergic Contact Dermatitis - DermNet, accessed June 10, 2025, https://dermnetnz.org/topics/contact-allergy-to-cocamidopropyl-betaine
33. EWG Skin Deep® | What is SODIUM PALM KERNELATE, accessed June 10, 2025, https://www.ewg.org/skindeep/ingredients/706148-SODIUM_PALM_KERNELATE/
34. Sodium Palm Kernelate - Tom's of Maine, accessed June 10, 2025, https://www.tomsofmaine.com/pages/ingredient/sodium-palm-kernelate
35. Cococin Cocos Nucifera Extract - Sabinsa Cosmetics - 8001-31-8 - Knowde, accessed June 10, 2025, https://www.knowde.com/stores/sabinsa-cosmetics/products/sabinsa-cosmetics-cococin
36. What does the term "Butyrospermum Parkii (Shea) Butter" mean? - Typology, accessed June 10, 2025, https://us.typology.com/library/what-is-butyrospermum-parkii-shea-butter-and-what-is-its-utility
37. SODIUM CHLORIDE - Cosmetics Ingredient INCI, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/sodium-chloride
38. Use of salt in the pharmaceutical, cosmetics and detergent industries., accessed June 10, 2025, https://www.dadakarides.com/h-khrisi-toy-alatiou-se-viomikhanies-farmakon-kal

lintikwn-kai-aporripantikwn-en-98
39. The sobering truth about propylene glycol and its safety in food and cosmetics - Hyalofemme, accessed June 10, 2025, https://hyalofemme.co.uk/propylene-glycol-safety-in-food-and-cosmetics/
40. Propylene Glycol - Hazardous Substance Fact Sheet, accessed June 10, 2025, https://nj.gov/health/eoh/rtkweb/documents/fs/3595.pdf
41. Zinc oxide - Ingredient | Inside our products - L'Oréal, accessed June 10, 2025, https://inside-our-products.loreal.com/ingredients/zinc-oxide
42. Zinc Oxide - Chemical Safety Facts, accessed June 10, 2025, https://www.chemicalsafetyfacts.org/chemicals/zinc-oxide/
43. EWG Skin Deep® | What is TITANIUM DIOXIDE (sunscreen grade), accessed June 10, 2025, https://www.ewg.org/skindeep/ingredients/726566-TITANIUM_DIOXIDE_sunscreen_grade/
44. Tetrasodium EDTA - Advanced Dermatology, accessed June 10, 2025, https://www.advanced-dermatology.com.au/tetrasodium-edta
45. EDTA - What to Know About this Cosmetic Ingredient - Cosmébio, accessed June 10, 2025, https://www.cosmebio.org/en/reports/edta-ingredient-health-beauty-products-cosmetics/
46. Safety Assessment of Etidronic Acid and Salts of Etidronic Acid as Used in Cosmetics - CIR Report Data Sheet, accessed June 10, 2025, https://www.cir-safety.org/sites/default/files/etidro092016TR.pdf
47. EWG's Guide to Healthy Cleaning | TETRASODIUM ETIDRONATE | Substance, accessed June 10, 2025, https://www.ewg.org/cleaners/substances/5998-TETRASODIUMETIDRONATE/
48. SINE ADIPE LAC - Ataman Kimya, accessed June 10, 2025, https://www.atamanchemicals.com/sine-adipe-lac_u32201/
49. Sine Adipe Lac is a milk derivative commonly used as an emulsifier and emollient in skincare products. It helps to enhance the texture of formulations and provides a moisturizing effect. - Ingredient Explorer - Revea, accessed June 10, 2025, https://www.myrevea.com/ingredient-explorer/sine-adipe-lac/
50. Alpha-Isomethyl Ionone - Cosmetics Info, accessed June 10, 2025, https://www.cosmeticsinfo.org/ingredient/alpha-isomethyl-ionone/
51. Alpha-Isomethyl Ionone Ingredient Allergy Safety Information - SkinSAFE, accessed June 10, 2025, https://www.skinsafeproducts.com/ingredients/alpha-isomethyl-ionone
52. What are the side effects of Benzyl Alcohol? - Patsnap Synapse, accessed June 10, 2025, https://synapse.patsnap.com/article/what-are-the-side-effects-of-benzyl-alcohol
53. Benzyl Alcohol Topical: Uses, Side Effects, Interactions, Pictures, Warnings & Dosing, accessed June 10, 2025, https://www.webmd.com/drugs/2/drug-150360/benzyl-alcohol-topical/details
54. Benzyl Salicylate - Cosmetics Info, accessed June 10, 2025, https://www.cosmeticsinfo.org/ingredient/benzyl-salicylate/

55. EWG Skin Deep® | What is COUMARIN, accessed June 10, 2025, https://www.ewg.org/skindeep/ingredients/701686-COUMARIN/
56. HEXYL CINNAMAL | - Ataman Kimya, accessed June 10, 2025, https://atamankimya.com/sayfalar.asp?LanguageID=2&cid=3&id=8&id2=12882
57. Coumarin Allergy: Signs, Diagnosis & Treatment, accessed June 10, 2025, https://getcurex.com/allergens-and-symptoms/allergy-symptoms-immunotherapy-coumarin
58. Hexyl Cinnamal Ingredient Allergy Safety Information - SkinSAFE, accessed June 10, 2025, https://www.skinsafeproducts.com/ingredients/hexyl-cinnamal
59. Limonene Allergy: Causes, Symptoms & Relief - Curex, accessed June 10, 2025, https://getcurex.com/allergens-and-symptoms/allergy-symptoms-immunotherapy-limonene
60. LIMONENE: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews, accessed June 10, 2025, https://www.webmd.com/vitamins/ai/ingredientmono-1105/limonene
61. Linalool Allergy: Signs, Diagnosis & Care - Curex, accessed June 10, 2025, https://getcurex.com/allergens-and-symptoms/linalool
62. What Is Linalool? Benefits, Sources, Side Effects, How to Use It - Dr. Axe, accessed June 10, 2025, https://draxe.com/health/linalool/
63. Dipropylene Glycol Methyl Ether - Hazardous Substance Fact Sheet, accessed June 10, 2025, https://www.nj.gov/health/eoh/rtkweb/documents/fs/0804.pdf
64. CAS 68439-57-6 Sodium Alpha Olefin Sulfonate - cosmetics, accessed June 10, 2025, https://cosmetics.alfa-chemistry.com/product/sodium-alpha-olefin-sulfonate-cas-68439-57-6-395067.html
65. Yellow 6: Understanding Its Applications and Potential Health Impacts, accessed June 10, 2025, https://www.rupahealth.com/post/yellow-6-understanding-its-applications-and-potential-health-impacts
66. Tartrazine - Wikipedia, accessed June 10, 2025, https://en.wikipedia.org/wiki/Tartrazine
67. EWG Skin Deep® | What is D&C Red No. 33 (CI 17200), accessed June 10, 2025, https://www.ewg.org/skindeep/ingredients/701803-DC_Red_No_33_CI_17200/
68. EWG Skin Deep® | What is FD&C Red No. 4 (CI 14700) Lake, accessed June 10, 2025, https://www.ewg.org/skindeep/ingredients/702430-FDC_Red_No_4_CI_14700_Lake/
69. BLUE 1 LAKE - Cosmetics Ingredient INCI, accessed June 10, 2025, https://cosmetics.specialchem.com/inci-ingredients/blue-1-lake