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Understanding Shaving Creams: Chemical Composition, Functional Ingredients, and Quality Evaluation

Fand Varun Sanjay[1], Khole Nikhil Santosh[2], Vyavahare Prathamesh Vitthal[3]
Asst. Prof. Ashwini More[4]
Students, Department of Pharmacy[1,2,3]
Guide, Department of Pharmacy[4]
Mrs. Saraswati Wani College of Pharmacy, Ganegaon, Maharashtra
Affiliated to Dr Babasaheb Aambedkar Technological University, Lonore, Raigad

Abstract: *Shaving cream, once basic soap-based foam, has evolved into a diverse range of formulations designed to enhance comfort, efficiency, and skin health during shaving. Modern creams combine surfactants, humectants, emollients, and lubricants to soften hair, hydrate skin, and minimize friction, reducing irritation and razor burns. Various types—such as traditional lathering creams, brushless options, and transparent gels—offer distinct benefits. Lathering creams provide rich cushioning, while gels enable precise shaving and often include soothing ingredients like aloe vera or tea tree extract. Recently, skincare-focused formulations with hyaluronic acid, vitamins, and botanicals have emerged to support hydration and post-shave recovery. Effectiveness is measured by factors like lather stability, razor glide, slickness, rinseability, and post-shave feel. Ultimately, the ideal shaving cream varies by skin type and shaving method, with its main goal being to transform shaving into a smooth, protective, and rejuvenating experience for users.*

Keywords: Shaving cream, Lather, Stearic acid.

I. INTRODUCTION

Shaving cream goes beyond being an ordinary grooming item—it holds an important position in the cosmetic industry. It designed for application on the body to cleanse, protect, enhance, or modify appearance, shaving cream is a well-formulated mixture typically composed of oils, soaps or surfactants, and water. [1]

Shaving cream is a product applied to the skin to aid in the removal of hair. It helps to soften both the skin and hair, making the shaving process smoother and more comfortable. By creating a protective layer, shaving cream reduces friction between the razor and the skin, minimizing the risk of cuts, irritation, and razor burns while leaving the skin feeling soft and refreshed. [2]

Fig.1: Shaving cream

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The skin is coated with shaving cream to facilitate smoother and easier hair removal. It enhances comfort during shaving by softening and hydrating both the skin and hair, resulting in a smoother finish. Shaving creams packaged in tubes are often applied with a shaving brush to produce a rich, foamy lather. These creams are generally formulated as an emulsion consisting of oils, soaps or surfactants, and water. Shaving refers to the act of removing hair by cutting it close to the skin's surface with a razor or similar bladed instrument. Shaving is not mandatory. Many individuals choose not to remove their body hair, as it serves functional roles such as preventing dirt build-up in certain areas and enhancing the skin's sensitivity to touch and movement.

Classes of Shaving Preparations

Shaving preparations are broadly classified into three principal categories:

(a) Shaving sticks and powders,

(b) Shaving soaps, and

(c) Shaving creams.

Each category is formulated to facilitate the shaving process by enhancing lubrication, minimizing skin irritation, and improving overall comfort during hair removal.

Shaving Powders:

Having powders are traditionally favored within professional barbering due to their convenience and hygienic application. The powder is dispensed into a shaving mug, after which water is added, and a shaving brush is used to generate lather. This approach ensures that a fresh portion of the product is utilized for each client, thereby minimizing the risk of contamination. The simple composition and ease of preparation make shaving powders a practical and sanitary option in grooming practices.

Lather Shaving Creams:

Lather-based shaving creams share compositional similarities with conventional soaps but are distinguished by their higher water content, which imparts a creamier and more stable texture. The balance between sodium and potassium soaps plays a crucial role in determining the consistency, foaming ability, and stability of the final formulation.

To further improve product performance, stabilizing agents such as borax and super fatting components are incorporated. These additives not only enhance lather quality but also help maintain emulsion integrity and skin conditioning properties during shaving.

Brushless Shaving Creams:

Brushless shaving creams are formulated to provide lubrication without the need for foam generation. Their effectiveness lies in superior lubricating capacity, which reduces razor drag and ensures a smoother, less irritating shave. Following use , a thin residual film of oil remains on the skin, contributing to post-shave softness and hydration. These products are typically formulated as oil-in-water (o/w) emulsions, with the inclusion of wetting agents to promote efficient beard softening and enhance razor glide. The non-foaming nature of brushless creams offers convenience and is particularly suited for individuals with sensitive or dry skin. [3]

Globally, the shaving cream industry has transformed alongside consumer expectations and regulatory trends. While synthetic formulations were once dominant, today's market emphasizes sustainability, herbal-based ingredients, and dermatologist-approved products. Developments such as eco-friendly packaging, sulfate-free bases, and hypoallergenic blends highlight the shift toward greener, safer, and more skin-friendly shaving solutions. [4]

History:

The practice of shaving or grooming facial hair dates back far beyond the earliest written records. Historical references, including those found in the Bible, indicate the existence of barbers in ancient times. Evidence suggests that professional barbers were already present in Greece as early as 400 B.C. [5]

Shaving soaps and similar grooming products, in the form recognizable today, first appeared in records around 125 years ago. [6]

Early shaving creams were created by saponifying cooking fats using potash and soda lye. Since those initial experiments, humans have consistently sought ways to make shaving more convenient, comfortable, and pleasant. Alongside population growth, there has been a notable rise in people's attention to personal grooming, demonstrated by

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the fact that modern American men shave more often than men did a hundred years ago. This trend has driven steady growth in the demand for shaving cream. [7]

The earliest known version of shaving cream dates back to around 3000 BC in Sumer, where a mixture of wood alkali and animal fat was applied to beards to aid in shaving. Up until the early 1900s, men commonly used hard bars or sticks of shaving soap. Later, soft soap combined with oils began to be sold in tubes. In 1919, Frank Shields, a former MIT professor, created the first true shaving cream, which was introduced to the American market under the brand name Barbasol. This product offered an easier alternative to traditional soap and brush methods, and during its initial production in Indianapolis, each tube was filled entirely by hand. Barbasol remains available internationally today.

The first aerosol shaving cream, Rise, was launched in 1949. By the 1950s, pressurized cans had captured about two-thirds of the U.S. market. Initially, chlorofluorocarbons (CFCs) served as propellants, but these were phased out in the late 1990s due to their ozone-depleting effects, replaced by gaseous hydrocarbons like pentane, propane, butane, and isobutane.

The 1970s saw the emergence of shaving gels, and in 1993, Procter & Gamble patented a post-foaming gel that transforms into a foam when applied to the skin, combining the benefits of both gels and foams. [2]

Mechanism of Shaving with Shaving Cream

Applying the Cream:

A thin layer of shaving cream is spread over the skin.

The cream typically contains water, surfactants, oils, and moisturizers.

Softening and Hydrating Hair:

Water in the cream penetrates the hair, causing it to swell.

Oils and emollients help soften the hair, making it easier to cut.

Creating a Protective Foam Layer:

Surfactants reduce the surface tension of water, allowing foam to form.

The foam traps air and forms a cushion, separating the skin from the razor.

Providing Lubrication:

The creamy, slippery layer decreases friction between the razor and skin.

This allows smooth blade movement and lowers the risk of cuts.

Cutting the Hair:

The razor trims the softened hair at skin level.

The foam barrier protects the skin from direct blade contact.

Post-Shave Care:

Remaining moisturizers and emollients keep the skin hydrated.

Some formulations include ingredients that reduce irritation or redness.[8]

Ideal characteristics of shaving cream [2]

Smooth Application – should glide effortlessly and evenly across the skin.

Effective Foaming – forms a rich, stable lather quickly for better shaving experience.

Razor Glide – reduces friction by providing sufficient slip between the razor and skin.

Hydration – helps maintain skin moisture during and after shaving.

Skin Safety – minimizes irritation, redness, cuts, and razor burn.

pH Balance – should match the skin's natural pH (~5.5) to protect skin health.

Product Stability – remains consistent over time without separation, spoilage, or microbial contamination.

Pleasant Aroma – delivers a refreshing scent that is not overwhelming.

Safe Ingredients – free from toxic chemicals and unlikely to cause allergic reactions.

Easy Rinse-Off – washes away completely without leaving any residue.

Soothing or Cooling Sensation – provides comfort, often through ingredients like menthol.

Extended Shelf Life – maintains quality over long-term storage.

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Visually Appealing – attractive look, color, and packaging.
Cost-Effective and Practical – affordable and convenient to use, available in tubes, cans, or jars.

Anatomy and Physiology of the Skin and hair:

Skin:

Epidermis:

The epidermis, the outermost layer of the skin, consists of stratified, keratinized squamous epithelial cells. Its thickness varies across different regions of the body, being most substantial on the palms and soles. This layer lacks both blood vessels and nerve endings. Instead, its deeper portions receive oxygen and nutrients from the underlying dermis through interstitial fluid, which also carries waste away as lymph. [9]

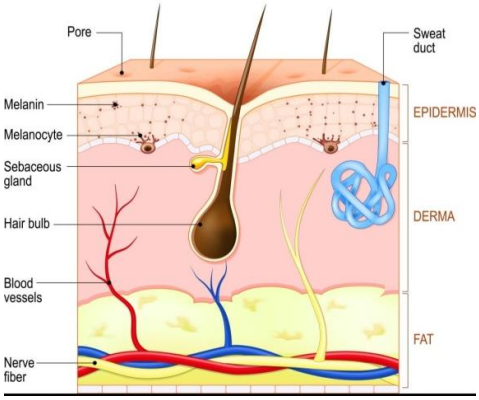

Fig.2 Anatomy of Skin

Dermis:

The dermis is a resilient and flexible layer of the skin, primarily composed of connective tissue. Its structure is formed by a network of collagen fibers intertwined with elastic fibers. When the skin is excessively stretched, the elastic fibers can break, resulting in permanent lines known as striae or stretch marks, commonly observed during pregnancy or in cases of obesity. Collagen fibers help retain water, providing the skin with firmness; however, this capacity diminishes with age, contributing to the formation of wrinkles. The dermis houses important cell types such as fibroblasts, macrophages, and mast cells. Beneath its deeper portion lie areolar connective tissue and variable amounts of adipose (fat) tissue.[10]

c) Subcutaneous Glands:

These glands consist of secretory epithelial cells situated alongside hair follicles. Their primary function is to release sebum, an oily substance, into the hair follicles. Sebaceous glands are distributed throughout the body except on the palms and soles. They are particularly abundant on the scalp, face, underarms, and groin regions. In transitional areas where one type of epithelium changes to another—such as the lips, eyelids, nipples, labia minora, and glans penis—sebaceous glands exist independently of hair follicles, releasing sebum directly onto the skin surface.[11]

2. Hair:

Hair is a pliable filament primarily made up of dead, keratinized cells. It consists of two main components: the hair follicle, a living structure located beneath the skin, and the hair shaft, a fully keratinized, nonliving portion that extends above the skin's surface. The arrector pili muscle is situated between the dermoepidermal junction and the hair bulge area. Above the insertion point of this muscle, sebaceous glands, and in certain regions, apocrine glands, open into the follicle.

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The hair shaft is composed of three layers: the cuticle, cortex, and sometimes a medulla. The cortical cells are closely connected to the cuticle cells, which are flat and roughly square-shaped. The free edges of these cuticle cells point outward, creating extensive overlapping due to peripheral cell movement. These overlapping structures are crucial because they help anchor the growing hair within the follicle by interacting with the cuticle cells of the inner root sheath. Additionally, this arrangement facilitates the removal of dirt and shed cells from the scalp. [3]

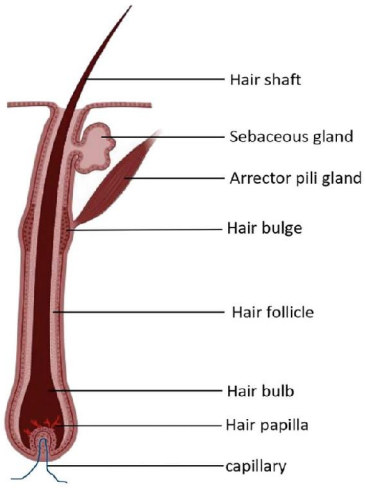
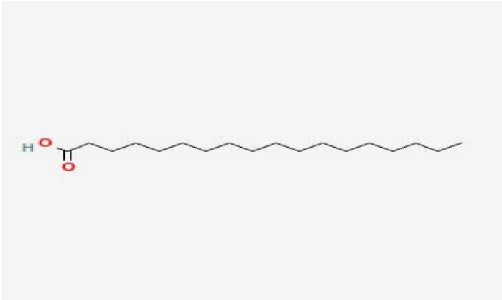


Fig.3 Anatomy of Hair

Ingredients

Stearic acid [12]:



St.1 Stearic Acid

Stearic acid, also known as octadecanoic acid, is a saturated fatty acid with an 18-carbon chain found in both plant and animal fats, especially in animals. It is a waxy, white or colorless solid with a mild odor, insoluble in water but soluble in oils. Naturally, it acts as a metabolite in humans, plants, and other organisms and is chemically derived from octadecane.

Role: Main fatty acid; acts as a thickener, emulsifier, and foam stabilizer. Provides creamy texture, stable lather, and reduces friction during shaving.

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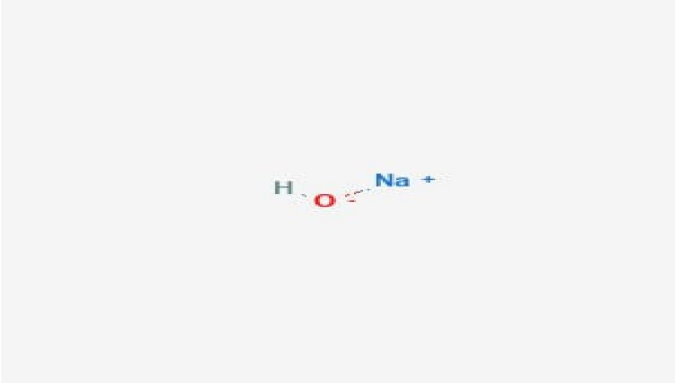
Potassium hydroxide (KOH) [13]:

St.2 Potassium hydroxide (KOH)

Potassium hydroxide (KOH) is a strong alkali available as white or yellowish pellets, flakes, or in liquid form. It is highly corrosive but nonflammable, reacting vigorously with many materials. KOH is widely used in industries such as chemical production, petroleum refining, and cleaning agent formulation. It also plays roles in soap and bleach manufacturing, serves as an electrolyte in alkaline batteries, and is used as a food additive. In laboratories and medicine, it helps dissolve tissues for microscopic analysis, especially in identifying fungal infections.

Role: Strong alkali used to saponify fatty acids (like stearic acid), forming potassium stearate, which is the soap component that creates foam and cleansing properties.

Sodium hydroxide (NaOH) [14]:



St.3 Sodium hydroxide (NaOH)

Sodium hydroxide, also known as caustic soda or lye, is a white, odorless crystalline solid that easily absorbs moisture. It releases intense heat when dissolved in water or neutralized with acids, making it highly corrosive. Used in solid or 50% aqueous form, it is essential in manufacturing soap, paper, rayon, dyes, explosives, and petroleum products. It is also applied in textile processing, bleaching, metal treatment, electroplating, and electrolytic extraction

Role: Also used for saponification; usually in combination with KOH to adjust hardness and consistency of the shaving cream.

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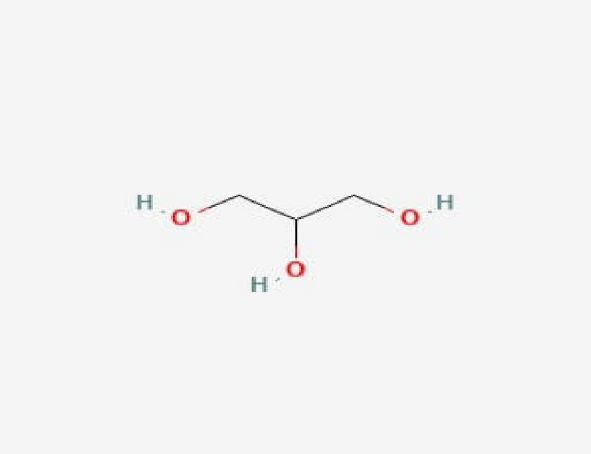
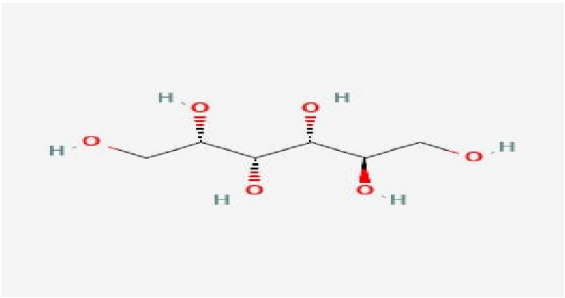
Glycerine [15]:



St.4 Glycerin

Glycerin (CAS No. 56-81-5), or glycerol, is a polyhydric alcohol with the formula $C_3H_8O_3$. It is a simple triol containing three hydroxyl groups. Found naturally in plants and animals as part of fats, oils, and intracellular lipids, glycerin can also be synthesized from non-biological materials. It appears as a clear, thick, sweet-tasting liquid that rarely crystallizes due to its strong tendency to supercool and its lowered freezing point in the presence of water.
Role: Humectant; attracts and retains moisture on the skin, preventing dryness and providing smooth glide for the razor.

Sorbitol [16]:



St.5 Sorbitol

Sorbitol, or glucitol, is a sugar alcohol with a mild sweetness and slow metabolism. It is produced by reducing glucose, converting its aldehyde group to a hydroxymethyl group. Found naturally in fruits like apples, pears, and peaches, and industrially obtained from potato starch, sorbitol serves as a humectant and thickener in cosmetics, maintaining moisture and enhancing texture. Its high refractive index also makes it useful in clear gels, as well as in toothpastes and mouthwashes.
Role: Another humectant; enhances moisturizing properties, stabilizes foam, and improves cream texture.

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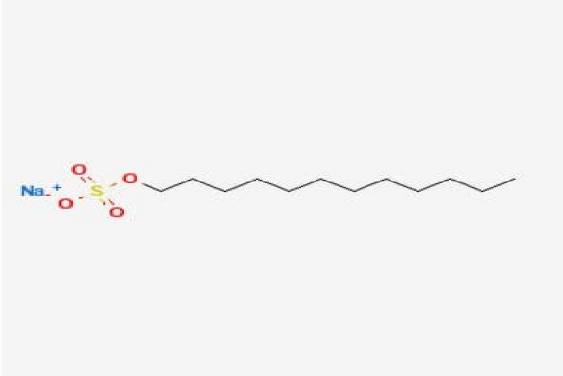
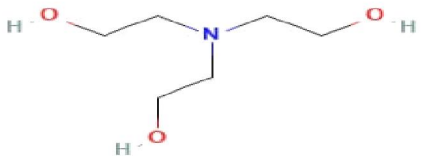
Sodium lauryl sulfate (SLS) [17]:



St.6 Sodium lauryl sulfate (SLS)

Sodium lauryl sulfate (SLS) is a strong anionic surfactant formed by esterifying sulfonic acid with dodecanol and then neutralizing it with sodium carbonate. Its formula, CH_3 $(CH_2)_{10}CH_2OSO_3Na$, shows a hydrophilic sulfate head and a hydrophobic 12-carbon tail, allowing it to act effectively as a cleansing agent for the face, body, and hair.
Role: Surfactant and foaming agent; helps in creating rich lather and improves spreadability on the skin.

Triethanolamine (TEA) [18]:



St.7 Triethanolamine (TEA)

Triethanolamine (TEA) is an amino alcohol that is industrially synthesized by reacting ammonia with ethylene oxide. In cosmetics, TEA is commonly used either as a surfactant or to regulate the product's pH.
Role: pH adjuster and mild emulsifier; neutralizes excess fatty acids and helps stabilize the oil-in-water emulsion.

Coconut oil [19, 20]:

Fig.4 Coconut oil

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Coconut oil, derived from the coconut palm fruit, is rich in medium-chain fatty acids like lauric, capric, and caprylic acids. It moisturizes and softens the skin and is beneficial for conditions such as eczema and in promoting growth among premature infants. Topical application may outperform mineral oil in easing eczema symptoms and can improve skin health, temperature control, breathing, and growth in preterm babies.
Role: Emollient; softens the skin, provides lubrication, and contributes to foam richness.

Bees wax [19, 21]:

fig.4 Bees wax

Beeswax, obtained from honeybee combs, can vary in colour from white to yellow or brown depending on the presence of pollen oils. It functions as a thickener, emulsifier, and stiffening agent in cosmetics. Beeswax absolute is mainly used for fragrance in soaps and perfumes, while both white beeswax and beeswax absolute are also applied in pill coating and polishing.
Role: Beeswax in shaving cream acts as an emollient, thickener, stabilizer, and protective agent, improving both texture and skin comfort during shaving.

Aloe Vera [19, 22]:

fig.5 Aloe Vera

Aloe Vera juice is rich in antioxidants that reduce oxidative stress, potentially lowering the risk of chronic diseases like diabetes, heart disease, and cancer. It is used to manage skin issues such as psoriasis, seborrhea, dandruff, and acne, promote healing of minor burns, scrapes, and radiation-induced skin damage, and support the treatment of anal fissures and herpes lesions.
Role: Soothing and moisturizing agent; reduces irritation and redness, promotes skin healing.

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	Ingredients	Role
1	Stearic Acid	Base/Emulsifier
2	KOH (Potassium Hydroxide) Solution	Saponifying agent
3	NaOH (Sodium Hydroxide) Solution	Saponifying agent
4	Glycerine	Emollient/Humectant
5	Sorbitol	Humectant
6	SLS (Sodium Lauryl Sulfate)	Foaming agent
7	TEA (Triethanolamine)	PH adjuster/mild Emulsifier
8	Coconut Oil	Moisturizer
9	Bees wax	Preservative/Thicknig agent
10	Aloe Vera	Soothing and moisturizing agent

Evaluation Parameters of Shaving Cream [3, 23]:

Physical Properties:

The shaving cream was examined for its physical characteristics, including texture and colour, to assess its quality (30 points).

Cream pH:

The skin's slightly acidic pH plays a key role in protecting against chemical and biological hazards by neutralizing alkalis and harmful substances. The pH of the cream was measured using a pH meter to ensure compatibility with skin.

Appearance:

The cream's overall appearance was assessed based on its color, texture, and uniformity.

Viscosity:

Viscosity was determined using a Brookfield viscometer. The cream had a density of 0.066 g/cm³ (456), and the angular velocity was gradually increased from 0.5 cm to 20 cm to record its flow properties.

Evaluation Tests for Formulation [2]

pH Measurement: Dissolve 1 gram of the formulation in 9 ml of distilled water. Determine the pH using pH paper.

Spreadability: Place an appropriate amount of the sample between two glass slides. Apply a weight of 100 g on the top slide for 5 minutes. Spreadability can be calculated using the formula:

S= ml/t

Where, m = weight applied to upper slide. L = length moved on the glass slide. T = time taken.

Washability: Apply the preparation directly onto the skin and rinse it off with normal water to evaluate how easily the formulation washes away.

Homogeneity: Assess the uniformity of the cream by observing its appearance and feeling its texture. Alternatively, press a small amount of cream between the thumb and index finger to check for consistency.

Irritation Study: Select an area of 1 cm² on the dorsal surface of the left hand. Apply the cream and monitor for any signs of irritation, redness (erythema), or swelling (edema) at regular intervals over a 24-hour period.

II. CONCLUSION

Shaving creams are skilfully developed formulations that combine both natural and synthetic ingredients to deliver smooth lubrication, moisture retention, and skin protection during shaving. The analysis of their chemical structure and active components highlights the importance of each constituent—such as surfactants, emollients, humectants, and preservatives—in enhancing consistency, stability, and overall usability. Quality assessment through parameters like pH level, spreadability, foam formation, and moisturizing capacity ensures that the product remains safe, effective, and satisfactory for consumers. In essence, a clear understanding of the formulation principles and evaluation techniques of shaving creams contributes to creating advanced, skin-compatible, and environmentally sustainable grooming products.

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