

## COSMECEUTICAL CRITIQUE

## Cleansers

The use of soap-like substances for cleansing dates back as early as 2,500 BCE, and soap itself is believed to have been invented between 600 and 300 BCE (Soap Technology for the 1900's, Champaign, Ill., American Oil Chemists' Society, 1990, p. 1-47).

Interestingly, though, the soap production process remained a carefully protected secret until it was detailed in a publication in 1775, eventually setting the stage for the soap industry (Dermatol. Ther. 2004;17 Suppl 1:35-42).

The oldest brand, Yardley, made by a small perfumery and soap business, was founded in 1779, but the first industrial manufacturer of soap in an individually wrapped and branded bar did not occur until 1884 in England (American Soap Makers Guide, New York, Henry Carey Baird & Co., 1928, p. 914-9).

The soap industry grew substantially during the 20th century, fueled by increasing interest in cleanliness and other health benefits of soap, as well as in soap's sensory pleasures (J. Am. Acad. Dermatol. 1979;1:35-41). Concurrently, interest in health and hygiene led to the development of deodorant soaps, while the desire for beautiful skin and aromas led to the development of cleansing bars of different colors, shapes, and fragrances.

## Modern Cleansing Agents

Increased awareness of soap-induced skin irritation drove consumer demand in the 1940s for mild cleansing bars. The introduction of synthetic detergents into the cleansing arena in 1948 led to the development of patently milder cleansing bars that were better for the skin than soaps (J. Am. Acad. Dermatol. 1979;1:35-41).

Mild cleansers have represented an increasing proportion of the cleanser market in recent years, and interest is growing in the functional benefits, especially moisturizing. Greater understanding of the effects of cleansing agents on skin and the use of milder surfactants and polymers have led to novel approaches to the delivery of skin care benefits from cleansers (Dry Skin and Moisturizers: Chemistry and Function, 2nd ed., Boca Raton, CRC Press, 2006, p. 405-28).

Hand washing is integral to personal hygiene and helps prevent infectious germ transmission, but frequent hand washing, of course, can itself lead to dry, damaged, and irritated skin (Contact Dermatitis 1995;32:225-32). Gentle cleansers and moisturizers are recommended to maintain a healthy skin barrier in these cases.

Facial cleansing is typically associated with freshening and improving appearance, including the removal of "oily" residues (including make-up) without damaging the skin. Foaming (surfactant-containing) and nonfoaming (low- to no-surfactant) systems and towelettes rep-

resent the currently available facial cleansing products (Dermatol. Ther. 2004;17 Suppl 1:35-42). Nonfoaming agents are usually mild but less efficient cleansers. Cleansing towelettes are convenient and easy to use.

## Surfactants

Surfactants are the primary active ingredients in cleanser formulations, controlling the degree of mildness or irritancy of a product. The chief surfactants used in cleansers are anionic, because of their ideal foam and lather characteristics.

Soap (alkyl carboxylate) is the main surfactant used in most cleansing bars. Typically, soap is produced by saponification, which involves a reaction of a triglyceride oil/fat with an alkali. The oils most often used are vegetable oils,

such as palm oil, palm oil derivatives (palm stearine, palm olein), rice bran oil, ground nut oil, and castor oil combined with coconut oil or palm kernel oil (Dermatol. Ther. 2004;17 Suppl 1:35-42).

Nonvegetable ingredients used in soap are generally derived from animal fat, such as tallow. Although soaps are effective cleansers, they are known to irritate the skin, eliciting reactions such as erythema, xerosis, and pruritus, particularly in cold weather (Dermatol. Ther. 2004;17 Suppl 1:35-42).

Newer classes of soaps—superfatted soaps, transparent soaps, and combination bars—have been developed to mitigate the irritancy of soaps, which is associated with poor rinsability and a high pH (Dermatol. Ther. 2004;17 Suppl 1:35-42; Cosmetics Toiletries 1995;110:89):

► **Superfatted soaps.** These are derived from incomplete saponification (neutralization), which is achieved by leaving unreacted fatty acids or oils in the product or by adding fatty alcohols, fatty acids, or esters during manufacturing.

Superfating usually enhances soap product characteristics, including mildness, moisturization, lather, mush value, and wear rate (Dermatol. Ther. 2004;17 Suppl 1:35-42; Indian J. Pediatr. 2002;69:767-9; The Manufacture of Soaps, Other Detergents and Glycerin, West Sussex, U.K., Ellis Horwood Limited, 1985).

► **Transparent soaps.** Made with a high level of humectants that tend to solubilize the soaps, leaving a transparent, clear appearance, transparent soaps also have high levels of active soap and an alkaline pH, which tend to promote irritancy. These products are usually mild, however, because of the presence of glycerin and low levels of fatty acids (Dermatol. Ther. 2004;17 Suppl 1:35-42).

► **Combination bars.** These cleansing agents combine natural soaps with milder synthetic surfactants and typically cause less irritation than normal soaps. Although the pH of these products is in

the high range, the synthetic surfactants tend to suppress irritancy (Dermatol. Ther. 2004;17 Suppl 1:35-42).

► **Synthetic detergent bars.** Syndet bars, unlike soaps, are produced through esterification, ethoxylation, and sulfonation of oils, fats, or petroleum products, and are formulated in the neutral pH range. The synthetic surfactants frequently used in these bars include alkyl glyceryl ether sulfonate, alpha olefin sulfonates, betaines, sulfosuccinates, sodium cocoyl monoglyceride sulfate, and sodium cocoyl isethionate (Dermatol. Ther. 2004;17 Suppl 1:35-42). The unique molecular characteristics of sodium cocoyl isethionate have significantly contributed to the mildness of cleansing bars.

## Cleansing Liquid Surfactants

Liquid cleansers often combine anionic and amphoteric surfactants. Anionic surfactants commonly used in liquid cleansers include soaps (salts of fatty acids) and synthetic surfactants such as alkyl ether sulfate, alkyl acyl isethionates, alkyl phosphates, alkyl sulfosuccinates, and alkyl sulfonates. Cocoamidopropyl betaine and cocoamphoacetate are the typical amphoteric or zwitterionic surfactants used.

Notably, nonionic surfactants such as alkyl polyglucoside and amino acid-based surfactants like acyl glycinate, alkyl glutamates, and sarcosinates are being increasingly incorporated as primary surfactants in cleanser systems for their mildness-enhancing activity (Surfactants in Cosmetics, New York, Marcel Dekker, 1997, pp. 427-71).

Although most liquid cleansers are formulated in the neutral to acidic pH range, products that contain soap (alkyl carboxylate) as the main active ingredient typically exhibit an alkaline pH.

## Structurants and Other Ingredients

With cleansing bars, structurants such as long-chain fatty acids, waxes, and alkyl esters are necessary to maintain the solid format and facilitate the complex manufacturing process. In liquids, structurants impart the right rheology and consistency to the product for optimal dispensing and in-use experience. Structurants also ensure the physical stability of dispersed and suspended phases and confer moisturizing effects.

A moisturizing effect is provided in cleansing systems by water-soluble humectants such as glycerin. Emollients are included in cleansers to reduce the drying effects of surfactants. In moisturizing shower gels, typical emollients and occlusives include triglyceride oils, lipids, petrolatum, waxes, and mineral oil.

Other functional ingredients may be found in cleansers formulated for specific benefits. For example, bactericidal actives such as triclosan or triclocarban are contained in antimicrobial cleansers.

The Food and Drug Administration regulates synthetic cleansers and those designed to achieve antibacterial or oth-

er druglike effects. The Consumer Product Safety Commission regulates pure soap products.

## Mild, Moisturizing, Cleansing Agents

Delivering lipids, emollient oils, and occlusives under cleansing conditions is one of the primary approaches to reducing visible signs of skin dryness and improving hydration. Incorporating high levels of emollients into a stable cleansing formulation and depositing the emollients on the skin during washing are achieved through specially structured surfactant formulations with cationic polymers to aid deposition and retention of oils and occlusives.

Emollient and occlusive ingredients used in cleansing liquid formulations include vegetable oils (soybean or sunflower seed) and petroleum jelly.

Hydrophobic emollients are more often included in cleansers because they are easier to deliver to skin than water-soluble moisturizers such as glycerin and other humectants.

Paradoxically, cleansing often leads to a weakening of the skin barrier. Consequently, for most skin disorders, cleansing with commonly used soap-based products may prove problematic and aggravate a patient's particular skin condition. In addition, prolonged daily use of cleansers that induce short-term damage can lead to xerosis, scaling, flaking, erythema, and pruritus. Therefore, mild cleansing is recommended for the management of compromised skin conditions such as acne, rosacea, atopic dermatitis, and photodamage.

## Conclusion

Soap has an interesting and extensive history and has long been the primary cleansing agent. In recent decades, innovations have led to a marked increase in the variety and versatility of products used for cleansing and beautifying purposes.

Underlying many of these developments was the motivation to formulate products that would not cause irritation. Subsequently, agents have been developed that are more suitable for use on dry or sensitive skin or with compromised skin conditions.

Antibacterial soaps have also been formulated, but could conceivably contribute to the growing problem of antibacterial resistance. This information is available in more detail in the second edition of my book, "Cosmetic Dermatology: Principles and Practice" (McGraw-Hill Professional, 2009). ■

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