Review Article

CLEANSERS AND THEIR ROLE IN VARIOUS DERMATOLOGICAL DISORDERS

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Abstract

The art of cleansing has progressed immensely over several thousand years from simply scraping the skin to an exercise in relaxation and improvement in the skin's health and appearance in the present day. Soaps – the basic cleansing agent has also undergone a sea change in its evolution with many variants and newer constituents being incorporated into it. In dermatological disorders like acne, rosacea, atopic dermatitis, photoaging, 'sensitive skin', occupational dermatosis cleansers may have a beneficial role along with other therapeutic measures. With the advent of aesthetic dermatology, the act of cleansing and the use of various cleansing agents prior to aesthetic procedures has also assumed significance.

Key Words: *Synthetic detergents, acne, rosacea, atopic dermatitis*

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Introduction

Hygiene is the practice of keeping oneself and one's surroundings clean in order to prevent illness or disease. Consequently, skin hygiene includes both skin cleaning and also taking care of its health.

Among humans, cleansing has come a long way beyond dirt removal. It is a ritual performed by man since the time of his origin and has been an essential part of religious ceremony and belief. In recent times, the act of cleansing to many people serves as a means of relaxation and escape from the vagaries of everyday life, and also as a way to improve the skin health and appearance.[1] Irrespective of the outlook, a fine balance needs to be maintained between skin cleansing and the preservation of its homeostatic properties.[2]

History

The idea of cleansing dates back to the origin of human race, only the ritual would have been performed in different ways.

In earliest times, cleansing was done by using a piece of bone or stone to scrape the skin. Later civilizations used materials of plant origin along with water for cleansing. Many different civilizations can be given credit for discovering soap. The earliest mention of the soap making process can be found in Sumerian clay tablets dating to *ca*. 2000 BC. By 600 BC, tree ash and animal fat had been used by the Phoenicians to prepare soap. Roman legend says that soap was discovered near Mount Sapo, a site of burnt animal sacrifices located outside Rome.[1] The importance of soap as a cleansing agent was recognized only after the first century. The Greek physician Galen (130–200 AD) and the eighth century chemist Gabiribne Hayyan were the first to have written about the use of soap as a body-cleansing agent. The details of saponification—the process of soap making was published in 1775.[3] The English have been credited with developing the first wrapped soap bar in 1884. The soap market continued to expand and during the Second World war (1948), the development of synthetic detergents came as a major breakthrough.[1] Synthetic detergents now form the basis of many present day skin-cleansing products.

Why we need cleansers?

Many of the environmental impurities and cosmetic products are not water soluble and so washing the skin with simple water would not be sufficient to remove them. Substances capable of emulsifying them into finer particles are to be used for making these fat soluble impurities water soluble. Herein, cleansers fit into the picture. Skin cleansers are surface—active substances (i.e. emulsifiers/ detergents/surfactants/soaps) that lower the surface tension on the skin and remove dirt, sebum, oil from cosmetic products, microorganisms, and exfoliated corneum cells in

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an emulsified form. An ideal cleanser should do all these without damaging or irritating the skin, on the contrary it should try to keep the skin surface moist.[4]

Cleanser Composition

Surfactants are the principal constituents of most cleanser formulas and are mainly responsible for its cleansing action. Surfactants move to the interface upon dissolving in water and act by lowering the interfacial tension.[1] Surfactants can be ionic, nonionic, and silicone containing. Ionic surfactants based on their polar portions can be anionic (–ively charged), cationic (+ively charged), and amphoteric (both + and –ively charged). The type and amount of surfactant in a cleansing agent has a bearing on its drying and irritancy potential[5] [Table 1].

Soap is the prototype anionic surfactant used in skin cleansers and plays a prominent role in the personal cleansing market. However, soap quite frequently can cause dryness and irritation of the skin.

Evolution of modern day cleansers

Cleansers can be divided into three basic types:

Soaps

Composed of long chain fatty acid alkali salts with a pH of between 9 and 10.[6]

Soap subsets

a) *Glycerin bars/transparent bars*: used rampantly in our country in winter. They contain humectant–glycerine to counter the drying effects of soap.
b) *Superfatted soaps*: contain greater amount of lipids such as triglycerides, lanolin, paraffin, stearic acid, or mineral oils which provide a protective film on the skin.
c) *Deodorant soaps/antibacterial soaps*: contain antibacterial agents such as triclosan, triclocarban, or carbanile to inhibit the growth of bacteria and thereby odor.

Syndet bars

Syndet (synthetic detergent) bars have a nonsoap synthetic surfactant such as fatty acid isothionates, sulfosuccinic acid esters as their principal ingredient. Synthetic surfactants unlike soaps are not manufactured by saponification and their structure is often tailored to impart specific properties to the molecule. Syndets have a neutral or slightly acidic pH and are less irritating to skin and do not form a soap scum layer. Transmission electron microscopy has demonstrated that skin washed with synthetic detergents has shown well-preserved lipid and protein regions compared to significant damage to both after washing with soap.[7] The relatively high free fatty acid content of synthetic detergent bars provide a moisturizing benefit that help to maintain skin hydration.[3]

Combars

Composed of an alkaline soap to which surface active agents with a pH of 9–10 have been added. Combars are milder cleansers than true soaps, but induce more thorough cleansing than synthetic detergents.[6]

Table 1: The constituents of skin cleansers[4]

1. Water	6. Fillers (hardeners)
2. Surfactants (emulsifiers)	7. Preservatives (inhibit microorganisms)
3. Moisturizers (for hydration)	8. Fragrance (mask surfactant odour)
4. Binders (stabilizers)	9. Dyes or pigments (in some)
5. Lather enhancers (in some)	

Cleanser variants

Lipid free cleansing lotions

These contain fatty alcohols and are suitable for people with sensitive or dry skin. They can be wiped off without water. The fatty alcohols in these lotions facilitate evaporation and so rinsability is high. When used on the face, there is less facial residue which is an advantage of these lipid free-cleansing lotions. These agents also contain emollients (e.g., fatty alcohols) and/or humectants (e.g., propylene glycol) which counter the irritancy or drying potential of the surfactant.[5]

Liquid body washes

These offer a different sensation, are more convenient as well as more hygienic than the wash bar. They employ milder surfactants and incorporate more emollients, thus can actually improve skin overtime.[3]

Cold creams

They combine the effect of a lipid solvent, such as wax or mineral oil, with detergent action from borax.[6]

Adverse effects of soaps

Harsh cleansers such as soaps are known to cause:

1. After wash tightness it is a sensation of tightness perceived 5–10 min after washing with a soap. Rapid evaporation of water from the skin surface causes this tightness.[7]
2. Skin dryness, scaling and roughness–lipid solvents such as acetone, alcohols and even nonionic surfactants can cause dryness of the skin.[7] Cold weather and low humidity can aggravate these effects.
3. Skin irritation–skin irritation along with erythema and itching following the use of harsh soaps are mainly due to damage to the skin barrier.[7]
4. Allergic contact dermatitis to the fragrances, preservatives, or dyes present in some soaps.

Factors causing dryness and irritation in cleansers

The major factors affecting the drying and irritancy potential of cleansers, include type and rinsability of surfactant ingredients and to a lesser degree pH.[3]

i) Surfactant ingredients: Surfactants after binding to keratin cause protein denaturation, thus leading to damage to the cell membrane of keratinocytes. This in turn leads to adverse cutaneous responses.[5] Surfactant chain length is also an important factor in determining the irritant potential with Kellum opining that the most noticeable irritant reactions developed with fatty acids having chain lengths from C8 to C12 coming in contact with the skin.[1] Although anionic surfactants are considered to have the greatest irritancy potential, their proportion in a cleansing agent and their combination with cationic acrylate polymers or nonionic surfactants and humectants like propylene glycol modifies the irritation potential.

ii) Skin cleanser residue or rinsability factor: The irritancy potential of a cleansing agent may increase the longer it is left on the skin. Residual levels of different products on the skin vary, and these levels correlate with irritation reactions.[5]

iii) pH of cleansing agent: Although controversial, but still many dermatologist believe that maintaining the skin surface at its physiological pH (4–6.5) during cleansing prevents overgrowth of certain microorganisms, like *Propionibacterium acnes*. Soaps with an alkaline pH have also been said to cause damage to the lipid bilayer of the stratum corneum thus causing dryness of the skin.[5] However, other workers have shown that the pH of a cleanser appears to have little effect on its role in damaging the skin.[1] Present day synthetic detergents and lipid free cleansers have a neutral or slightly acidic pH which closely matches the skin pH.

Considering all these factors, it can be concluded that synthetic detergents and lipid free cleansers have the least irritancy potential compared to other market products. A recent study has compared the 31 cleansers available in the Indian market and has proven the above.[8]

Use of cleansers in various dermalogic disorders

For normal skin choosing a particular cleanser is less important as compared to people with dermatological disorders such as atopic dermatitis, acne vulgaris, rosacea, photoaging, occupational dermatosis, perianal pruritus, and sensitive skin. In all these cases, a cleansing agent that can be used along with topical therapies and also is biocompatible with the skin condition should be recommended [Table 2].[5]

Cleansing in atopic dermatitis

Atopic dermatitis (AD) develops as a result of a complex interrelationship of environmental, immunologic, genetic, and pharmacologic factors.[9] Several trigger factors such as irritants (soap and detergents, occupational irritants, and disinfectants), microorganisms (*Staphylococcus aureus*, viruses, and dermatophytes), aeroallergens, seasonal changes, and psychogenic factors may aggravate the disease. Although most dermatologists agree that the skin of patients of atopic dermatitis should be kept clean, there is no unanimity of opinions regarding the use of common toilet soaps for cleansing the skin in the course of management of this condition. Washing twice daily with a classic alkaline soap (pH 10.2) has shown to reduce the stratum corneum cell layer and caused attrition of intercellular lipids in individuals suffering from atopic dermatitis. This damage to the skin barrier function could result in increased colonization of gram-positive bacteria.[5]

Since soaps have an irritant effect on skin and AD patients typically demonstrate a diminished irritant threshold, therefore, synthetic washing bars are a good choice for cleansing in these patients. Their mildness and ability to maintain proper hydration of the stratum corneum are a boon for the atopic dry skin.[10]

Cleansing in acne

The goal of cleansing for acne or acne-prone skin is to gently remove surface dirt, sweat, and excessive skin lipids without irritating or drying the skin. The ideal cleanser for acne skin should be:

i) non comedogenic,

ii) non acnegenic,

iii) non irritating, and

iv) non allergenic.[11]

The myth associated with acne that vigorous scrubbing of the skin with soap and water several times a day will reduce the oiliness; however, only leads to an aggravation of acne and sometimes even may cause acne detergicans.

There is a wide spectrum of skin cleansing agents for acne prone patients ranging from lipid free cleansers, syndets, astringents, exfoliants, and abrasives.[12] The major side effects of most antiacne therapies are dryness and irritation of the skin, so gentle cleansing is important in these group of patients. A nonionic, fragrance-free dermatologic bar or liquid cleanser with good rinsability is the preferred cleanser in acne. The cleansing regimen should suit the needs of the individual patient.[11]

Cleansing in rosacea

The skin of patients with rosacea is extremely sensitive to chemical irritants. It is better to avoid classic soaps, cleansers containing alcohol, astringents, and abrasives in these patients. Ideally, only very mild cleansing agents should be used in these patients. If more irritating cleansing agents are used they should be diluted extensively.[5]

Table 2: Dermatological disorders in which cleansers may have a beneficial role

1. Atopic dermatitis	6. Xerotic skin
2. Acne	7. Sensitive skin
3. Rosacea	8. Retinoid induced dermatitis and post peel
4. Photoaged skin	9. Idiopathic perianal pruritus
5. Occupational dermatitis	

Therapeutic skin cleansers, containing sulfacetamide 10% and sulfur 5% in addition to a synthetic detergent, are approved for the treatment of rosacea. Vigorous cleansing should however be avoided. The only contraindication to their use being a known hypersensitivity to sulfonamides, sulfur, or other components.[13] Gentle cleansing is recommended in rosacea patients.

Cleansing in photoaged skin

Excessive long-term exposure to sunlight damages the skin, and is known to cause premature aging and skin cancer. Since these persons have an already compromised skin surface, so lipid free cleansing agents containing humectants and emollients also can help in reducing the severity of some of the symptoms associated with photoaged skin.[5]

Cleansing in occupational dermatosis

Occupational dermatosis is an important group of disorders encountered in practice. Among them, contact dermatitis, both irritant and allergic are of special concern. Prevention is the key to reduce the incidence and prevalence of both forms of contact dermatitis. Avoidance of causative irritants both at home and the workplace is the primary treatment of contact dermatitis. People suffering from these disorders should practice good skin care daily. Skin cleansing products are equally important both as skin protection and skin care products in an industrial setup for removal of soiling. Skin compatible hand cleansing is vital for the prevention of occupational dermatitis.[14] The basic requirements for an efficient skin cleanser to prevent occupational skin diseases are its easy solubility in both hard and soft water, its ability to remove fats, oils, greasy materials without drying the skin, its free flow through the dispensers and a long shelf life without easy deterioration on storage.[15]

In reality, however no cleanser can be labeled as ideal for occupational dermatosis. While liquid synthetic detergents are generally perfectly adequate for cleansing hands at home, more powerful hand cleansers are needed for the removal of heavy duty industrial soiling such as oil, grease, paints, and lacquer. Products free from scrubbing agents are usually skin friendly and preferred by dermatologists.[14]

Cleansing in xerotic skin

Xerotic skin is seen in several dermatological disorders and also in the geriatric population as a part of natural aging due to decreased sebum production. Environmental factors, such as low humidity and wind may also exacerbate dryness. To rehydrate and soften xerotic skin, emollients, humectants, or keratin-softening agents should be applied liberally—immediately after bathing and reapplied as often as necessary to soften xerotic skin and rehydrate it.[16] People with xerosis should use cleansing agents that do not cause further dryness, and ideally contain humectants and/or emollient ingredients.

Cleansing in "sensitive skin"

Dermatologists and cosmetic scientists define "sensitive skin" as that which exhibits contact irritant or allergic reactions more readily than the average population.[17]

This increased reactivity to external factors can be due to:
i) physiologic phenomenon,
ii) heightened neurosensory input,
iii) increased immune responsiveness and/ or
iv) compromised barrier function.[18]

Frosh recommends that people who have sensitive skin should use very mild cleansing agents.[5] Liquid facial cleansers are highly effective and beneficial for sensitive skin. These can also be used synergistically with topical or systemic therapy.[4]

Cleansing in retinoid-induced dermatitis and post-chemical peel cleansing-induced sensitive skin

Topical retinoids used in a wide variety of dermatological disorders increase skin susceptibility to irritation. In these cases, the patient should use a cleanser that does not aggravate the state of their weakened barrier. The humectants and emollients found in lipid-free cleansers could help lessen the symptoms of these disorders.

Facial chemical peels are rapidly becoming popular as cosmetic procedures for treatment of photoaging, wrinkles, scars, and discoloration. Peeling produces controlled injury to the skin that promotes the growth of new skin with an improved appearance. Since the skin is vulnerable following the procedure and subsequent period of epithelial regeneration, mild cleansing agents are to be used to avoid adverse reactions.[10]

Cleansing in idiopathic perianal pruritus

Perianal pruritus is defined as an unpleasant cutaneous sensation that induces scratching of the skin around the anal orifice. It can be primary or idiopathic when no apparent cause can be found or secondary due to an identifiable etiology. Topical corticosteroids are quite effective in controlling idiopathic perianal pruritus, but long-term use can cause atrophy of the skin of the anogenital area. Perianal cleansing with mild liquid cleansers containing humectants can be a safe initial step for controlling perianal itching and can be as effective as topical corticosteroids.[19]

Conclusion

Cleansers have evolved significantly from just serving as cleaning agents for removal of sebum, dirt, dead cells, and microorganisms from skin mainly because of the challenge of meeting the ever changing consumer expectations. With the advent of advanced technologies, newer cleansers are now being manufactured which are mild, provide moisturizing benefits and can be easily washed off. In various dermatological disorders, all these properties of

modern cleansers enable them to be used concomitantly with topical therapeutic measures thus influencing the outcome of treatment and progression of the disorders. Dermatologists can enhance the overall management of various skin disorders by advising their patients how to adjust their cleansing regimen to best suit their needs and achieve optimal results with therapy.

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CODFI-IAISD Award for the year 2009 for best original research work on contact/occupational dermatitis published in IJD in 2009 goes to:

Dr. Nilendu Sarma, Department of Dermatology, Venereology & Leprology, N R S Medical College, Kolkata for his article “Occupational allergic contact dermatitis among construction workers in India” (IJD 2009, Vol 54, Issue 2, Page 137-41)