

The pH of Commonly Available Soaps, Liquid Cleansers, Detergents and Alcohol Gels

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Background: The hydrogen ion concentration (pH) of a cleanser certainly has an impact on skin condition. Dermatologists always need to recommend a cleanser to patients with hand dermatitis or sensitive skin; particularly during the outbreak of swine (AH1N1 virus) influenza, frequent hand washing and alcohol gel cleansing were greatly recommended.

Objectives: The purpose of this study was to evaluate the pH of various commonly available cleansers and alcohol gels on the market to assess patient comfort in using such products and to make good recommendations to our patients.

Methods: Multiple brands of liquid cleansers, dishwashing liquids, soaps, laundry detergents, and alcohol gels commonly available on the market were assessed for pH by using a pH meter and pH-indicator strips. The pH assessment imitated real-life conditions by diluting each cleanser with tap water and then comparing the changed pH.

Results: The pH levels of liquid cleansers, dishwashing liquids, a beauty bar, and alcohol gels were acidic to neutral and compatible with normal skin pH. Most bar soaps, baby soaps, and powdered laundry detergents had a pH in the alkali range. The pH of concentrated cleansers was slightly different from that of their dissolved forms.

Conclusion: Regarding the antiseptic property and pH of the cleansers, alcohol gels with moisturizers appeared to be the best hand cleansers to recommend to our patients.

CLEANSERS have an effect on skin condition and particularly the skin barrier in several ways. Dermatologists usually have to recommend cleansers to their patients who have abnormal skin conditions such as eczema, acne, or sensitive skin. Many characteristics of a cleanser should be considered, and the most important of these is its hydrogen ion concentration (pH). The pH of a cleanser definitely has an impact on the skin's surface, which is slightly acidic, by the alteration of bacterial flora, moisture in the skin, and skin surface.¹ Reports show that the pH of the skin changes depending on the pH of the cleanser used.²⁻⁴ The high pH of cleansers can aggravate surfactant-induced dryness and irritation. Due to the epidemic of swine (AH1N1 virus) influenza, frequent hand washing and cleansing with alcohol gels have been highly recommended worldwide. However, there is limited user acceptability owing to anticipated adverse effects on skin condition. Atopic dermatitis or chronic hand dermatitis patients believe that their skin conditions are aggravated by this frequent use of alcohol gels. In this study, we

evaluated the pH of various commonly available soaps, cleansers, detergents, and alcohol gels to assess patient comfort in using such products and to make recommendations to our patients.

Materials and Methods

Available and commonly used liquid cleansers, dishwashing liquids, bar soaps, powdered laundry detergents, and alcohol gels were assessed for their pH. In the case of bar soaps, a few drops of tap water at room temperature were poured onto the soap, which was then rubbed to obtain lather into which pH-indicator strips (pH 0–14 Universal indicator strips, Merck, Darmstadt, Germany) were dipped. In the case of the liquid soaps, a few drops of the soap were poured onto the pH paper. To mimic the daily use of these cleansers, they were dissolved in tap water to a concentration of 10 to 50% volume per volume (v/v) or weight per volume (except for Siriraj Hand Clean 70% alcohol gel) prior to pH measurement with a pH meter (CyberScan pH500, Eutech Instruments Pte Ltd, Singapore). Each sample was measured twice to obtain an average pH value.

Results

In this study, all soaps and cleansers evaluated were classified by use into the five following categories: liquid

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cleansers, bar soaps, dishwashing liquids, powdered laundry detergents, and alcohol gels.

Liquid cleansers Cetaphil Cleansing Lotion (Galderma, La Défense Cedex, France), Physiogel cleanser (Stiefel Laboratories, Bangkok, Thailand) perfume-free Eucerin pH5 Washlotion (Eucerin, Beiersdorf, Germany), and Hibiscrub are complex formulations composed of amphoteric, anionic, non-ionic, and silicone surfactants. Liquid cleansers are usually less irritating, having the same pH as that of skin and containing emollients and humectants.³ The pH values of all liquid cleansers were acidic (5.21–6.58).

Bar soaps Lux White Glamour (Unilever, Thailand), Care Baby Soap (Colgate-Palmolive, Thailand), Johnson's baby soap (Johnson & Johnson, Thailand), and Dove Beauty Cream Bar (Unilever, Mannheim, Germany) are a combination of fats, animal or vegetable oils and salt together with anionic surfactants that usually cause drying and irritation to skin.³ The pH values of the bar soaps were absolutely alkaline (10.0–11.3), with the exception of Dove Beauty Cream Bar.

Dishwashing liquids, such as Sunlight Standard Lemon (Unilever Corporation [Thailand] Limited) and Lipon F Dishwashing Liquid (Lion Corporation [Bangkok, Thailand] Limited), are detergents usually composed of highly foaming mixtures of surfactants and cause low skin irritation. They are primarily used for the hand-washing of utensils.⁵ Their pH levels were acidic to neutral (5.5–7.2).

Powdered laundry detergents Breeze (Unilever, Thailand) and Attack Concentrated Detergent Powder (Kao Corporation, Japan) consist of (1) ionic and anionic surfactants that remove the dirt from clothes, (2) perfume, and (3) phosphors and anticaking agents to prevent the powder becoming one large lump in the presence of moisture.⁵ The pH values of these powdered laundry detergents were extremely alkaline (10.8–11.7). People have daily exposure to more cleansers such as dishwashing liquid and powdered detergents during housework.

The alcohol gel assessed (Siriraj Hand Clean 70% alcohol gel) is an in-house antiseptic moisturizing alcohol hand gel containing 70% (v/v) ethanol and 3% (v/v) lanolin; its pH was 5.5, which made it more compatible with skin than the other cleanser.

Discussion

The natural pH of the skin surface is reported as ranging from 4.0 to 7.0; the average is 4.7.⁶ Skin pH values in this acidic range indicate that the skin is in a healthy condition

in terms of the biophysical parameters of barrier function, moisturization, and regulation of bacterial flora.⁷ Washing the skin with alkaline soaps or cleansers significantly increases the skin pH and has potentially functional and clinical disadvantages.⁸ The main action of a skin cleanser is the removal of dirt and grime from the skin surface. However, removing useful skin lipids together with dirt is unavoidable.⁹ Detergent-induced barrier dysfunction is a common problem found in our practice as seen in chronic hand dermatitis and atopic dermatitis patients.

In this study, the pH values for various soaps, liquid cleansers, laundry detergents, and alcohol gels that are commonly available in Thailand were determined with a

Table 1. pH Values of Various Cleansers*

<i>Cleanser</i>	<i>Average pH of Diluted Cleansers by pH Meter</i>	<i>Average pH of Cleansers by pH-Indicator Strips</i>
Liquid cleansers		
Cetaphil Cleansing Lotion	6.58	5.5
Physiogel (Stiefel Laboratories, Thailand)	5.95	6.0
Eucerin pH5 Washlotion (perfume free)	5.21	5.5
Hibiscrub	5.82	6.0
Bar soaps		
Lux (white)	11.31	10.0
Care	10.71	10.0
Johnson's baby soap	10.74	10.0
Dove Beauty Cream Bar	6.92	7.0
Dishwashing liquids		
Sunlight Standard Lemon	6.92	5.5
Lipon F Dishwashing Liquid	7.21	6.0
Powdered laundry detergents		
Breeze Excel	10.84	12.0
Breeze color	11.19	12.0
Attack Concentrated Detergent Powder	11.69	11.0
Siriraj hand clean 70% alcohol gel	NA [†]	5.5
Tap water	7.00	7.0

NA = not available.

*Room temperature, 24.5°C.

[†]The special probe of the pH meter for viscous substances (alcohol gels) was unavailable.

pH meter and pH-indicator strips. The pH assessments were designed to mimic real-life situations by diluting each cleansing product with tap water (pH 7.0 [range, 6.5–8.0], in accordance with ISO/IEC 17025, World Health Organization recommendation, 2006).¹⁰ We found that the pH values of concentrated cleansers were slightly different from those of their dissolved forms (0.05–1.42 [SD 0.8]) (Table 1). The deviations were not statistically significance and depended on the amount of each cleanser and on the pH of the tap water.

According to our findings, liquid cleansers, dishwashing liquids, Dove Beauty Cream Bar, and Siriraj alcohol gel had pH values in keeping with that of normal skin. Unexpectedly, dishwashing liquid is gentler to the skin than ordinary soap. Except for Dove Beauty Cream Bar, the regular soaps commonly used by the population at large have an alkaline pH. Even the baby soaps, which are the so-called mild soaps, have an alkaline pH. Powdered detergents had the highest pH values among the cleansers tested, ranging between 10 and 12. Powdered detergents containing harsh surfactants can cause damage to skin proteins and lipids, leading to afterwash tightness, dryness, barrier damage, irritation, and even itch.

As seen from in vitro models, exposure to an acid solution caused faster restoration of skin pH and had less irritation potency than did exposure to an alkali solution.¹¹ In addition, recent studies show that high-pH solutions, even in the absence of surfactants, can increase stratum corneum swelling and alter lipid rigidity, which suggests that cleansers with a neutral or acidic pH close to the normal pH of 5.5 are potentially less damaging to the skin.¹² With new technology, moisturizing alcohol hand gels that offer significant advantages in health care settings have been developed.¹³ Alcohol hand gels can be used for quick and effective antiseptic hand washing without water. The numerous brands of alcohol gels differ in humectant concentration, alcohol grade, and type of alcohol used. One recent study showed that alcohol-based gels did not alter transepidermal water loss or cause irritation. In addition, the gels hydrated the skin (in proportion to their glycerin content) and decreased skin pH.¹⁴ Our in-house antiseptic moisturizing alcohol hand gel (Siriraj alcohol gel), which contain 3% lanolin as a moisturizer and which has a pH of 5.5, could be among the good choices of hand cleansers.

There are reports that show a significantly higher skin surface pH and slower alkali neutralization in patients with acute dermatitis, atopic dermatitis, and ichthyosis vulgaris than in individuals without these conditions.¹⁵ From a dermatologic point of view, before a cleanser is recommended to a patient, especially one with dermatitis or sensitive skin, many of its aspects should be taken into

consideration; one essential aspect is its pH because an alkaline cleanser might aggravate the underlying skin condition of such a patient. However, the pH values of cleansers as used in real life slightly deviate from those indicated on the cleansers' packaging.

Conclusion

In regard to the antiseptic properties and pH values of hand cleansers, alcohol gels with moisturizer appear to be the best cleansers to recommend to our dermatitis patients in this era of influenza outbreaks.

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