

## The pH of antiseptic cleansers

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**Background:** Daily bathing with antiseptic cleansers are proposed by some physicians as an adjunctive management of atopic dermatitis (AD). As atopic skin is sensitive, selection of cleansing products becomes a topic of concern.

**Objective:** Our purpose is to evaluate the pH of various antiseptic body cleansers to give an overview for recommendation to patients with AD.

**Methods:** Commonly bar and liquid cleansers consisted of antiseptic agents were measured for pH using pH meter and pH-indicator strips. For comparison, mild cleansers and general body cleansers were also measured.

**Results:** All cleansing bars had pH 9.8–11.3 except syndet bar that had neutral pH. For liquid cleansers, three cleansing agents had pH close to pH of normal skin, one of antiseptic cleansers, one of mild cleansers and another one of general cleansers. The rest of antiseptic cleansers had pH 8.9–9.6 while mild cleansers had pH 6.9–7.5. Syndet liquid had pH 7 and general liquid cleansers had pH 9.6.

**Conclusion:** The pH of cleanser depends on composition of that cleanser. Adding antiseptic agents are not the only factor determining variation of pH. Moreover, benefit of antiseptic properties should be considered especially in cases of infected skin lesions in the selection of proper cleansers for patients with AD.

**Key words:** pH; Cleanser; Antiseptic; Atopic; Dermatitis

### INTRODUCTION

*Staphylococcus aureus* (*S. aureus*) colonization and infection is a common complication of atopic dermatitis (AD), due to defective epidermal barrier function and decreased antimicrobial peptides [1]. *S. aureus* superantigens were reported to worsen the inflammation of AD [2]. The density of *S. aureus* tends to increase with the clinical severity [3]. In addition, bacterial infection is not

only a factor causing acute and severe disease exacerbation but viral and fungal infections are also potentially associated with the severity [4]. Therefore, antimicrobial therapy is a beneficial treatment module in the management of AD. Breneman et al. [5] reported the using of antimicrobial soap regularly could decrease bacterial colonization on the skin and improved the clinical severity of AD.

There is a wide range of antiseptic cleansers commercially

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available in the market. As atopic skin is more sensitive, cautious selection of cleansing products is very important for avoiding adverse effects. In order to recommend suitable antiseptic cleansers for patients with AD, several aspects should be considered. The hydrogen ion concentration (pH) of antiseptic cleanser is one factor of concern. Since the majority pH of cleansers is alkaline, it subsequently changes the cutaneous pH, which ranged from 4 to 6 (mean of normal skin pH is around 5.4–5.9) [6, 7]. This change affects the physiologic protective “acid mantle” of the skin by decreasing the fat content [8]. Moreover the pH of cleanser has an effect on the skin surface by alteration of normal skin flora, moisture content and disruption of stratum corneum [9]. The changes in pH are key elements in the induction of irritation and dryness for the inflamed skin of some patients with AD [10, 11]. Several studies demonstrated that alkaline solutions including surfactant-free solution elevate both lipid rigidity and stratum corneum swelling. Accordingly, in order to lowering the skin damage, cleansings with neutral pH and pH close to 5.5 are recommended [12].

It is important that dermatologists and the patients with AD are aware of the irritation potential of products that are used for body cleansing. The aim of this study is to assess the pH of various commonly available antiseptic cleansers and to make an overview for recommendations to patients with AD.

## MATERIALS AND METHODS

### Materials

Commonly available bar and liquid body cleansers that consist of antiseptic agents such as triclosan, triclocarban and chloroxylenol were measured for the pH. For comparison, mild baby cleansers which general people believe that they are suitable for the use on their sensitive skin due to their mildness as well as the general cleansers on the market were also measured.

### Methods

#### pH measurement of cleansing products

In the case of cleansing bars, we weighed one gram of them and dissolved it in 19 mL of tap water. This was made up to prepare 5% cleansing solution (weight by volume) and the liquid cleansers were weighed at one gram and was made up to 5% cleansing solutions in tap water in order to resemble the actual usage condition.

The pH was determined using a pH meter (Thermo Scientific Orion 2 Star, Thermo Scientific, Beverly, MA, USA) and pH-indicator strips (pH 0–14 Universal indicator strips, Merck, Darmstadt, Germany). Each sample was measured twice to acquire an average pH value.

## RESULTS

The tested cleansers were classified as cleansing bars and liquid cleansers. For the antiseptic cleansers, all of them were consisted of antiseptic agents such as triclosan, triclocarban and chloroxylenol. The average pH value of cleansers are shown in Table 1.

For the cleansing bars, antiseptic bars had average pH measured by the pH meter between 9.9 and 10.7 while mild cleansing bars had an approximate pH of 10 and syndet bar had a neutral pH. General cleansing bars had pH 10.5–11.3. Therefore, all of them had an alkaline pH except syndet bar.

For liquid cleansers, three cleansing agents had pH closed to the pH of normal skin of normal people (pH 5.4–5.9) [6], one of antiseptic liquid cleansers (sample 12), one of mild liquid cleansers (sample 18) and another one of general cleansers (sample 23). The rest of the liquid antiseptic cleansers had pH between 8.9 and 9.6, while mild liquid cleansers had pH between 6.9 and 7.5. Syndet liquid had an approximate pH of 7 and general liquid cleansers had pH 9.6.

## DISCUSSION

The association between colonization of microbial organisms and eczema severity of the AD patient has been described, most particularly *S. aureus* [3]. Increased numbers of *S. aureus* are found in over 90% of lesional skin in atopic eczema. Even in normal-appearing skin, it can be isolated with *S. aureus* [13]. Moreover, its ability to produce superantigen leads to acute exacerbation and maintenance of skin inflammation [2, 14]. Recent studies show that using diluted sodium hypochlorite baths and intranasal mupirocin have improved the clinical severity for moderate to severe AD in infection-prone patients [15, 16]. In addition, several studies have demonstrated that a short course of systemic antibiotics or even a topical therapy for localized lesions is helpful. It is crucial not to start patients on prolonged antimicrobial therapy. This is because they can increase the risk of bacterial resistance [17, 18]. Thereby,

**Table 1.** Comparison of the pH of antiseptic and other cleansing products

Type of cleansers	Sample	Antiseptic composition	Average pH measured by pH-indicator strips	Average pH measured by pH meter
Antiseptic cleansing bars	1	Tricocarbon, chloroxylenol	9.5	9.87
	2	Tricocarbon	10.0	10.25
	3	Tricocarbon	10.5	10.57
	4	Tricocarbon	10.5	10.67
	5	Triclosan	10.5	10.65
	6	Triclosan	10.5	10.53
Mild cleansing bars (baby cleansing bars)	7	No	10.0	10.17
	8	No	10.0	10.18
Syndet bar cleanser	9	No	7.0	7.09
General cleansing bars	10	No	10.0	11.31
	11	No	10.5	10.58
Antiseptic liquid cleansers	12	Chloroxylenol	5.0	5.00
	13	Tricosan, chloroxylenol	9.0	9.35
	14	Tricocarbon	8.5	8.94
	15	Triclosan	8.5	9.00
	16	Triclosan	9.0	9.60
	17	Triclosan	9.5	9.52
Mild liquid cleansers (baby cleansers)	18	No	5.0	4.91
	19	No	7.0	6.90
	20	No	7.0	7.38
	21	No	7.5	7.52
Syndet liquid cleanser	22	No	7.0	7.06
General liquid cleansers	23	No	5.5	5.41
	24	No	9.5	9.57
	25	No	9.5	9.59
Tap water		Bangkok, Thailand	7.5	7.51

1, Dettol original (Reckitt Benckiser, Indonesia); 2, Protex Pro Clean (Colgate-Palmolive, Thailand); 3, Safeguard (Procter & Gamble, Thailand); 4, Dr.Somchai acne skin care soap (S.S manufacturing, Thailand); 5, Asepto soap (Codaa, Switzerland AG); 6, Vasaline duo active (Unilever, Thailand); 7, Care baby soap (Colgate-Palmolive); 8, Johnson baby soap (Johnson & Johnson, Thailand); 9, Dove whitening (Unilever); 10, Lux white glamour (Unilever); 11, Parrot Botanicals Soap Green Bar (Rubia Industries, Thailand); 12, Dettol original (Reckitt Benckiser, China); 13, Asepto original (Codaa); 14, Protex pro expert (Colgate-Palmolive); 15, Deterderm duo extra plus (Padsaard-Lab, Thailand); 16, Vasaline healthy white (Unilever); 17, Be nice (Bio manufacturing, Thailand); 18, Johnson top to toe wash (Johnson & Johnson, Malaysia); 19, Babymild (Greensville, Thailand); 20, Care kids hypoallergenic (Colgate-Palmolive); 21, Dermaporn original (Milott Lab., Thailand); 22, Dove beauty cream (Unilever); 23, Imperial leather (PZ Cussons, Thailand); 24, Lux (Unilever); 25, Shokubutsu monokotari (Lion Co., Thailand).

antiseptic cleansers are an adjunct option to the management of AD [18].

Regular use of antiseptic cleansers is more advantageous even for microbial organisms colonized on the normal skin of AD. Some studies have shown a benefit from the use of antiseptics in the treatment of AD. In a study of AD patients by Breneman et al. [5], daily washing with triclosan- or triclocarbon-containing

soaps resulted in significantly greater improvement in skin lesions than washing with placebo soap. A double-blinded comparative study, mineral oil-based bath emollient containing triclosan and benzalkonium chloride was previously shown to achieve significant clinical improvement in patients with AD [19]. In a recent study, treatment with 1% triclosan in emollient did slightly better than the emollient-alone group regarding SCORAD (scoring atopic

dermatitis) change from baseline within day 14, this difference was no longer statistically significant by day 27. However, patients using triclosan required less topical steroids than those with emollient alone [20]. In general, regular use of an antiseptic cleanser was well tolerated, decreased bacterial colonization and provided clinical improvement. However, various studies proposed that the patients with AD do not tolerate frequent baths because their skin barrier function is impaired [21, 22]. In severe generalized bacterial infection, antiseptic baths can be a great benefit to eradicate the crusts and a decrease in the number of *S. aureus* on the skin, but optimal concentrations regarding antiseptic efficacy, the frequency and skin tolerance remain to be defined [18]. Recently the authors of a *Cochrane Database Systematic Review* did not find clear evidence to support the use of antibacterial agents in non-infected eczema. However, they mentioned that the studies were small and poorly reported [23]. Further large studies with appropriate comparators are required in order to assess the role of antiseptics in secondary prevention.

Majority of AD patients do not tolerate strong antiseptics agents, such as chlorhexidine, gentian violet, and bleach baths [14]. So, mild antiseptic agents that are generally offered in the market, such as triclosan, triclocarban and chloroxylenol, are the alternative. *WHO Guidelines on Hand Hygiene in Health Care* demonstrated the range of antiseptic activity that was varied by concentrations. In addition, the antiseptic efficacy against *S. aureus* showed no difference and among antiseptic substances, 'triclosan' tended to be a bacteriostatic [24]. However, we cannot compare which cleansing products provide the most effective antibacterial efficacy because its potency against microbe can be enhanced by formulation effect. In fact, the concentration of antiseptic substances of each cleanser should be considered. Nevertheless, on the label of products, the concentration of antiseptic substance does not present according to the trade secret. In addition, the regulation of local Food and Drug Administration's is not restricted on presenting the active ingredient percentage. According to Atiyeh et al. [25] study, the concentration of 1%–2% of triclosan and 0.5%–4% chloroxylenol are regularly used for antibacterial therapy.

Cleansing bars are normal toilet soaps that are manufactured by the process of saponification, where alkalis are added to animal fats and vegetable oils with anionic surfactants that usually cause drying and irritation to the skin [26]. Thus, in our study, all of cleansing bars have an alkaline pH ranging between 9 and 11. Washing with them disturbs barrier function by extracting lipids,

thereby increasing transepidermal water loss and increasing pH [27]. However, the exposure to alkaline cleansers in the setting of the diminished barrier function of atopic skin leads to further disruption of the permeability barrier and subsequent inflammation and dermatitis [28].

For liquid body cleansers, only three cleansing agents in our study had pH closed to the pH of normal skin of normal people, one of antiseptic cleansers, one of mild liquid cleansers and another one of general liquid cleansers. The rest liquid-cleansing agents had pH ranged from neutral to alkali pH (6.9–9.6). In general, liquid cleanser has more slightly acidic pH than cleansing bars since their formulations are complicated, utilizing a combination of surfactant including amphoteric, anionic, non-ionic, and silicone surfactants [29]. Liquid cleansers also contain a mixture of emollients and humectants that lowering the pH of product and also moisten the dry skin caused primarily by anionic surfactants [30]. Adding antibacterial agents is not the only factor causing variation of the pH, which may be depending on the formulation of that cleanser [31].

Besides the pH, there are several factors leading to irritancy potential of cleansing agents, including type of surfactants, and amount of skin residue [32]. The mildness of cleansers and their ability for maintaining proper hydration of the stratum corneum are beneficial to AD skin. The presence of humectants and emollients can also influence the overall mildness of a cleansing agent.

In conclusion, liquid antibacterial cleansers with slightly acidic or neutral pH are preferable for people who are at increased risk for irritancy reactions or atopic skin. The pH of cleanser depends on the composition of that cleanser. Adding antibacterial agents is not the only factor determining variation of the pH of cleanser. Besides pH, the benefit of antiseptic properties should be considered especially in cases of infected skin lesions in the selection of proper cleansers for patients with AD.

## REFERENCES

1. Ong PY, Leung DY. The infectious aspects of atopic dermatitis. *Immunol Allergy Clin North Am* 2010;30:309-21.
2. Leung AD, Schiltz AM, Hall CF, Liu AH. Severe atopic dermatitis is associated with a high burden of environmental *Staphylococcus aureus*. *Clin Exp Allergy* 2008;38:789-93.
3. Gong JQ, Lin L, Lin T, Hao F, Zeng FQ, Bi ZG, Yi D, Zhao B. Skin colonization by *Staphylococcus aureus* in patients with

- eczema and atopic dermatitis and relevant combined topical therapy: a double-blind multicentre randomized controlled trial. *Br J Dermatol* 2006;155:680-7.
4. Baker BS. The role of microorganisms in atopic dermatitis. *Clin Exp Immunol* 2006;144:1-9.
  5. Breneman DL, Hanifin JM, Berge CA, Keswick BH, Neumann PB. The effect of antibacterial soap with 1.5% triclocarban on *Staphylococcus aureus* in patients with atopic dermatitis. *Cutis* 2000;66:296-300.
  6. Braun-Falco O, Korting HC. Normal pH value of human skin. *Hautarzt* 1986;37:126-9.
  7. Rippke F, Schreiner V, Doering T, Maibach HI. Stratum corneum pH in atopic dermatitis: impact on skin barrier function and colonization with *Staphylococcus Aureus*. *Am J Clin Dermatol* 2004;5:217-23.
  8. Lambers H, Piessens S, Bloem A, Pronk H, Finkel P. Natural skin surface pH is on average below 5, which is beneficial for its resident flora. *Int J Cosmet Sci* 2006;28:359-70.
  9. Parra JL, Paye M; EEMCO Group. EEMCO guidance for the in vivo assessment of skin surface pH. *Skin Pharmacol Appl Skin Physiol* 2003;16:188-202.
  10. Korting HC, Braun-Falco O. The effect of detergents on skin pH and its consequences. *Clin Dermatol* 1996;14:23-7.
  11. Gfatter R, Hackl P, Braun F. Effects of soap and detergents on skin surface pH, stratum corneum hydration and fat content in infants. *Dermatology* 1997;195:258-62.
  12. Ananthapadmanabhan KP, Moore DJ, Subramanyan K, Misra M, Meyer F. Cleansing without compromise: the impact of cleansers on the skin barrier and the technology of mild cleansing. *Dermatol Ther* 2004;17 Suppl 1:16-25.
  13. Boguniewicz M, Leung DY. Recent insights into atopic dermatitis and implications for management of infectious complications. *J Allergy Clin Immunol* 2010;125:4-13.
  14. Boguniewicz M, Schmid-Grendelmeier P, Leung DY. Atopic dermatitis. *J Allergy Clin Immunol* 2006;118:40-3.
  15. Craig FE, Smith EV, Williams HC. Bleach baths to reduce severity of atopic dermatitis colonized by *Staphylococcus*. *Arch Dermatol* 2010;146:541-3.
  16. Huang JT, Abrams M, Tlougan B, Rademaker A, Paller AS. Treatment of *Staphylococcus aureus* colonization in atopic dermatitis decreases disease severity. *Pediatrics* 2009;123:e808-14.
  17. Abeck D, Mempel M. *Staphylococcus aureus* colonization in atopic dermatitis and its therapeutic implications. *Br J Dermatol* 1998;139 Suppl 53:13-6.
  18. Schnopp C, Ring J, Mempel M. The role of antibacterial therapy in atopic eczema. *Expert Opin Pharmacother* 2010;11:929-36.
  19. Harper J. Double-blind comparison of an antiseptic oil-based bath additive (Oilatum Plus) with regular Oilatum (Oilatum emollient) for the treatment of atopic eczema. In: Lever R, Levy J, editors. *The Bacteriology of eczema*. London: The Royal Society of Medicine Press Limited; 1995. p. 42-7.
  20. Tan WP, Suresh S, Tey HL, Chiam LY, Goon AT. A randomized double-blind controlled trial to compare a triclosan-containing emollient with vehicle for the treatment of atopic dermatitis. *Clin Exp Dermatol* 2010;35:e109-12.
  21. Gelmetti C. Skin cleansing in children. *J Eur Acad Dermatol Venereol* 2001;15 Suppl 1:12-5.
  22. Elias PM, Schmuth M. Abnormal skin barrier in the etiopathogenesis of atopic dermatitis. *Curr Opin Allergy Clin Immunol* 2009;9:437-46.
  23. Bath-Hextall FJ, Birnie AJ, Ravenscroft JC, Williams HC. Interventions to reduce *Staphylococcus aureus* in the management of atopic eczema: an updated Cochrane review. *Br J Dermatol* 2010;163:12-26.
  24. World Health Organization. WHO guidelines on hand hygiene in health care: first global patient safety challenge clean care is safer care. Geneva: World Health Organization; 2009.
  25. Atiyeh BS, Dibo SA, Hayek SN. Wound cleansing, topical antiseptics and wound healing. *Int Wound J* 2009;6:420-30.
  26. Corazza M, Lauriola MM, Zappaterra M, Bianchi A, Virgili A. Surfactants, skin cleansing protagonists. *J Eur Acad Dermatol Venereol* 2010;24:1-6.
  27. Hannuksela A, Hannuksela M. Soaps and detergents in skin diseases. *Clin Dermatol* 1996;14:77-80.
  28. Bikowski J. The use of cleansers as therapeutic concomitants in various dermatologic disorders. *Cutis* 2001;68:12-9.
  29. Kuehl BL, Fyfe KS, Shear NH. Cutaneous cleansers. *Skin Therapy Lett* 2003;8:1-4.
  30. Abbas S, Goldberg JW, Massaro M. Personal cleanser technology and clinical performance. *Dermatol Ther* 2004;17 Suppl 1:35-42.
  31. Nix DH. Factors to consider when selecting skin cleansing products. *J Wound Ostomy Continence Nurs* 2000;27:260-8.
  32. Baranda L, González-Amaro R, Torres-Alvarez B, Alvarez C, Ramírez V. Correlation between pH and irritant effect of cleansers marketed for dry skin. *Int J Dermatol* 2002;41:494-9.