

The pH of the main Brazilian commercial moisturizers and liquid soaps: considerations on the repair of the skin barrier*

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Abstract: The pH of the skin is slightly acidic (4.6 to 5.8) which is important for appropriate antibacterial, antifungal, constitution of barrier function, as well as structuring and maturation of the stratum corneum. This study aimed to evaluate the pH of the main commercial moisturizers and liquid soaps in Brazil. Thus, pH of the products was quantified by pH meter in three measurements. A total of 38 moisturizers and six commercial liquid soaps were evaluated. Mean pH of 63% and 50% of the moisturizing and liquid soaps presented results above 5.5, disfavoring repair, function, and synthesis of dermal barrier.

Keywords: Dermatitis, atopic; Hydrogen-Ion concentration; Soaps; Wetting agents

The pH of the skin is slightly acidic (4.6-5.8), which is important for its antimicrobial activity, adequate barrier function, structuring and maturation of the stratum corneum. Age, body topography, skin type, sweat, soaps and other topic agents are variables that interfere with its values.¹

Atopic dermatitis (AD) is the most studied pathophysiological model of skin barrier defect. In AD, skin pH is commonly higher (7.0-7.5), leading to worsening of xerosis, pruritus and severity of eczema.²

Acidity of the skin surface is maintained by fatty acids released in sebum, lactic acid and sweat amino acids, as well as products of keratinization and hydrolysis of epidermal peptides, such as filaggrin. All these factors contributing to the reduction of pH are reduced in the stratum corneum of patients with AD.^{2,3} Furthermore, skin barrier defect is associated with reduction of ceramides and prophyllagrin, with greater transepidermal water loss (TEWL), favoring the penetration of substances that act as triggers for inflammation.^{3,4}

Hydration of the stratum corneum is directly related to damage to the cutaneous barrier and varies according to the body area, due to stratum corneum thickness and to microvasculature. After an injury to stratum corneum, TEWL may increase by more than 10 times.³ Reduction of water leads to cracks in the stratum corneum, allowing permeation of substances of higher molecular weight, including allergens and microorganisms. Even in the absence of eczema, the atopic patient presents skin dryness, with increased TEWL in both lesioned skin and uninvolved skin.^{3,5}

Filaggrin is the main peptide responsible for aggregating keratin and other proteins in the upper layers of the epidermis to form the stratum corneum.⁶ Its deficiency is common in AD (30%), ichthyosis vulgaris and also in the general population. Filaggrin has its synthesis reduced in alkaline environment, as well as the proteases that cause its degradation have higher activity in media with higher pH.⁶

When pH rises, enzymatic activity leads to an inappropriate desquamation, reducing stratum corneum integrity, in addition to the IL-1 β activation, which perpetuates chronic inflammation. Furthermore, production of ceramides is pH-dependent since acid sphingomyelinase and beta-glucocerebrosidase work more actively at pHs between 4.5-5.6.²

Moisturizers and liquid soaps are two important classes of products used both in the prevention and as coadjuvants of dermatological therapy in AD, and the acidic pH of these products (≤ 5.5) favors the repair of the cutaneous barrier.² To date, there are no studies evaluating the pH of the main commercial moisturizers and liquid soaps in Brazil.

A cross-sectional study was performed in which pH of moisturizers and liquid soaps were quantified by the Ultrabasic UB-5 pH meter (Denver Instruments, Denver, USA), from September to December 2015.

The main moisturizers and liquid soaps for dermatological use available in the market (Botucatu-SP, Brazil, in 2016) were select-

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TABLE 1: Mean pH of the 38 commercial moisturizers tested (alphabetical order)

Moisturizers	Product batch	Mean ph
Active Relief - Aveeno	0066LK SP	4,040
Atoderm Intensive Baume - Bioderma	028104S	4,333
Cetaphil Advanced moisturizing cream	P50926-3	4,553
Cetaphil Restoraderm Loção Hidratante	106159	5,660
Cold Cream - Helianto	1502009	5,776
Dermovance Hidratante Corporal - FQMDerma	L151294	5,383
Dove DermaSeries Intensive repairing body cream	10303TS01	7,586
Emoderm - TheraSkin	M521	7,070
Epidrat Ultra Loção Hidratante - Mantecorp	B14K1896	5,526
Fisioativ creme - Glenmark	L/B411013	5,183
Fisiogel Ação Calmante pele seca sensível e irritada	1049980	5,625
Fisiogel Hidratante pele seca e sensível	1047437	5,413
Hidra Kids Loção Infantil Hidratante	4040118	6,180
Hidrashower Body - Dermage	201402010	4,023
Hidratante Corporal - Moderm	L 1651	5,506
Hydracell Hidratante Corpo e Face - Germed	9231303	4,880
Hydraporin Hidratante - Mantecorp	B15B0172	5,540
Lipikar Baume AP+ - La Roche-Posay	54LD02	4,840
Neutrogena Intensive Body Care	3224B09	4,276
Neutrogena Norwegian	0715K	4,936
Nivea Milk	44629333	4,680
Nutraplus 20 - Galderma	4801015	6,755
Nutratopic Loção Emoliente Pele Reativa - ISDIN	41571	5,633
Nutratopic Rx Creme Dermatológico - ISDIN	40871	5,240
Original Loção Hidratante - Saniskin	L 150818	7,813
Professional Repair - Eucerin	34915025DY	6,596
Sebamed Loção Hidratante	3009000E	5,386
SkinSec Loção Hidratante Corporal - Darrow	1400368	5,725
Topicrem Ultra-hydratant Lait Corps	C1793	7,680
TriXéra+ Selectiose Crème émolliente - Avène	F 525	5,823
Umiditá AI creme - Libbs	1505038A	5,790
Umiditá Infantil - Libbs	15004034	5,876
Universal Emulsão Hidratante - Merck	BR55816	8,616
Ureadin 3 Loção - ISDIN	3184200	7,090
Ureativ 10 Loção Hidratante para todo o corpo - Glenmark	3402016	8,393
Uremol fluid - Stiefel	L 1050495	7,786
Vasenol Clinical	VIF040306008	6,253
Vasenol Repairing	24803	5,786

TABLE 2: Mean pH of six commercial liquid soaps tested (alphabetical order)

Liquid soap	Product batch	Mean pH
Cetaphil Restoraderm	106159	5,623
Dove DermaSeries Body Cleanser	11053T001	6,456
Eucerin pH 5 Syndet Gel de Limpeza	34557034	5,093
Johnson's Baby da Cabeça aos Pés	0275B10	4,490
Nutratopic Gel de Banho	41561	5,563
SkinSec	1300675	5,130

ed. After calibration, the measurements were performed in triplicate, by the same operator, directly in the products, and the average of the measurements were considered.

Thirty-eight moisturizers and six liquid soaps were assessed. The pH average of the samples are disclosed in tables 1 and 2. In 24 (63%) moisturizers and three (50%) liquid soaps, pH exceeded 5.5, disfavoring the repair of the cutaneous barrier. In 12 (32%) moisturizers and one (17%) liquid soap, the pH was higher than the physiological skin pH (5,8), disfavoring the antimicrobial function.

Indication of moisturizers and soaps in patients with skin barrier defect should consider not only the hydration capacity of the stratum corneum, but also its repair. In addition, it was evidenced the prevention of AD and atopic march in murine model, using acidified moisturizing (pH 2,8).⁷

Kubota *et al.* evaluated 70 patients with AD submitted to rapid baths twice a day at 42°C in a medium with acidic pH, and observed improvement in cutaneous symptoms in 76% of cases.⁸

Colonization by *S. aureus* constitutes an important pathogenic factor in AD due to the production of superantigens and tox-

ins, as well as its capacity to stimulate, expand and maintain the inflammatory reaction. Virulence and multiplication of bacteria reach their maximum at neutral pH, being inhibited in an acidic medium. Potential for adhesion of *S. aureus* to human keratinocytes also rises with increasing pH.⁹

Sasai-Takedatsu *et al.* assessed 22 patients with AD with no specific treatment; half of them received electrolytic acid water spray twice daily, and the other half received placebo. The treated group presented reduction of AD, improvement of sleep quality and reduction of bacterial colonization.¹⁰

The pH differences identified in this study do not discredit the hydration capacity of the products in the stratum corneum, nor their temporal stability. However, in patients with skin barrier deficiency, as in AD, the pH of topical products should be considered in their indication.

In conclusion, there is an important proportion of commercial moisturizers and liquid soaps with pH above 5.5, which can interfere in function, repair and synthesis of skin barrier. □

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