CLEANSING OF SENSITIVE SKIN

WITH DETERMINATION OF THE pH OF THE SKIN FOLLOWING USE OF SOAP AND A SOAP SUBSTITUTE\(^1\)

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The role of soap as a cause of dermatitis in persons with sensitive skin is often underestimated. Although the occurrence of soap sensitivity is comparatively rare, when sensitivity does occur, the problem of maintaining personal hygiene and household cleanliness is a difficult one.

EFFECTS OF SOAP ON THE SKIN

Soaps contain eczematizing substances, which under ordinary use produce only temporary, quickly reparable changes in the "acid mantle" of the skin. However, when the skin is abnormally sensitive, or when soap is employed excessively, the effects of these irritating substances are manifested as a clinically recognizable dermatitis.

The belief that truly "neutral" soaps exist is erroneous because alkali is always set free from soap through hydrolysis in water. This is also true of the so-called superfatted soaps. Free alkali is the factor which produces keratin hydration and which interferes with the integrity of one of the protective mechanisms of the skin. Among the other harmful soap components may be included resin, sodium silicates, fatty acids and perfumes (1A and 1B). Blank (1) suggests that certain fatty acids (especially of low molecular weight) might irritate the skin in the presence of alkali.

Some persons complain that "hard water" irritates their skin. Lane and Blank suggest the explanation that hard water precipitates deposits (resulting in what is known as "bath tub ring") onto the surface of the skin and thereby prolongs the time the skin remains alkaline, subsequent to washing. This may lead to irritation.

Recently Bernstein and Herrmann (2) studied the pH variations of the skin before and after washing with soap and water. They observed that this procedure normally increases the pH by 1.0 to 2.0 units for about three and a half hours. In the presence of skin abnormalities, however, where the pH is shifted toward the alkaline side, Bernstein and Herrmann found that this influence of soap may be particularly marked and prolonged. In eczemas, for example, the increase in pH was evident not only in the affected areas, but also in the unaffected surroundings and even in far distant areas.

The defatting action of soap is so well recognized that attempts have been made to prevent it by superfattting. The fallacy in these attempts has been pointed out by several investigators who indicate that the incorporation of an excess of fat does not change any of the abnormal effects of soap on sensitive skin. These soaps are as alkaline and as drying as ordinary soap, since they contain the same potentially eczematizing components.

CLINICAL MANIFESTATIONS OF SOAP DERMATITIS

The important clinical features of soap dermatitis are listed by Osborne, Jordan and Dolce (3) as: "(a) The eruption is usually vesicular with a patchy distribution on the dorsum of the fingers, hands and occasionally on other exposed areas. (b) The eczema tends to improve in warm weather and in general is better or worse depending upon the degree and

\(^1\) From the Dermatological Department (Service of Doctor Eugene Traugott Bernstein), and Laboratory (Director Doctor Joseph Gudeman) of Beth David Hospital, New York City.

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frequency of exposure to these substances. (c) Many of these cases are erroneously diag-
nosed as ringworm and unsatisfactorily treated as such. While this type of dermatitis has
never been proven to be caused by soap, it has often been greatly aggravated by the use of
soap. For example, the dermatologist frequently sees eczematous dermatitis in house-
wives, cooks, hairdressers, bartenders, surgeons, nurses, dentists and canners, which has
been aggravated by the use of soap. (Soap effects may also predispose the skin to typical
infections with cocci or fungi, because these organisms find ready access and conditions are
favorable for their growth when the protective acid mantle of the skin is impaired.)

Occupational dermatitis in industrial workers is often due to the improper use of soapy
cleansing agents rather than to industrial irritants. Klauder and his collaborators (4)
state, "It is worthy of emphasis that trade dermatitis is caused annually, in an enormous
number of cases, not by the substances encountered at work, but by the removal of these
substances with methods harmful to the skin."

SOAPLESS DETERGENTS AS SOAP SUBSTITUTES

A solution to the problem of soap dermatitis—whether soap is the primary,
initiating, aggravating or predisposing factor—may be obtained by the complete
substitution of soap with soapless detergents.

For many years the entire ritual of skin cleansing has been so standardized
that a satisfactory soapless detergent necessarily must approximate as closely
as possible the by far most common, most pleasing and most convenient soap
product used, i.e., the soap cake. A detergent cake should lower the acidity
of normal skin as little as possible, should not be a primary irritant and should
have a low sensitizing index; it is expected to form suds readily in soft or hard,
warm or cold water, but not to exert a markedly defatting action on the skin.

Several nonirritating cutaneous detergents are available today but of these
only two actually comply closely with the above outlined qualifications: One
of these products is in the form of a cream—an emulsion of lanolin sterols,
petrolatum, an alkyl ether sulfonate and water. The other product is in the
form of a cake2, similar in shape and size to the guest size soap cake. It con-
tains lauryl sulfoacetate as a wetting agent and lactic as well as boric acid
dispersed in a bentonite buffer.

After numerous trials using both detergents, the author observed a decided
preference, on the part of his patients, towards the cake product because of
its convenience, economy and mildness. This detergent cake is so mild that
its suds do not irritate the conjunctivae of the eye, unlike soap or other avail-
able detergents. Osborne, Jordan and Dolce (3) have definitely established
the nonirritating and low sensitizing qualities of lauryl sulfoacetate.

EXPERIMENTAL

The effect of several modifications of the detergent cake and of the finally adopted form,
on the pH of the skin, was determined in experimental studies using the method devised and
described by Bernstein and Herrmann (2). All examinations were carried out at least four
hours after any preceding washings. The pH was taken on two symmetrically-located skin
areas before each washing procedure, whereupon both areas were washed for one minute
each: with Lowila soap cake and water on one site and with ordinary toilet soap and water
on the other. The toilet soaps used in comparison were Camay soap, Amazon Float, Life-

2 Lowila Cake
buoy soap and Cashmere Bouquet, i.e., that kind of soap which happened to be in use in the laboratory. The washed areas were rinsed with tap water and dried with paper towels. Contact of one test area with material used for the procedure on the other test area was carefully avoided. pH determinations were made on each site 1, 5, 10, 20, 40 minutes, and so on, after washing, until the original before-washing pH figures returned and remained consistent. In this way, fifty test series were carried out.

In the course of examinations, several changes in the originally-tested cake sample were necessary. These essential improvements concerned not only the acids employed for maintaining skin acidity, but also the components important for detergent action and consistency of the material. Shortcomings found in earlier samples necessitated alteration of emulsifying and wetting agents. Likewise, the selection of acids, as well as their concentration and proportion, were subjected to changes depending on the outcome of pH studies and tolerability of the samples on the skin.

RESULTS

The result of these investigations was that washing with the final detergent cake produced only a very moderate and comparatively transient increase in pH on the skin, unlike the marked and more persistent rise following the use of soap. Results of a representative experiment are as follows:

<table>
<thead>
<tr>
<th>Time after washing</th>
<th>pH Forearm, Flexor aspect</th>
<th>pH Soap</th>
<th>pH Lowila Cake</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Minute after washing</td>
<td>7.0</td>
<td>3.3</td>
<td>4.2</td>
</tr>
<tr>
<td>5 Minutes after washing</td>
<td>6.5</td>
<td>3.8</td>
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<tr>
<td>12 Minutes after washing</td>
<td>6.5</td>
<td>3.8</td>
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<tr>
<td>30 Minutes after washing</td>
<td>6.2</td>
<td>3.8</td>
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<tr>
<td>40 Minutes after washing</td>
<td>4.5</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>60 Minutes after washing</td>
<td>4.2</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>70 Minutes after washing</td>
<td>4.0</td>
<td>3.8</td>
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HOUSEHOLD DETERGENTS

The most common soaps and allied cleansers used for household purposes, washing dishes, laundry, and so forth, are marketed in powder or flake form and are often more irritating to the skin than toilet soap. The common use of these products in watery solution necessitates frequent immersion of the skin for long periods. Treatment, or attempts to prevent soap dermatitis in susceptible houseworkers, are futile unless a satisfactory substitute for household soaps can be provided. Obviously, a suitable soapless household cleanser must have qualifications similar to those outlined for cutaneous detergents.

A household detergent available for prescribing by physicians, to enable them to offer a soap-free regimen, is a supersaturated solution of aryl alkyl sulfonate. This is a satisfactory soap substitute for all household cleansing, and meets the aforementioned requirements except for physical form. The liquid form was decided on after repeated trials indicated that no matter which proper detergent was chosen, in flake or powder form, in actual use a fine powder always floated in the air and produced more or less violent sneezing attacks.
The new liquid household detergent\(^3\) is economical—a teaspoonful in a gallon of water is sufficient for most washing—and gives satisfactory results.

**CLINICAL EXPERIENCE WITH THE CUTANEOUS DETERGENT CAKE AND THE HOUSEHOLD LIQUID DETERGENT**

The value of maintaining a soap-free regimen was observed by the author during the last two years in 146 cases of dermatitis. These cases included the eczematous dermatoses, neurodermatitis, fungous and other infections and seborrheic dermatitis. Approximately 34% of these cases were occupational dermatoses occurring among fur workers.

A critical evaluation of results of the soap-free procedure is impossible because the latter was merely part of the general treatment in most cases other than the frank dermatoses. However, it was possible to obtain a definite clinical impression of the importance of soap in predisposition to and in aggravation of cutaneous diseases. Where soap was the causative agent, its complete substitution with the detergent cake (and the liquid) quickly cleared up the condition and prevented its recurrence.

In fungous infections, moniliasis, "athlete's foot", etc., the use of soap usually prolonged the period of therapy. When it was desirable to maintain cleanliness, the use of the new detergent, instead of soap, materially aided the usual therapy. Recurrences could apparently be reduced by the simple expedient of maintaining the soap-free regimen.

Contact dermatitis is probably the most frequently encountered occupational disease among fur workers, fur handlers, finishers, operators, and so forth. While soap is usually not the causative agent in these cases, it can be an aggravating factor. Substitution of soap with the detergent cake proved to be of value as an adjunct in the treatment of this type of dermatitis as well as a preventive of its occurrence and recurrence.

**SUMMARY**

The well-known role of soap as an initiating, aggravating, prolonging and predisposing factor for dermatitis is discussed: Soap contains eczematizing substances which ordinarily cause only temporary, quickly-reparable changes on the skin surface. However, when it is used excessively or when the skin is abnormally sensitive, a clinically recognizable dermatitis may result.

A promising countermeasure is the substitution of soap with soapless detergents. Among the satisfactory available detergents for this purpose are: an acidified cake containing lauryl sulfoacetate dispersed in bentonite for skin cleansing; a liquid containing aryl alkyl sulfonate for household cleansing.

When soap is a causative factor in dermatitis the simple substitution of soap with the above-described detergents, will be found an effective treatment.

The soap-free regimen is also of value, especially as a preventive, when soap is an aggravating factor as in occupational dermatitis, atopic dermatoses, fungous infection and dyshidrosis.

\(^3\) Lowila Liquid
REFERENCES