ELSEVIER

The Effect of Detergents on Skin pH and Its Consequences

HANS CHRISTIAN KORTING, MD
OTTO BRAUN-FALCO, MD

Interest in skin surface pH is already of long standing. More than a century ago, in 1892, Heuss claimed that the entire surface of the body is acidic.[1] This early finding, based on the use of hardly adequate technology, was corroborated by the investigations of Schade and Marchionini.[2] With the help of a so-called gas chain bell electrode, adapted for cutaneous use, they determined skin surface pH between 3.0 and 5.0. Schade and Marchionini had already addressed differences according to the region of the body area; in particular, they found that occluded skin was less acidic than skin exposed only to the atmosphere. Later Blank considered the skin surface pH to lie in the range of 4.2 to 5.6,[3] which described the range considered relevant ever since.

In fact, Marchionini and his group focused not only on skin surface pH by itself but also on its presumable biologic meaning. As early as the 1930s, they formulated the hypothesis that the potential of differing bacterial species to grow on human skin differed according to its dependence on its surface pH. This was established mainly by comparing the capability of certain bacterial species, including *Serratia marcescens*, to survive on unoccluded and occluded human skin with their known difference in skin surface pH.[4] The concept has remained popular ever since, although it did not remain unchallenged. This might be due to the suggestive term "acid mantle," coined by Marchionini.

The Normal Surface Skin pH

In the 1950s, the flat glass electrode became available; it is still the device of choice for the determination of skin surface pH. This electrode, devised by Ingold, was introduced into the scientific literature by Schirren, who demonstrated that this easy-to-use device essentially gives the same results as the previously used quinhydrone electrode.[5] Virtually all modern investigations use the flat glass electrode, and in most cases the pH range for normal human skin is said to be between 5.4 and 5.9—as was demonstrated in detail in a specialized review.[6] A study on the subject was performed by Zlotogorski; investigating facial skin, he found values between 4.0 and 4.9.[7] This is roughly in accordance with our findings. At the forehead the pH in Munich volunteers ranged from 4.5 to 5.6 and at the forearm from 4.2 to 5.4, with mean values reading 4.8 and 4.7 respectively.[8]

Influence of Repeated Washings on Skin Surface pH

It has been known for a long time that cleansing the skin can lead to changes in its surface pH and that there is a relationship between the pH of the cleanser and the degree of influence on the skin surface under the aspect of its pH.[9] This held true as initial data from the 1940s were confirmed in the 1960s. Yet, the effect was considered to be short-lasting: about 2 hours after an individual washing procedure.[10] Given that there are two or three such procedures a day, it seems obvious that there should be no profound effect on related parameters. Against this background it has come as a surprise to many that there are also long-lasting effects with as few as two washing procedures of 1 minute each a day, as we demonstrated at the end of the 1980s.[8] According to a randomized open crossover trial, skin surface pH increases on the regular use of a conventional soap and decreases again after the change to an acidic cleanser (of pH 5.5) and vice versa. Yet, it was not clear at first whether it was the pH of the cleanser by itself that influenced the skin surface pH or perhaps related factors. Hence, similar investigations were performed using an alkaline cleanser of identical pH (8.5) yet chemically corresponding to the acidic one—that is, a corresponding syndet. In fact, such was the case even when a so-called neutral cleanser was used instead of the alkaline one (ie, a chemically corresponding syndet of pH 7.0).[11] The data found in this case at the forearm are represented in Fig 1[12]. As could be expected, a short-term effect was demonstrated in one of these trials.[8] Hence there is ample evidence that there is both a short-term and a long-term effect on skin surface pH if a cleanser is used whose pH deviates from the pH of the skin surface to which it is applied. In keeping with this hypothesis, so-called neutral cleansers are by no means neutral in a biologic sense.

Address correspondence to Prof. Dr. H.C. Korting, Dermatologische Klinik und Poliklinik der Ludwig-Maximilians-Universität, Frauenlobstrasse 9–11, D-80337 Munich, Germany.

0738-081X/96/$32.00
SSDI 0738-081X(95)00104-2