Negative Patch Test Reactions to Sweat in Atopic Dermatitis

Sir,

Patients with atopic dermatitis (AD) often complain of itching during or after sweating. In addition, predilection sites of AD are flexures or folds of the skin, which are usually sweat-accumulating sites. It is apparent that sweating has some pathological implication in AD. The mechanism, however, has not been clarified. We previously reported that most patients with AD showed positive immediate skin reactions to their own sweat and also demonstrated IgE antibody to sweat in the sera of AD patients (1). However, IgE allergy does not explain an eczematous dermatitis of AD. Therefore, we performed patch testing with sweat to examine whether sweat could induce eczematous lesions in AD patients.

MATERIALS AND METHODS

Patients

A total of 20 patients with AD (11 males and 9 females, mean age 20.9 years, range 13–28 years) were selected for this study. The diagnosis of AD was based on typical clinical features mentioned by Hanifin & Rajka (2). All patients had mild to moderate skin lesions at least in the sites of sweat accumulations. As a control group we selected 10 non-atopic patients (5 males and 5 females, mean age 19.6 years, range 14–28 years). Their skin diseases consisted of bacterial or viral skin infection (4 cases), contact dermatitis (3), verruca vulgaris (2) and acne vulgaris (1).

Preparation of sweat antigen

The collection of sweat and its preparation from a healthy subject (one of the authors, J.A.) were performed as described previously (1). Concentration of sweat was accomplished by freeze-drying. The protein concentrations of sweat after dialysis were 0.22 mg/ml (as is), 1.76 mg/ml (10 times), 8.21 mg/ml (50 times) by Follin Lowry method (3), respectively.

Patch testing

We performed two series of patch testing using Finn chambers on Scanpor in 10 patients with AD. A normal skin area of the upper back was stripped 10 times with Cellophane tape in each patient. In the first 10 patients, patch tests were performed with two concentrations of sweat (as is and 10 times concentrated) in the stripped and non-stripped areas for 2 days, respectively. The first reading was made on day 2, 15 min after the patches were removed, and the second reading was made on day 3 (series 1). In the 10 patients different from the previous patients, patch tests were similarly performed using 50 times concentrated sweat with or without 0.1% sodium lauryl sulfate (SLS) except 24 h occlusions (4). The first reading was made on day 1, when the patches were removed, and the second reading was made on day 2 (series 2). Control patients were tested with two methods used in series 1 and 2. Informed consent was obtained from the patients.

Intracutaneous skin testing

Sweat collected from each patient was serially diluted two-fold with saline, and this was injected into the normal (looking) forearm skin of the patient, simultaneously with the patch tests. The reaction was read 15 min, 1 day and 2 days later. Skin test threshold was expressed as the maximum dilution with a positive reaction.

RESULTS

Patch testing

Both patients with AD and control patients were negative to the patch testing of the two series.

Intracutaneous skin testing

All 20 patients with AD showed positive immediate type skin reactions to sweat at a titre between 2^{0}–2^{6} (geometric mean $2^{2.5}$), but none of the patients showed positive delayed type skin reactions to sweat. None of the 10 control patients showed positive immediate or delayed type reactions.

DISCUSSION

Sulzberger et al. first noted the relation between sweat and AD (5). They showed that injection of sweat into the skin of AD patients induced immediate wheal and flare reactions. However, the research in this field did not much advance, because sweat was believed to be contaminated with many exogenous materials.

Recently, we demonstrated IgE allergy to sweat in AD using sweat collected by the "anaerobic method" (1). We confirmed by RAST inhibition test that sweat antigens did not cross-react with house dust mite and *Staphylococcus aureus* (1). Sweat allergy was also demonstrated in cholinergic urticaria (6) and, therefore, it is not specific to AD.

Histopathology of primary lesions of AD shows eczematous changes, indicating that it belongs to a delayed contact type skin reaction (7). Hence, direct contact with allergens of the skin may be the main pathogenetic process in AD. In this context, human dander (8), house dust mite (9) and inhalant allergens (10) have been tested and were shown to give positive patch test reactions in AD. Sweat is always in contact with the skin and can be an important candidate as a contact allergen, as far as a contact dermatitis theory of AD is valid.

In this study, we attempted to detect a delayed type hypersensitivity to sweat in AD, but this was not successful even using a high concentration of sweat as well as penetrative SLS. The results indicate that sweat itself cannot induce eczematous lesions in the skin of AD and control skin diseases. Therefore, the prevalence of atopic skin lesions in sweat-accumulating sites of the body has to be explained by other reasons than delayed contact eczematous reactions to sweat itself. These may include an irritation of the skin with sweat by non-immunological mechanisms, a change of bacterial flora on the skin surface by sweat, easier attachment of inhalant allergens to the sweat, or induction of itch by neurological mechanisms during sweating.

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