

ORIGINAL ARTICLE

Role of foods in irregular aggravation of skin lesions in children with atopic dermatitis

Toshiaki UENISHI,¹ Hisashi SUGIURA,¹ Toshihiro TANAKA,¹ Masami UEHARA²¹Department of Dermatology, Shiga University of Medical Science, Seta, Otsu, and ²Yasu Hospital, Koshinohara, Yasu, Japan**ABSTRACT**

Atopic dermatitis is a common inflammatory skin disease that especially affects children and adolescents. Many environmental factors have been recognized as relevant in aggravating skin lesions of the disease. However, it remains to be determined whether foods play a role in worsening of skin lesions in children with atopic dermatitis. In the present study, we investigated whether foods play a role in irregular aggravation of skin lesions in children with the disease. The study population consisted of 69 patients aged 3–15 years with atopic dermatitis. They were hospitalized and open challenge tests were performed with suspected foods. Photographs of representative skin lesion sites were taken at baseline and before and after the challenge. We determined challenge-positive foods by evaluating the comparable before/after challenge photographs. One to three (average, 1.9) challenge-positive foods were confirmed in 52 (75%) of the 69 patients examined. Predominant offending foods were chocolate, cheese and yogurt. Specific immunoglobulin E values to offending foods were mostly negative. We asked patients to exclude challenge-positive foods from their diets. They were then discharged and followed up for 3 months at our outpatient clinic. Exclusion of the offending foods for 3 months brought about a remarkable improvement in the disease. These results suggest that foods play an important role in irregular aggravation of skin lesions in children with atopic dermatitis.

Key words: atopic dermatitis, children, irregular aggravation, offending foods, open challenge test.

INTRODUCTION

Atopic dermatitis is one of the most common skin diseases that usually occurs in children.^{1,2} Although the etiology of atopic dermatitis has not yet been elucidated, many investigators have proposed numerous factors which could provoke or deteriorate skin lesions of the disease.^{3,4}

Foods as a trigger of atopic dermatitis have long been the subject of debate.^{5,6} The results in previous studies on the role of foods in pathogenesis of the disease in children are different between reports. Some authors state that foods often deteriorate skin lesions in children with atopic dermatitis,^{7–9} but others report that foods are not usually involved in exacerbations of the disease in children with the dermatosis.^{10,11}

Patients with atopic dermatitis often show unpredictable, irregular aggravation of skin lesions.^{12,13} We previously reported that foods played an important role in unpredictable, irregular aggravation of skin lesions in adult patients with the disease.¹⁴ In the present study, we selected children with atopic dermatitis who showed irregular aggravation of skin lesions, and tried to see whether foods could provoke the irregular worsening of dermatitis in children with the disease.

METHODS**Patients**

The study population consisted of 69 children with atopic dermatitis who showed unpredictable, irregular aggravation of skin lesions. They ranged in age

Correspondence: Toshiaki Uenishi, M.D., Department of Dermatology, Shiga University of Medical Science, Tsukinowa-cho, Seta, Otsu 520-2192, Japan.
Email: uenishi@belle.shiga-med.ac.jp

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from 3–15 years. All the patients fulfilled the diagnostic criteria of Hanifin and Rajka.¹⁵

Informed consent to join the present study was obtained from parents of all patients. The degree of dermatitis ranged from mild (involvement of <10% of body surface; 13 cases) to moderate (involvement of 10–50% of body surface; 34 cases) or severe (involvement of >50% of body surface; 22 cases).

Throughout the present study, all patients were instructed to maintain their dermatological treatment, which was comprised of topical steroids, emollients and oral antihistamines.

Candidates for offending foods

As previously described,¹⁴ we chose food items which were eaten, not every day, but on the day or the preceding day of irregular skin exacerbation. These food items were regarded as candidates for offending foods. Patients were prohibited from eating the candidates for offending foods for 2 weeks, and they were admitted to our hospital.

Challenge tests

After admission, one of the suspected foods was given at breakfast as an open challenge. The volume of the suspected food to be taken was roughly equal to that the patient had been taking at a meal. Skin lesions on the entire body were observed at 1, 2, 4, 10, 24 and 48 h after the challenge. To ensure an objective evaluation of skin lesions, we selected two or three representative skin lesion sites where active eczematous inflammation was observed for photographs. These lesions were photographed at baseline and before and 48 h after the challenge. Intensity of pruritus (severe, moderate or mild) was determined by subjective evaluation of the patient. An overall assessment of clinical symptoms was performed by comparing the photographs of skin lesions and the intensity of pruritus before and after the challenge test. The skin condition after the challenge test was assessed on a five-point scale: severely worsened (>50% aggravation), moderately worsened (25–50% aggravation), slightly worsened (<25% aggravation), unchanged or improved. The assessment was done by the authors. When the skin lesions severely or moderately worsened, the challenge test was regarded as positive.

If the challenge was negative, challenge test with the next food was performed successively. If a positive food challenge reaction occurred, a further challenge test was postponed until the aggravation disappeared. In most cases, the food-induced aggravation of dermatitis persisted for 2–4 days, and disappeared by 1 week. Thus, the washout period was approximately 1 week.

Specific immunoglobulin E

When possible, specific immunoglobulin (Ig)E antibody values to challenge test-positive foods were measured by the radioallergosorbent test (RAST; Pharmacia, Uppsala, Sweden). The results were expressed as RAST scores ranging from 0–4. A score of 2 was interpreted as positive.¹⁶

Follow up

When challenge test-positive foods were confirmed, patients were asked to exclude these foods from their diets. They were then discharged and observed biweekly or monthly for a period of 3 months at our outpatient clinic to observe the clinical effect of long-term exclusion of the challenge test-positive foods. At the end of follow up, photographs of the representative skin lesion sites were taken. By comparing the photographs with those at baseline, the skin condition was assessed on a five-point scale: markedly improved (>50% improvement), moderately improved (25–50% improvement), slightly improved (<25% improvement), unchanged or worsened.

RESULTS

In the 69 children with atopic dermatitis examined, one to five (average, 2.6) candidates for offending foods were observed.

Of the 69 patients, 52 (75%) had positive challenge tests to one to three (average, 1.9) of the suspected foods. Thus, a total of 99 positive food challenge tests were obtained.

The kinds of challenge test-positive foods were different from patient to patient (Table 1). Totally, 24 kinds of foods were confirmed to aggravate skin lesions in at least one of the patients examined. The predominant offending foods were chocolate (Fig. 1), cheese (Fig. 2) and yogurt (Fig. 3). Fermented soybean, potato chips, glutinous rice cake and instant noodles

Table 1. Challenge test-positive foods (99 instances) in 52 Japanese children with atopic dermatitis who showed unpredictable, irregular aggravation of skin lesions

Challenge test-positive foods	No. of patients
Chocolate	24
Cheese	16
Yogurt	14
Fermented soybeans	10
Potato chip	10
Glutinous rice cake	8
Instant noodles	6
Others	11

aggravated skin lesions in a considerable number of patients. Egg and milk were found to be offending foods in only a few patients.

Initial onset of exacerbation of skin symptoms occurred after 4–10 h of ingesting offending food in 15 (15%) positive tests, 11–24 h after the ingestion in 72 (73%) positive tests and 25–48 h after the challenge in 12 (12%) positive tests.

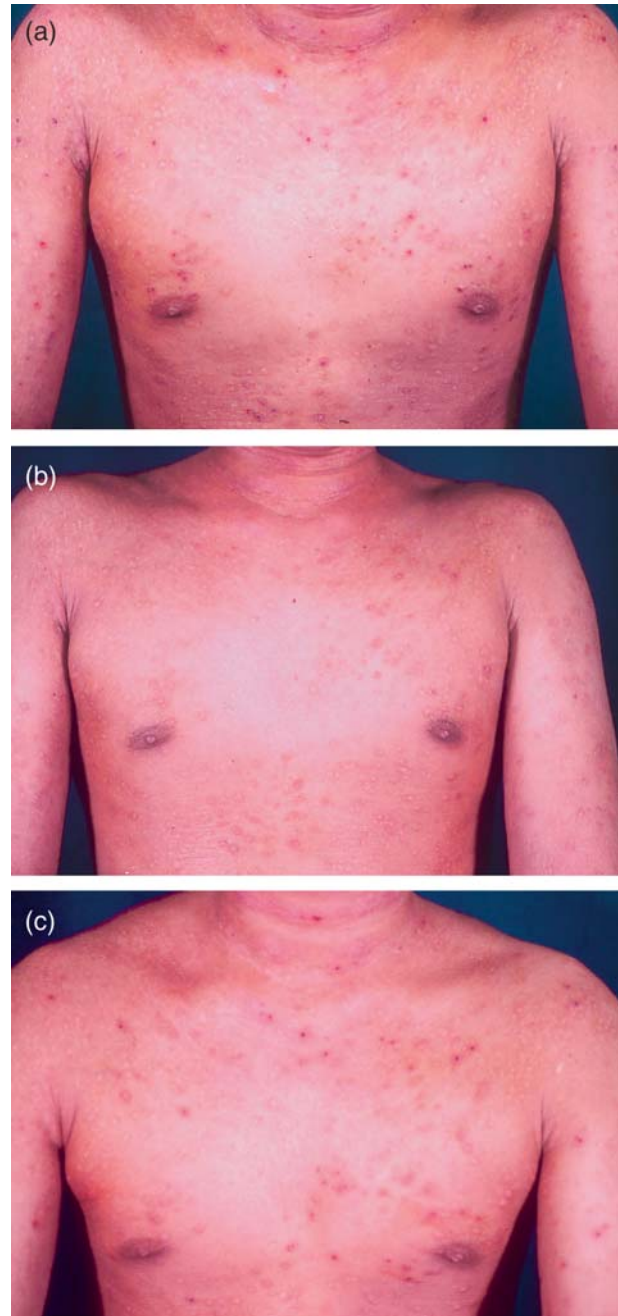
There was no aggravation of skin symptoms within 3 h of food challenge. In all of the positive challenges, initial skin symptoms were an aggravation of preexisting skin lesions and increase in itch. Some patients developed new papular eczematous lesions in uninvolved skin sites.

Specific IgE values (RAST) to 86 challenge test-positive foods were measured in 46 patients. Of the 86 challenge test-positive foods, 72 (84%) showed negative RAST and 14 (16%) revealed positive RAST.

Of the 52 patients who showed positive food challenges, 44 were followed up for 3 months. During the follow-up period, they were prohibited from ingesting the challenge test-positive foods, and asked to continue their ordinary dermatological treatment. Exclusion of the offending foods for 3 months brought about a progressive improvement of skin lesions in all of the patients. Thus, at the end of follow up, marked improvement was obtained in 25 (57%) patients (Figs 4,5), moderate improvement in 15 (34%) and slight improvement in four (9%).

DISCUSSION

The present study demonstrated that foods provoked aggravation of skin lesions in 75% of children with atopic dermatitis and that exclusion of offending

**Figure 1.** A 14-year-old boy showing a positive challenge to chocolate. (a) Before exclusion, (b) after 2 weeks of exclusion and (c) 2 days after challenge.

foods brought about a considerable improvement of the disease. Thus, it is likely that, in children with atopic dermatitis, foods play an important role in aggravation of the dermatosis. We previously reported that foods were responsible for aggravation



Figure 2. A 12-year-old boy showing a positive challenge to cheese. (a) Before exclusion, (b) after 2 weeks of exclusion and (c) 2 days after challenge.

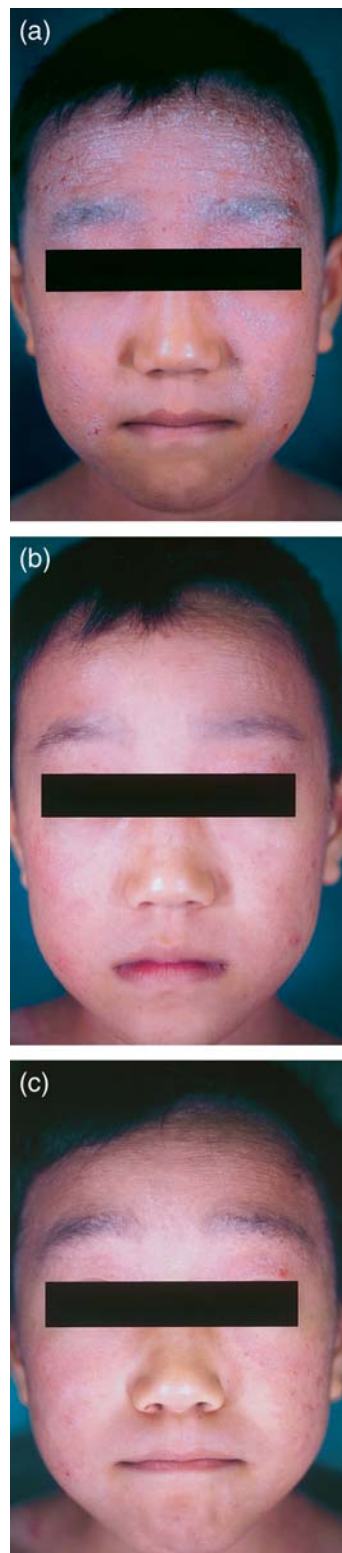


Figure 3. A 10-year-old boy showing a positive challenge to yogurt. (a) Before exclusion, (b) after 2 weeks of exclusion and (c) 2 days after challenge.



Figure 4. A 3-year-old boy showing a positive challenge to yogurt. (a) Before exclusion and (b) after 3 months of exclusion.

of skin lesions in approximately half of adult patients with atopic dermatitis.¹⁴

The predominant offending foods in Japanese children with atopic dermatitis examined in the present study were chocolate, cheese and yogurt. Other frequently offending foods were fermented soybean, potato chips, glutinous rice cake and instant noodles.



Figure 5. An 11-year-old boy showing a positive challenge to fermented soybean. (a) Before exclusion and (b) after 3 months of exclusion.

Egg and milk have long been documented as offending foods, especially in children with atopic dermatitis.^{8,17} In the present study, however, very few children with the dermatosis showed positive challenge tests with these foods.

The kinds of offending foods in children with atopic dermatitis were basically the same as those determined in adult patients with atopic dermatitis in a previous study.¹⁴

Concerning the clinical course seen in positive food challenge tests in children with atopic dermatitis, the present study demonstrated that the onset of exacerbation of skin symptoms mostly occurred between 10–24 h after intake of the offending food. The initial skin symptoms were an aggravation of preexisting skin lesions and new papular eczematous lesions in uninvolved skin sites. Thus, the clinical courses of positive food challenge tests in children with atopic dermatitis were almost the same as

those which were observed in adult patients with the disease in a previous study.¹⁴ Other authors^{10,18–20} have also reported that worsening of skin lesions often occurred on the next day of food challenge in patients suffering from the disease.

The present study further showed that specific IgE values to offending foods were negative in most cases examined. It is then likely that food-induced, non-IgE-mediated aggravation of skin lesions occurs in at least some patients with atopic dermatitis.

A standard method of examining offending foods of atopic dermatitis is not yet established. Some investigators^{8,21,22} state that double-blind placebo-controlled food challenge is highly reliable, while open challenge testing lacks reliability. In the present study, however, we could determine offending foods in children suffering from atopic dermatitis by using an open challenge test. We succeeded in detecting offending foods in adult patients with the disease by an open challenge test in a previous study.¹⁴ The present study further demonstrated that a long-term exclusion of open challenge test-positive foods brought about a progressive improvement of the disease. It is then evident that open challenge testing is fairly reliable in examining offending foods of atopic dermatitis.

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