

Experience with an elimination diet in children with atopic dermatitis

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(Received 28 May 1982; accepted for publication 23 June 1982)

Summary

In order to define possible food-provoking factors, we placed twenty-nine children with chronic atopic dermatitis on an elimination diet. The children remained on their normal diet for 2 weeks followed by 2 weeks on the elimination diet. Foods were then re-introduced at the rate of a new one every 2 days in an attempt to identify foods exacerbating eczema. Thirteen children (45%) completed the elimination diet and seven of these were improved on parental assessment of sleeplessness, itchiness and area of eczema. Five were improved on the dermatologist's assessment. Only two children were able to identify foods provoking their eczema. Sixteen children (55%) failed to complete the elimination diet. Eight felt it was too strict, while eight did not return for follow-up. From our experience, dietary manipulation in older children with chronic atopic dermatitis offers only limited long-term therapeutic gains.

Introduction

The importance of food allergy in the pathogenesis of atopic disease remains controversial (Johnstone & Dutton, 1966; Halpern *et al.*, 1973; Dannaeus, Johansson & Foucard, 1977/1978; Kjellman & Johansson, 1979). However, recent publications have renewed interest in the role of food in atopic dermatitis in children. Atherton *et al.* (1978) suggest that avoidance of cow's milk and egg in children with eczema results in both symptomatic and objective skin improvement. In addition, the study of Matthew *et al.* (1977) suggests that avoidance of ingested and inhaled allergens in the first 6 months of life may decrease the incidence of eczema in the first 12 months. These two studies suggest a possible role for food as an exacerbating factor in eczema.

One of the major problems in clinical practice is to try to identify food-provoking factors. Some parents nominate certain foods—e.g. chocolate, orange juice, eggs—

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which they feel cause a flare-up in their child's eczema and have the child avoid these foods. A major question is whether the identification and removal of previously unsuspected food-provoking factors could improve chronic atopic dermatitis. It is clear that the identification of specific IgE antibodies to food allergens in children with atopic dermatitis is not well correlated with clinical sensitivity to that food (Atherton *et al.*, 1978; Atherton, 1981). Thus, it is necessary to rely on dietary manipulation in any attempt to define possible food-provoking factors. Elimination diets have been of some success in elucidating food precipitants in chronic urticaria in adults (Gibson & Clancy, 1978), and Atherton (1981) has recently advocated their use in children with atopic dermatitis. However, the role of dietary manipulation in the management of children with atopic dermatitis remains unclear, despite the apparent widespread use of various forms of dietary treatment in the community. In this paper we describe our experience with an elimination diet in children with chronic atopic dermatitis.

Materials and methods

We studied twenty-nine children, between the ages of 2 and 12 years, with atopic dermatitis who regularly attended the Dermatology Clinic at the Royal Alexandra Hospital for Children. Each child had persistent atopic dermatitis requiring regular topical steroid therapy. Informed consent was obtained from the parents before entry into the study. We obtained a clinical history of the atopic dermatitis in each child, with particular reference to foods which the parents felt exacerbated the atopic dermatitis.

The study design consisted of the following: (1) 2 weeks of the child's normal diet for a control period; (2) 2 weeks of the elimination diet; and (3) re-introduction of foods at the rate of a new one every 2 days.

We used an elimination diet based on one described for use in Australian conditions (Gibson & Clancy, 1978). The diet consists of lamb, chicken, beef, lettuce, carrots, parsley, pears, rice, plain flour, semolina, matzo crackers or Carrs water biscuits, sugar, golden syrup, honey, oils, vinegar, salt and pepper, and coffee. Many of these foods are unpalatable to children which restricts the diet even more. The diet excludes foods commonly known to cause food allergies as well as foods containing salicylates, benzoates, tartrazine, yeast and penicillins. During re-challenge we asked the parents to note any foods which they felt caused an exacerbation of the child's eczema. If a food was identified it was eliminated again and re-introduced at a later date to confirm the reaction. Any foods which had been previously suspected and avoided by the parent were not used during the challenge. We kept local and systemic treatment constant throughout the study period.

The parental assessment was based on a diary card with sleep and itch scores (adapted from Haider, 1977) and area of eczema being used for analysis of improvement. The scores were recorded as follows:

Sleep score

- Sound sleep, no disturbance (0);
- some difficulty in going to sleep, no disturbance during the night (1);
- difficulty going to sleep, disturbed once or twice during the night (2);
- great difficulty in going to sleep, disturbed many times during the night (3).

Itch score

- No itching (0);

- mild, only aware of itching at times (1);
- moderate, often aware of itching, annoying (2);
- severe, constant itching, distressing (3).

Food

- each food was noted during the challenge period.

Area of eczema

- a weekly area of skin involved was quantitated by adding the squares outlined on a diagram of the body surface.

We compared the scores averaged over the first two weeks (i.e. control period) to the score in the fourth week (i.e. the second week on elimination diet). For improvement to have occurred, we required improvement in at least two parameters without any deterioration in the remaining parameter. Deterioration was regarded as deterioration in at least two parameters without improvement in any.

In addition, to the diary card an assessment of the severity of eczema was made by one of the dermatologists initially, during the second week of the elimination diet, and at the end of the study. The severity was assessed on the following criteria (Haider, 1977):

Inflammation

- Grade 1 mild erythema only;
- grade 2 moderate erythema swelling.

Lichenification

- Grade 1 mild, slight increase of criss-crossing skin pattern;
- grade 2 advanced, considerable increase of criss-crossing skin pattern with or without skin thickening.

Cracking

- Grade 1 moderate, occasional small cracks;
- grade 2 severe, troublesome large cracks.

An objective score was based on these grades and we considered a change of two or more significant.

We compared the scores before and during the elimination diets using the Wilcoxon matched-pairs signed-ranks tests and calculated the two-tailed probability. A *P* value of less than 0.05 was considered significant.

Results

Thirteen children completed the 2-week elimination diet schedule and all but one of these completed the challenge period. Based on the parental assessment outlined in the methods, seven children improved, three deteriorated and three remained the same. Based on the dermatologist's assessment, five improved (including four who improved on parental assessment), one deteriorated and seven remained the same. The scores before and during the elimination diet in the thirteen children who completed the diet are illustrated in Figs 1 (sleep score), 2 (itch score), 3 (area of eczema), and 4 (severity).

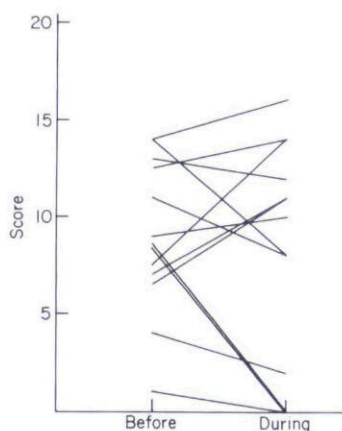


Fig. 1. Individual sleep scores before and during the elimination period (see methods) (P not significant).

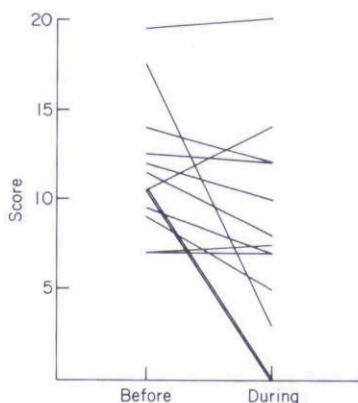


Fig. 2. Individual itch scores before and during the elimination diet period (see methods) ($P < 0.025$).

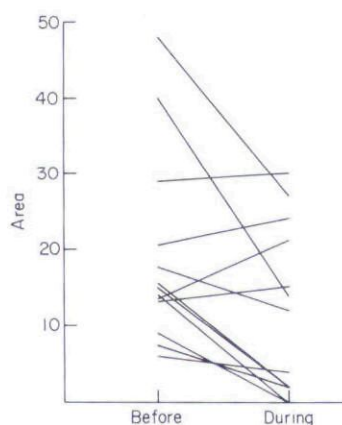


Fig. 3. Area of eczema scores before and at the end of the elimination diet period (see methods) ($P < 0.05$).

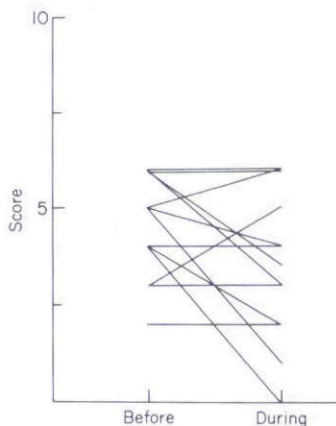


Fig. 4. Severity of eczema assessed by the dermatologist before and during the elimination diet period (see methods) (P not significant).

There was a significant improvement in the itch score ($P < 0.025$) and area of eczema ($P < 0.05$) but no significant difference in sleep score or severity.

Two of the thirteen patients who completed the diet were able to identify foods causing exacerbation of eczema during the challenge period. These were reproducible on at least two challenges. One child identified cheese whilst in the other eggs, vegemite and beans were identified as provoking factors. One child identified cheese as a provoking factor of urticaria but this did not seem to affect her dermatitis. A further three children maintained their improvement throughout the challenge period despite failing to identify a food-provoking factor.

Sixteen (55%) of the twenty-nine children did not complete the elimination diet.

Eight children felt the diet was too strict and difficult to follow. These children had stayed on the diet at least a week. Three of these eight children did improve on the dermatologist's assessment of severity. The other eight children did not return for follow-up.

Discussion

In the short term, the elimination diet appeared promising as seven of the thirteen children who completed the diet improved on parental assessment while five improved on the dermatologist's assessment. However, in the long term only two children were able to identify foods which exacerbated their eczema and therefore only in these two children was there any potential benefit from dietary avoidance.

Due to the difficulties of such studies there are only a few reports in the literature on this subject. Previous investigators have approached the question of food factors in atopic dermatitis in two major ways. The first is similar to our method using a strict elimination diet followed by challenge with different foods one at a time. This has the advantage of examining even previously unsuspected foods although it entails a long period of study. Rowe and Rowe (1951) investigated 100 children with atopic dermatitis using a strict elimination diet for an initial 2-4 week period followed by challenge with foods added every 4-7 days. They considered 'food allergy' to be the sole cause of atopic dermatitis in 44%. They defined 'food allergy' as a flare-up of eczema but it is unclear what their criteria for exacerbation of eczema were and how their topical therapy varied throughout the study period. It is therefore difficult to compare our results directly with their findings.

The other method used has been to challenge with foods either commonly suspected of causing exacerbations of eczema or which react on skin testing individuals with eczema. The challenge has been preceded by an elimination diet of variable strictness but always excluding the foods to be challenged. This method has the advantage of being much simpler but disregards many foods as potential exacerbating factors. Both Stifter (1965) and Sedlis (1965) chose skin-test positivity as the basis for their challenge studies. While they showed that skin tests have a poor predictive value with regard to foods exacerbating eczema, they did not resolve the question of the value of dietary manipulation in eczema. Hammar (1977) studied 18 children under 5 years with a variable elimination period followed by challenge with cow's milk then with cereals. He found exacerbation of dermatitis in fifteen children (mean age 13 months) but eleven lost their sensitivity to the offending food over the ensuing 18 months. Juto, Enberg and Winberg (1978) treated twenty-one infants with strict elimination of cow's milk and selected foods in older infants for a period of up to 6 weeks. Seven infants healed (all being under 6 months) while twelve improved. On challenge with milk, twelve infants were considered positive (erythema and/or itch). By 2 years of age only four infants had dermatitis and only two of these were milk-intolerant. In both these studies the effect was clearly age-related with a high spontaneous-remission rate. In view of this, together with lack of controls, it is difficult to interpret the significance of these results and in particular extend these implications to older children. Finally Atherton *et al.* (1978), using a double-blind cross-over technique compared a period of cow's milk and egg avoidance (dried-soya formula) to a control period (dried cow's milk and egg mixture) in children with eczema. In twenty of the thirty-six children (age 2-8 years) who completed the study, fourteen had a more favourable response to antigen avoidance while only one responded more favourably

to the control diet. However, the study was limited to only two foods and the authors admit the importance of finding a better technique of defining antigens which are important in individual patients.

A major drawback in using such a strict elimination diet as employed in our study is that it is virtually impossible to provide true blinding. As mentioned previously, Atherton *et al.* (1978) were able to provide a control period in their egg and milk avoidance study. Although the children did better on the antigen avoidance regime, there was a definite order effect with greater improvement occurring at the end of the first period than at the end of the second, whatever the diet content. This clearly suggested at least some placebo effect. In our study, it was of interest that three (38%) of the eight patients who did not complete the diet, but returned for follow-up, improved on the dermatologist's criteria. Thus, the improvement was rated the same, irrespective of whether there was adherence to the diet, suggesting that other factors may also be important in the improvement. Furthermore, three of the seven patients who improved on the diet maintained this improvement throughout the challenge period despite being unable to identify food-provoking factors. Thus, other variables such as more vigorous attention to local treatment may accompany the motivation achieved by implementation of a new therapeutic manoeuvre.

The choice of the time for the initial elimination diet and the duration of the challenge period is of obvious importance. It must be long enough to allow resolution of the eczema and subsequent exacerbations on challenge to occur but short enough to ensure good compliance and avoid any natural variation of eczema becoming a confounding factor. In the previous studies the initial elimination period has varied between 1–2 weeks (Sedlis, 1965) and up to 8 weeks (Stifler 1965). Our choice of 2 weeks was based on experience with chronic urticaria (Gibson & Clancy, 1978). While urticaria may be the mechanism of food-induced eczema (Atherton, 1981; Sedlis, 1965; Stifler, 1965) the dermatitis induced may take longer to resolve than urticaria. Nevertheless, our rate of improvement of 54% at 2 weeks is not significantly different from the improvement in 70% Atherton *et al.* (1978) achieved at 4 weeks. Compliance with the diet is clearly a problem and despite only 2 weeks on the full diet, our compliance was only 45%, again similar to Atherton *et al.* (1978). Thus, an optimal initial elimination period to allow sufficient time for recovery of dermatitis and ensure good compliance would be around 2–4 weeks. While reactions following challenge usually appear in the first 24–48 hours (Atherton, 1981; Juto *et al.*, 1978) some reactions have been noted to commence at 72 hours (Hammar, 1977). Therefore our choice of 2 days as the challenge period may not have allowed sufficient time to see all the reactions. This does not alter the fact that only two children noted reactions on challenge. While it is possible that the foods implicated were not the correct ones if the reaction occurred after 48 hours, the requirement for a food to cause an exacerbation on a second re-challenge reduces this possibility.

Our low incidence of children identifying foods may well be age-related. Infants have a high incidence of positive challenges particularly to milk (Hammar, 1977; Juto *et al.*, 1978) but become tolerant with age. In our study of older children, the incidence of positive challenges was much lower. It is unclear whether this age difference simply reflects a lowering of incidence of food reactions with age or whether in older children other factors such as greater variety of dietary intake may make it more difficult to recognize a positive challenge. Furthermore, we studied children with chronic atopic

dermatitis which may differ from eczema in infancy in both its tendency to spontaneous resolution and also its response to food factors.

At present, the use of this type of elimination diet and challenge procedure in the management of older children with atopic dermatitis would appear to be limited. Although there was a short-term benefit in about half of the patients who completed the diet, in the long term only two of the twenty-nine children who entered the study were able to modify their treatment as a result of it. Further experience is clearly necessary before the role of foods in the exacerbation of eczema is well defined. However, from the experience of our study, dietary manipulation after infancy offers little long-term therapeutic gain.

Acknowledgments

P.P. Van Asperen is supported by a grant from the National Health & Medical Research Council of Australia.

The authors wish to thank the patients and their parents for participating in the study and Ms S. Morvan for secretarial assistance.

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