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# Dietary Treatment of Nickel Dermatitis

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During a 5-year period, 61 patch-test-negative patients whose dermatitis flared after oral challenge with 2.5 mg nickel and 143 patients with positive patch tests to nickel who were not challenged orally adhered to a diet intended to reduce the daily intake of nickel for at least one month. After 1 to 2 months of dieting the dermatitis in 121 of the 204 patients had cleared or was markedly improved. One to 5 years after the initial diet treatment a questionnaire was sent to the 204 patients to inquire about the long-term results of the diet treatment. 150 patients responded to the questionnaire. 90 of these patients had continued to diet constantly or intermittently for a year or more. 88 patients felt that there was a long-term improvement as a result of diet treatment. *Key words: Nickel hypersensitivity; Eczema; Oral challenge; Questionnaire follow-up.* (Received August 12, 1984.)

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The hand eczema of nickel allergic patients may flare after the ingestion of nickel sulphate given as a single oral dose (1). The significance of this finding has been debated in the literature. In one study a reduction of the nickel intake in food was useful in clearing the vesicular hand eczema of some of a small group of patients (2). The use of Antabuse® in the treatment of nickel dermatitis seems effective, but no conclusive studies have been made (3). The fact that the dermatitis of relatively few patients flares after ingestion of amounts of nickel comparable to the amounts in the daily food intake has led some authors to suggest that the nickel content of food has no significance in the maintenance of chronic nickel dermatitis (4, 5).

Over the past 5 years we have prescribed low nickel diets for some nickel hypersensitive patients with vesicular hand eczema and for some with certain other morphologies of dermatitis. In the following the results of this type of treatment are detailed.

## MATERIAL AND METHODS

From July 1, 1978, to July 28, 1983, 6 508 patients (2 141 men and 4 367 women) were patch tested in our clinic with the Standard series of the International Contact Dermatitis Research Group including 5% nickel sulphate in petrolatum. Forty-nine men and 626 women had positive patch tests to nickel. The distribution of the types of eczema which may be associated with a systemic aggravation as well as the number of patients placed on a low nickel diet are given in Table I.

In addition to the above patients, 61 patch-test negative patients (6 men and 55 women) who experienced a flare of dermatitis after oral challenge with nickel (as previously described (6, 7)) were included in the study. 52 of these patients had hand eczema, 6 had perianal eczema, and 3 had other types of dermatitis.

The duration of the dermatitis was more than one year for 174 of the patients placed on diet and more then 10 years for 36 of these.

204 patients, 143 who were patch test positive and all 61 of those who were patch test negative but flared after oral chellenge with nickel, adhered to the low-nickel diet for 1 to 2 months. Diet restrictions (Table II) were suggested after conventional therapy including precautions to reduce external contact with nickel, topical treatment with corticosteroids, and in some cases also Grenz rays and corticosteroids given systemically had failed to clear the dermatitis. During the diet trial the patients were asked to continue whatever topical treatment they were using.

The patients were examined after 1 to 2 months to evaluate the results of dieting, and if their dermatitis had improved, it was suggested that they continue to follow the diet, but adhere to it less strictly. If there was no change in the dermatitis, the diet was discontinued.

One to 5 years after the initial diet treatment, a questionnaire was mailed to the 204 patients who had dieted for 1 month or longer. They were asked whether they still followed a low-nickel diet and, if so, what long-term effects there were. They were also requested to name possible individual food items which upon ingestion had given rise to flares of their dermatitis on at least two separate occasions.

## RESULTS

The results of the initial diet trial are listed in Table IV. The dermatitis of 32 of the 121 patients who experienced improvement cleared completely after 1 to 2 months of following

Table I. *Clinical types of dermatitis among 675 patients with positive patch tests to nickel*

In parenthesis the number of patients placed on a diet intended to reduce nickel intake. 4 men and 40 women had eczema at more than 1 site; the sum of locations is, therefore, higher than the number of patients

| | Men $n$=49 (11) | Women $n$=626 (148) | Total $n$=675 (159) |
|---|---|---|---|
| Hand and/or foot eczema | 27 (7) | 280 (97) | 307 (104) |
| Ano-genital eczema | 4 (2) | 20 (9) | 24 (11) |
| Vasculitis | 2 (1) | 12 (11) | 14 (12) |
| Eczema of eyelids | 1 (1) | 11 (5) | 12 (6) |
| Axillary eczema | 1 (1) | 15 (6) | 16 (7) |
| Other types of eczema (usually at sites of nickel contact) | 18 (1) | 331 (32) | 349 (33) |

Table II. *The food items patients were asked to avoid are listed below*

Patients were also asked not to cook acid foods in stainless steel cooking utensils

*Seafood*
herring
oysters and other shell fish
all tinned fish

*Vegetables*
asparagus
beans
mushrooms
onions
corn
spinach
tomatoes
peas
lettuce
carrots
all tinned vegetables

*Diverse*
baking powder
pickled cucumbers
chocolate

*Cereal products*
whole grain flour of all kinds
soy flour

*Fruit*
fresh pears
rhubarb
all tinned fruits
nuts

*Beverages*
tea
cocoa and chocolate beverages
beer
wine

a low-nickel diet. Equal effectiveness was seen among patch-test positive and patch-test negative patients and among those with hand eczema and dermatitis at other sites. Characteristically the improvement was seen after 1 to 2 months of dieting. Patients whose dermatitis improved but did not clear often experienced episodic flares of their dermatitis, but these were less frequent and less severe than before the diet was instituted.

One hundred and nineteen of all patients were able to name specific food items which had caused their dermatitis to flare on at least two separate occasions. Fifty had no experience with specific foods, and for 28 no information was available. Some of the 119 were among those patients with no improvement as a result of the diet. Those food items which caused aggravation of the dermatitis are listed in Table III.

Thirty-six patients felt that perspiring could induce aggravation of the dermatitis, 28 mentioned psychological stress as a factor, and 13 women experienced flares during menses.

The long-term effects of dieting for both patch-test positive and patch-test negative patients were evaluated on the basis of 150 responses to the questionnaire. Ninety patients had continued to follow the diet continuously or intermittently for at least a year, while 41 had adhered to the diet for 1 to 4 months only. Eighty-eight of the original 204 patients (43%, 95% confidence limits 36–50%) felt that they had achieved long-term benefit from the diet (Table I).

## DISCUSSION

Oral challenge with 1 to 5 mg nickel sulphate regularly reproduces the clinical symptoms of nickel allergic patients with hand eczema, while challenge with 0.5 mg nickel, which is

Table III. *Food items most commonly mentioned as the cause of flares among the 117 patients who felt that specific food items caused flares of their dermatitis*

| | | | |
|---|---|---|---|
| Wine | 44 | Various fruits | 16 |
| Beer | 31 | Tinned food items | 15 |
| Chocolate | 28 | Whole grain breads | 12 |
| Various vegetables | 23 | Carrots | 10 |
| Herring | 19 | peas | 10 |
| Tomatoes | 17 | Tea | 9 |
| Onions | 17 | | |

Table IV. *Results of diet treatment among 204 patients available for evaluation after 1 to 2 months (short-time) and after 1 to 5 years (long-term)*

| | Short-term effect | | Long-term effect | | |
|---|---|---|---|---|---|
| | Cleared or markedly improved | Moderate to no effect | Improved | No effect | No information available |
| Positive patch test ($n$=143) | 77 | 66 | 62 | 47 | 34 |
| Negative patch test; positive oral challenge with nickel ($n$=61) | 44 | 17 | 26 | 15 | 20 |
| Total ($n$=204) | 121 | 83 | 88 | 62 | 54 |

closer to the daily intake of nickel, less frequently produces aggravation of the dermatitis (1). It would, therefore, seem illogical that it is possible to improve nickel dermatitis by reducing the nickel intake in food. The challenge procedure is, however, artificial, and a single challenge dose is not directly comparable to the daily intake of nickel. Also, the sensitivity among patients varies greatly.

Ideally, clinical studies should be controlled, but long-term diet trials are difficult to carry out in this manner. The patients included in this study had eczema of long duration, and traditional treatment, including avoidance of external contact with nickel, had proved unsuccessful in clearing the dermatitis. Such patients are especially motivated to diet treatment, and it is interesting to note that between one-third and half of them had long-term benefit of the diet restrictions and continued to adhere to them, some constantly and some intermittently, for from 1 to 5 years.

The long duration of eczema, the repeated flares of dermatitis after certain food items, the long-term cooperation in the diet trial, and the poor response to traditional treatment combine to make a placebo effect of the diet unlikely.

There was some discrepancy between the food items known to contain significant amounts of nickel and those mentioned by the patients as the cause of flares of their dermatitis (Table III). The nickel load is composed of the sum of the food intake, and it is not to be expected that patients could point to specific offending food items unless they had consumed extraoridinary amounts of the particular food.

A detailed study of the metal content of foodstuffs carried out in Finland indicates that items like chocolate, soy beans, oats, and nuts have a high nickel content, while wine, beer, herring, onion and tomatoes are low in nickel (8). This is in agreement with the findings of Ellen (9). Cooking in stainless steel may increase the nickel content of food (10).

The dietary instructions used in this study were written in 1976 at a time when detailed, high-quality studies on nickel content in food were not available. Based on more recent informatlion, the dietary instructions should probably be revised.

The nickel in the body is accumulated from many different sources, and even though intake of the above-mentioned items with the greatest concentration of nickel is reduced, it is possible to obtain only a reduction of, but not an elimination of the total body content of nickel. This has previously been pointed out by Burrows (5). From an immunological point of view it can be expected that a reduced body load of nickel could reduce the activity of the cellular immune reactions against nickel. The opposite phenomenon is clinically recognized as the flares of nickel dermatitis seen after patch testing and oral challenge with nickel in patients with very active dermatitis. Furthermore, oral challenge with nickel in nickel allergic patients has been shown to result in an increased rate of lymphocyte transformation (11).

We consider it important to instruct the patients whose dermatitis does improve after 1–2 months of dieting to continue to diet moderately by avoiding the relatively few food items with a high nickel concentration, such as cocoa and soy bean products, nuts, and whole grain flours, in order to avoid repeated stimulation of the immune system. Such stimulation could lead to a more sensitive state and potential reaction to small amounts of nickel as well as to numerous non-specific stimuli.

Most of the food items mentioned by the patients as causes of flares are known to be able to induce a release of or contain mediators like histamine or other vasoactive amines, and this property could be responsible for the aggravating effect on the dermatitis (12). It would therefore seem reasonable to suggest that patients with nickel allergy avoid both food items with high nickel content and those which are known to contain or liberate vasoactive amines. Avoidance of the latter alone might be helpful, but the fact that

Antabuse®, which binds nickel, is a useful therapeutic agent indicates that the avoidance of food items with high nickel content is also important.

It is also possible that nickel salts, as such, liberate histamine or other vasoactive substances. Oral challenge with nickel salts has sometimes resulted in rapidly developing widespread erythema of short duration (13). This type of reactivity has been thought to be due to antibody formation (14) but could, in fact, be caused by non-immunological biochemical mechanisms.

One-third to one-half of the patients who followed the low-nickel diet described in this study experienced long-term benefit. This would appear, therefore, to be a useful, if tedious, treatment for nickel hypersensitive patients with certain morphologies of dermatitis, in particular hand eczema, who have not responsed to traditional therapy.

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