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Nickel Dermatitis and Diet: Clinical Improvement and a Reduction in Blood and Urine Nickel Levels with a Low-nickel Diet

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Gawkrodger DJ, Shuttler IL, Delves HT. Nickel dermatitis and diet: Clinical improvement and a reduction in blood and urine nickel levels with a low nickel diet. Acta Derm Venereol (Stockh) 1988; 68: 453–456.

A 27-year-old nickel-sensitive female who had had continuous spontaneous flare-ups of eczema, including at sites of previous metal contact, experienced a clearing of her eruption after commencing a low-nickel diet. When on the diet, whole-blood and urinary nickel levels fell to half or less of pre-diet values and this coincided with the clinical improvement. Low-nickel diets should be considererd for patients who are highly nickel sensitive. *Key words: Nickel sensitivity.* (Received February 19, 1988.)

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Orally ingested nickel can cause a flare-up of dermatitis in nickel-sensitive subjects (1). The amount of nickel required is usually much greater than the normal daily intake (2), although some patients might react to smaller quantities. About a half of nickel-sensitive patients improved on a low-nickel diet (3, 4); urinary nickel levels may fall, but not always by very much (3). However, the rationale for the diet has been challenged because only large amounts of orally administered nickel cause flare-ups (5) and diets are hard to assess objectively on a double-blind basis. We have treated a highly nickel-sensitive subject with a low-nickel diet and measured her blood and urinary nickel levels to provide objective data on the pharmacological effect of the diet.

PATIENT, METHODS AND RESULTS

A 27-year-old woman reported a 5-year history of reacting to jewellery and metal studs on clothing. The problem began 9 months after having her ears pierced. Over the 2 years before presentation the eczema worsened and would appear spontaneously at sites previously involved, without further local contact. She gave no history of atopy. Patch testing revealed a 3+ reaction at 48 h and 120 h to 5% nickel sulphate in petrolatum, but not to any other allergen in the standard battery.

She commenced a strict low-nickel diet similar to that outlined by Veien & Andersen (6): she ate fish, fruit, cheese, bread and crackers, drank beer and lager but avoided all tinned products, peanuts, bananas and chocolate. She took reduced amounts of vegetables and dairy products and used no

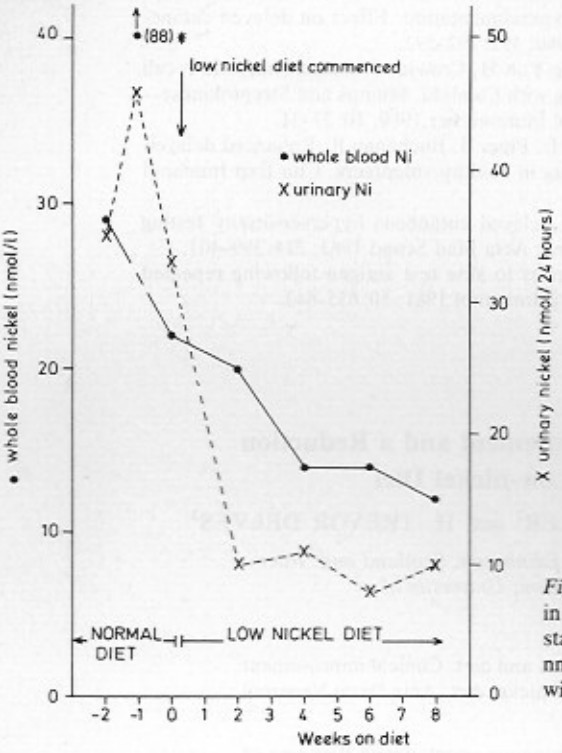

Fig. 1. Whole-blood nickel and 24-h urinary nickel levels in a 27-year-old nickel-sensitive woman before and after starting a low-nickel diet. (The pre-diet blood nickel of 88 nmol/l (asterisk) was possibly due to ingestion of food with a high nickel content.

stainless steel cooking utensils or cutlery. Improvement began within 2 weeks of starting the diet: from continuously having some eruption she became free of eczema and has remained so after 6 months on the diet.

Blood and urine samples were taken before commencing the diet and at regular intervals after it was started. Blood was withdrawn using a regular 21 g needle and placed in nickel-free tubes containing 30 units of lithium heparin as an anticoagulant. Urine was collected over a 24-h period using a receptacle previously washed in 10% Aristar grade nitric acid, and stored in an acid-washed plastic bottle with no rubber insert. Aliquots of urine were taken into acid-washed universal containers and all samples were stored at −20°C until required for analysis. The nickel concentrations in urine and whole blood were determined by atomic absorption spectrometry with electrothermal atomization (Shuttler & Delves, unpublished method). The limit of detection was 5 nmol/l. The within-run precision was 11% for 33 nmol/l of urine nickel, and 12% for 20 nmol/l of whole-blood nickel. Neither the sampling procedure nor the nitric acid used to preserve the urine samples introduced any contamination with nickel.

The results are shown in Fig. 1. All values fall within the normal range (whole-blood nickel <60 nmol/l: urine nickel <90 nmol/24 h) except for one pre-diet blood nickel value of 88 nmol/l which was associated with the one high urinary nickel excretion of 46 nmol/24 h. Although contamination with nickel cannot be completely eliminated we feel that it was unlikely in this case and that ingestion of food with a high nickel content prior to sampling is also a possibility. The whole-blood nickel level fell to approximately half the pre-diet value after one month on the low-nickel diet. The urinary nickel levels decreased to one-third or one-quarter of the pre-diet concentrations, a change being noted within 10 days of commencing the diet. All values remained low as the patient continued on the diet: this coincided with her being free of eczema.

DISCUSSION

Our study shows that a low-nickel diet can reduce blood nickel levels by a half and urine levels by a third or more. A decrease of the same magnitude in urinary nickel was found by

Kaaber et al. (3) in only one of their 14 patients on a low-nickel diet. Nickel-sensitive and non-nickel-sensitive subjects have similar blood and urine nickel levels (2, 7) but between individuals, nickel levels can show considerable variation (8). De Jongh et al. (9) found the same in multiple studies on one individual: correlation with disease activity was slight.

Some nickel-sensitive patients, perhaps those with the greatest reactivity, may be helped by a low-nickel diet. The relationship between nickel in the blood and nickel hypersensitivity is unknown: nickel-binding proteins in serum and blood cells are similar in nickel-sensitive and non-nickel-sensitive subjects (10). Whether the reduction in blood nickel produced by a low-nickel diet can influence nickel hypersensitivity will only be revealed by quantifying the hypersensitivity. Sjövall et al. (11) recently suggested that orally administered nickel may reduce hypersensitivity, perhaps by inducing tolerance. Low-nickel diets apparently do not do this, as patients relapse clinically if they resume a normal diet (3).

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