

Acrodermatitis Enteropathica: Zinc in Epidermis in Relation to Changes in Dosage of Zinc

Sir,

The role of zinc in human skin has been demonstrated by its effects in acrodermatitis enteropathica (AE). In healthy subjects there is no correlation between the concentration of zinc in the epidermis and dermis and that in serum (1). Little is known about the zinc content in the epidermis in AE in relation to that in the serum and about the way in which, and when, these variables are influenced by a change in the dosage of zinc.

We have followed up two patients with AE for 16 years (since 1973). During 1978–81 the dosage of zinc was decreased for some periods varying in length from 6 weeks to 6–8 months, and the concentrations of zinc in the serum and epidermis were followed.

PATIENTS AND METHODS

Case 1

This is a man born in 1955 who showed moderate to severe signs of AE from early 1956 to 1973, as previously reported in detail (2). At the age of 12 years he also developed pustular and cystic acne. Since June 1973 he has been treated with oral zinc (Zn^{2+}). Most of the time his daily dose has been Zn^{2+} 135 mg (45 mg \times 3, corresponding to 600 mg zinc sulphate,

given as Solvezink® effervescent tablets). There have been a few periods, however, with dosage reductions of Zn^{2+} to 45 or 90 mg daily. The dosage was first decreased during the second half of 1977 until March 1978.

Case 2

This patient is a man born in 1961 whose medical history of AE has been reported previously (2). At the start of zinc treatment in June 1974 his skin lesions were of moderate severity, mainly consisting in keratotic changes on the knees, elbows and heels. He has been prescribed a daily dose of Zn^{2+} of 90–135 mg. However, as shown in Table I, most of the time he has not followed this recommendation.

Control subjects

Control subjects for skin biopsies were 18 healthy males with a mean age of 31 years (1).

Blood samples

Blood was drawn in the morning, when the patients were fasting, and analysed for the concentrations of zinc and copper and the activity of alkaline phosphatase in serum as part of the routine procedure at the Department of Clinical Chemistry.

Determination of zinc in the epidermis

The procedure has been described in detail previously (1). Avoidance of contamination is essential. In short, two thin

Table I. The concentration of zinc in the epidermis and of zinc and copper in the serum, and the activity of alkaline phosphatase in the serum

	Age of the pat., years	Month, year	Dosage Zn ²⁺ mg since last follow-up	Serum zinc $\mu\text{mol/l}$	Serum copper $\mu\text{mol/l}$	Serum alkaline phosphatase $\mu\text{kat/l}$	Epidermal zinc $\mu\text{g/g}$ dry weight
Case 1	22	March 78	45 \times 2-3	13.0	23.8	3.6	51
	23	Nov 78	45 \times 3	14.6	20.0	3.0	66
	24	Aug 79	45 \times 2*	17.1	23.0	3.9	46
	24	Sep 79	45 \times 1	8.8	24.0	2.4	-
	24	Oct 79	45 \times 1	6.7	27.0	1.8	54
Case 2	16	May 78	45 \times 1-2	9.7	21.0	9.4	54
	16	Aug 78	45 \times 1	3.1	19.0	4.3	54
	17	Oct 78	45 \times 3	10.5	17.6	10.4	63
	17	Dec 78	45 \times 2	10.1	19.7	10.2	51
	17	Aug 79	45 \times 2-3	12.9	24.0	6.4	51
	18	Feb 80	45 \times 1-2	7.7	16.2	4.9	37
	20	Oct 81	45 \times 2	9.2	15.0	2.8	42
Male controls (n=18)							59 \pm 12

* Increased to 45 mg \times 3 two weeks before follow-up.

tangential shave biopsies were taken from the lateral part of the buttocks and placed in a few drops of saline, heated to 52°C for 5 seconds; epidermis was then separated from the dermis, dried, weighed and treated with deionized water for 24 hours and thereafter with 65% nitric acid for a further 96 hours. The zinc contents in the duplicate epidermal sheets were then determined by atomic absorption spectrophotometry at 214 nm and the mean of the two determinations was calculated.

RESULTS AND COMMENTS

During the first years of zinc treatment both patients needed a daily dose of Zn²⁺ of 135 mg to maintain their serum zinc level at > 10 $\mu\text{g/l}$. Table I summarizes the laboratory findings from the periods of decreased zinc dosage.

There has never been any obvious sign of recurrence of the clinical manifestations of AE in either of the two patients, although patient 1 has had a tendency to develop acne pustules and recurrent herpes simplex during periods of reduced zinc intake. Patient 2 has had a serum zinc concentration of only 4-6 $\mu\text{mol/l}$ on several occasions during the years 1981-89. It therefore seems probable that skin lesions typical of AE—resulting from slowly developing zinc deficiency—constitute a very late sign of severe deficiency.

During periods of low zinc intake, however, in both patients, changes in the long-chain fatty acid spectrum in the serum lipid esters and in adipose tissue similar to those before zinc treatment, reappeared (3).

In fact, the fatty acid pattern in patient 2 has never become fully normalised.

Thus in patients with AE a decrease in the serum zinc concentration is an early event occurring within a few weeks after reduction of the dosage of zinc, whereas a decrease in the epidermal zinc content is not observed until after 4-6 months of too low supplementation (as judged by decreasing serum levels). Furthermore, the absence of clinical signs of recurrence of the AE does not rule out that the patient may have a pronounced zinc deficiency. Measurement of zinc in one or several other tissues, e.g. leucocytes or epidermis, may add further information about the zinc status.

REFERENCES

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