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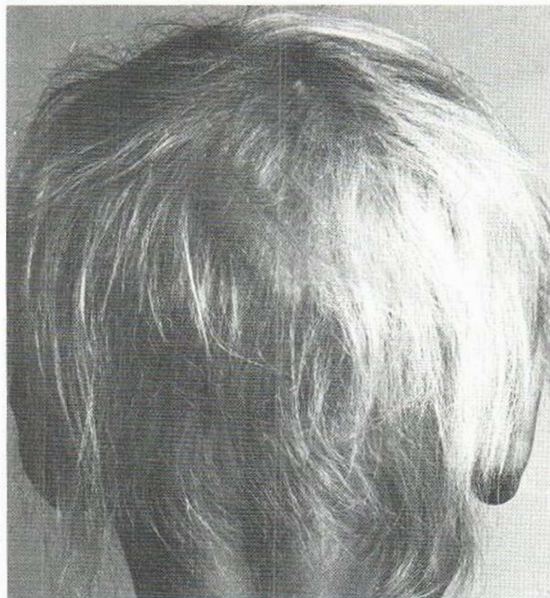


Fig. 1. Poor, thinned and colourless scalp hair before zinc therapy.

phatase levels was observed during the zinc supplementation. Microscopic examination of her poor scalp hair, using polarized light, revealed well-defined abnormalities of the hair shafts, as reported by others in a case of acrodermatitis enteropathica: 1) a marked individual variation in diameter, 2) narrowing often associated with waving or sharp bending and broken ends, 3) striation with a tendency to trichonodosis. Such changes were absent in the pigmented hair appearing after the start of zinc therapy.

Key words: Acrodermatitis enteropathica; Beau lines; Hair structure; Malabsorption; Sucrase deficiency; Zinc deficiency

Hair Changes Due to Zinc Deficiency in a Case of Sucrose Malabsorption

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Abstract. A 7-year-old girl suffering from chronic diarrhoea due to sucrase deficiency was referred because of poor hair growth. Her scalp hair had a poor, colourless appearance and was much thinned in the occipital region. Her skin was dry, but otherwise normal. P-zinc was low (7.9 $\mu\text{mol/l}$), whereas P-albumin was normal. Oral zinc therapy, 40 mg daily, had a marked beneficial effect on her scalp hair, eyebrows and eyelashes, which became thicker and pigmented. Beau lines appeared on thumb-nails and 4th left finger-nail. A rise in P-zinc and S-alkaline phos-

phatase levels was observed during the zinc supplementation. Microscopic examination of her poor scalp hair, using polarized light, revealed well-defined abnormalities of the hair shafts, as reported by others in a case of acrodermatitis enteropathica, a specific zinc malabsorption disease (9, 12), total parenteral nutrition (1) and antileukaemic chemotherapy (6). In these cases reported, zinc deficiency caused well-defined skin and hair changes (9) which often led to the diagnosis.

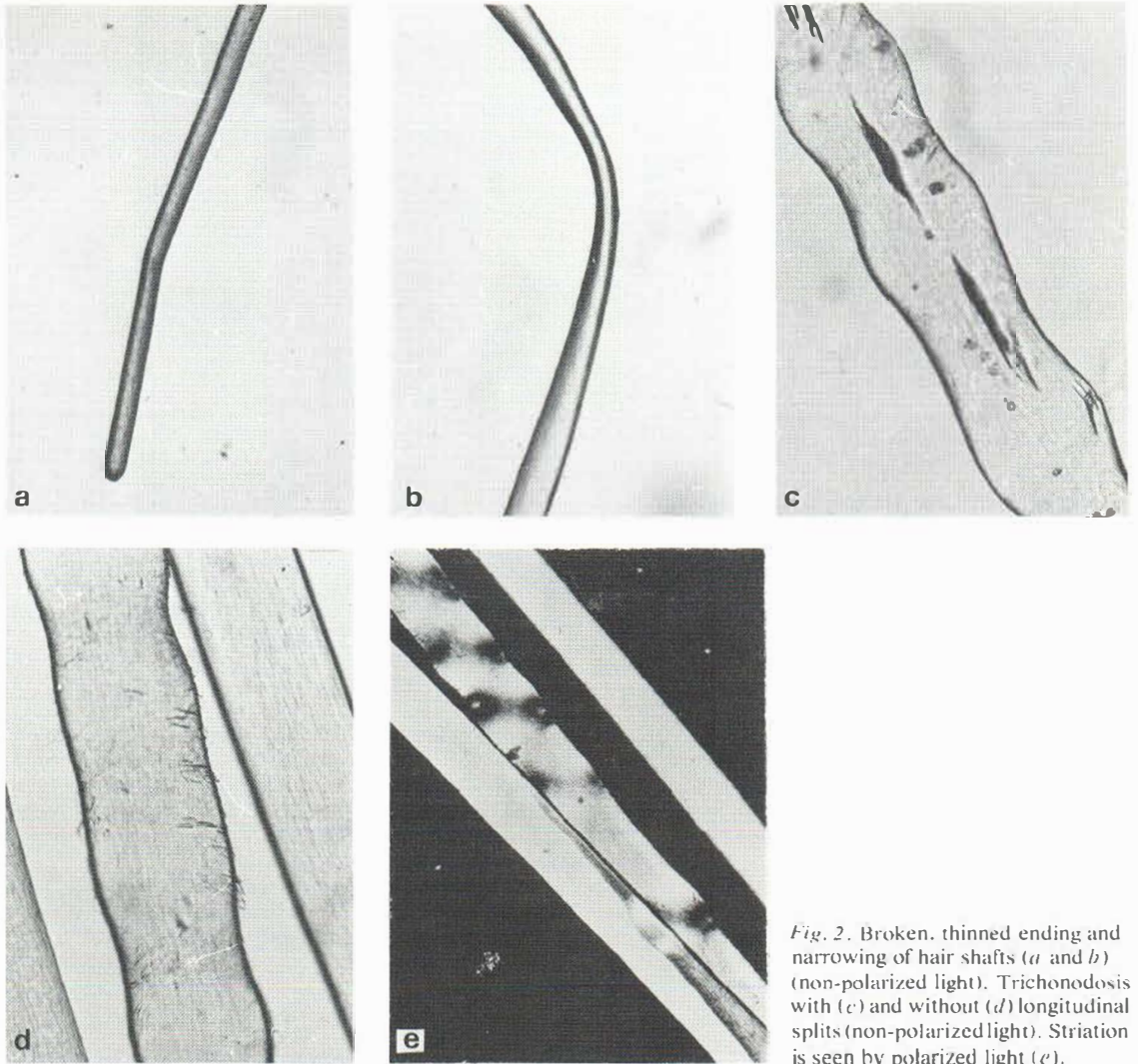


Fig. 2. Broken, thinned ending and narrowing of hair shafts (*a* and *b*) (non-polarized light). Trichonodosis with (*c*) and without (*d*) longitudinal splits (non-polarized light). Striation is seen by polarized light (*e*).

In the present case an additional cause of acquired zinc deficiency in childhood, sucrose malabsorption, presenting with an abnormal hair structure, is reported.

CASE REPORT

A 7-year-old girl had suffered from chronic diarrhoea since early childhood due to absence of sucrase in her small intestine. The diagnosis of sucrase deficiency was made at another hospital by intestinal biopsies performed at the age of 2 and 4. She had been treated with a sucrose-poor diet which, when followed strictly, significantly alleviated her malabsorption. This, however, was not always the case. At the time of referral she had from 4 to 8 episodes of diarrhoea per day.

She was referred because of poor scalp hair which within recent months had become increasingly thinned and brittle. Nails and hair were seldomly cut. Recurrent super-

ficial scaling on her hands had been noted by her parents.

On examination she appeared normally developed, 116 cm in height, weighing 23 kg. These values represent the 50th percentile for her age. Her skin was dry and pale, with a slight scaling present on the backs of her hands. No signs of acute or chronic zinc deficiency dermatitis were present. Her scalp hair was poor, colourless with an unkempt, mohair-like appearance, especially in the occipital region, where her hair was loose, shortened and thinned (Fig. 1).

Microscopic examination of the hair with polarized light revealed the following changes: 1) a marked individual variation in the diameter of the hair shaft; 2) narrowings of the hair shaft often associated with soft wavings, some of them with a swan-neck appearance, sharp angles or spearhead-like broken ends; 3) some hairs displayed multiple cross-ridges with a slight trichonodosis and short longitudinal splits (Fig. 2*a-e*).

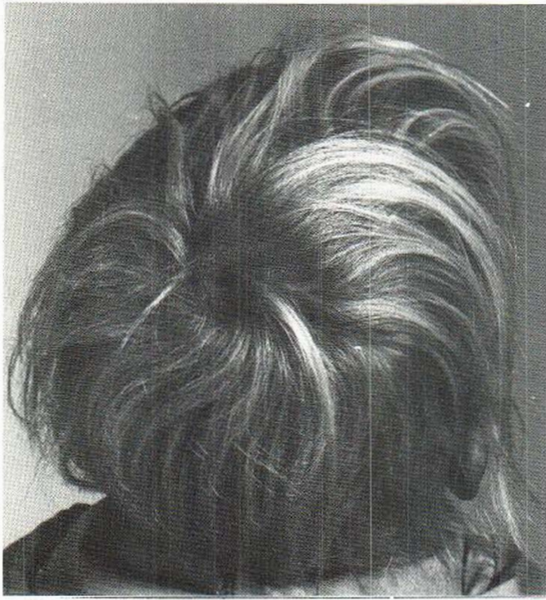


Fig. 3. New, pigmented scalp hair after zinc therapy for 4 months.

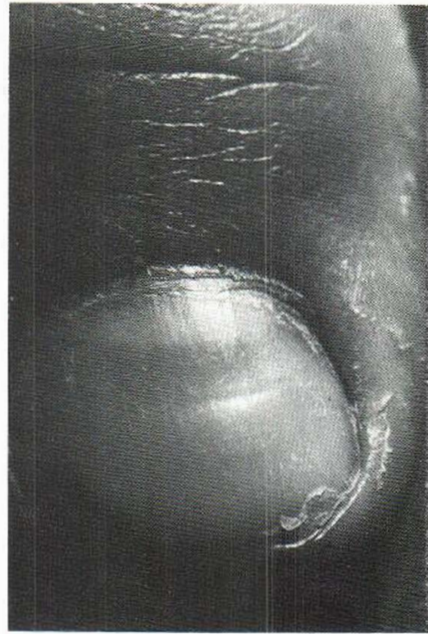


Fig. 4. Beau line of thumb-nail.

Laboratory analyses. Haemoglobin, WBC, S-iron, S-copper, S-calcium and S-creatinine were normal. P-zinc was decreased $7.9 \mu\text{mol/l}$ (normal $10.6\text{--}18.9 \mu\text{mol/l}$). P-albumin was above the mean value of the normal range, $681 \mu\text{mol/l}$ (normal $532\text{--}813 \mu\text{mol/l}$).

Course and therapy. Acquired chronic zinc deficiency was suspected and she was started on 40 mg zinc daily (about 2 mg/kg body weight) in the form of zinc sulphate slow-release tablets (Zinc-let®) 100 mg twice daily. Within 4 weeks, new scalp hair with a dark-blond pigmentation was seen to grow out, and old hair shafts showed a distinct pigmentation at their proximal ends (Fig. 3). Eyebrows and eyelashes also became more pigmented and thicker. It should be noted that the changes occurred during the summer time. After 8 weeks Beau lines were observed on the middle of the thumb-nails and the left fourth finger-nail (Fig. 4). There was a marked rise in the P-zinc level, and S-alkaline phosphatase values also rose (Table 1).

After 2 months the zinc medication was stopped and not resumed until 6 weeks later at a maintenance dose of 6 mg

zinc daily, supplied as a multivitamin-mineral preparation (Dolcivit®). This represents 60% of her recommended dietary allowance for zinc (4). P-zinc remained normal during the subsequent 3 months of observation. No subjective or biochemical side effects of the zinc therapy were noted.

Microscopic examination of new, pigmented hair showed a total absence of any hair abnormality.

Her gastrointestinal function was not improved by the zinc medication.

DISCUSSION

The patient was judged to be suffering from a chronic zinc deficiency in a mild degree, probably brought on by her malabsorption caused by sucrose intolerance. The diagnosis of zinc deficiency was established by the finding of a subnormal P-zinc level in the absence of hypoalbuminaemia, febrile

Table 1. P-zinc and S-alkaline phosphatase values during oral zinc therapy

	40 mg zinc/day				6 mg zinc/day		
	Pretreat- ment (May 28)	2 weeks (June 10)	4 weeks (June 25)	8 weeks (July 29)	Pretreat- ment (Sept. 9)	7 weeks (Oct. 29)	13 weeks (Dec. 12)
P-zinc, $\mu\text{mol/l}$ (10.6–18.9)	7.9	12.3	22.7	32.1	12.4	12.8	13.7
S-alkaline phosphatase, U/l (Age 1/2 to 9 yrs 250–1 000)	390	–	496	484	464	520	444

disease, liver disease, stress or corticosteroid therapy, and by the disappearance of relevant clinical symptoms, i.e. poor hair growth, during zinc supplementation. Furthermore, a rise in P-zinc and S-alkaline values and the delayed appearance of Beau lines on her finger-nails corroborate the diagnosis (8).

Our patient did not show skin changes of severe acute or chronic zinc deficiency (9). The only evidence on examination was a poor scalp hair which gave us an allusion to zinc deficiency, as it looked like a case of AEP, reported earlier (10). Dupré et al. (2) examined poor scalp hair of a severely zinc-deficient AEP infant. They found extensive narrowings of the hair shafts, often associated with wavings, and spearhead-like endings. On using polarized light, oblique striae of the hair shafts in association with areas of trichonodosis were visible. Our patients exhibited similar hair abnormalities which disappeared following zinc repletion, and we therefore judge them to be related to, although not specific for a systemic zinc deficiency.

In zinc deficiency the hair growth is decreased or stopped, the decisive factor being the degree of deficiency (9). Striae, an optical phenomenon probably due to qualitative or quantitative changes of the hair shaft, might reflect fluctuations of the protein formation, appearing at close intervals due to a greatly reduced hair growth rate in severe zinc deficiency. In a mild degree of zinc deficiency, similar changes could be expected to appear as more extensive narrowings because of the faster hair growth rate. Beau lines and uneven dystrophic nail plates of acute and chronic zinc deficiency, respectively (8), could be regarded as a parallel phenomenon to these hair changes.

Discoloration of scalp hair which was reversed by zinc therapy was reported in AEP (10) and in a case of acquired zinc deficiency due to alcoholism and malnutrition (3). As also illustrated by the present case, zinc plays an unknown but important role in the pigmentation of hair, which remains to be studied further.

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Histiocytosis X with Unusual Skin Symptoms

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Abstract. A 4-year-old boy with skin symptoms resembling verruca plana juvenile was observed. The light- and electron-microscopic picture showed the typical features of histiocytosis X (Letterer-Siwe syndrome). Beside the skin manifestations some less dense areas in the skull