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The Pharmacokinetics of Selenium in Psoriasis and Atopic Dermatitis

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Fairris GM, Perkins PJ, Lawson AD, Blake GM. The pharmacokinetics of selenium in psoriasis and atopic dermatitis. Acta Derm Venereol (Stockh) 1988: 434–436.

The pharmacokinetics of [^{75}Se-L]-selenomethionine was studied in 10 patients with psoriasis, 10 with atopic dermatitis and 10 healthy subjects. Values for the gut absorption and the rate of endogenous excretion of [^{75}Se-L]-selenomethionine, the exchangeable total-body selenium and plasma selenium concentration showed no significant differences between either patient group and the controls. The results suggest that there is no gross abnormality of selenium pharmacokinetics in either disease, and fail to explain why previous studies have found reduced selenium concentrations and selenium-dependent glutathione peroxidase activity in psoriasis and atopic dermatitis. (Received April 5, 1988.)

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A reduction in the activity of red cell selenium-dependent glutathione peroxidase (1) and the concentration of selenium in whole blood, plasma and leukocytes (2, 3) has been reported in patients with psoriasis or atopic dermatitis. We have investigated whether these changes might be associated with reduced gut absorption of selenium, increased endogenous excretion or reduced values of exchangeable total-body selenium.

PATIENTS AND METHODS

Ten subjects with psoriasis and 10 with atopic dermatitis who had been referred to the Department of Dermatology in Southampton were recruited to the study. Ten healthy controls, with no history of skin disease, were recruited from amongst hospital personnel. Each control was matched with one patient with psoriasis and one with atopic dermatitis as regards age and smoking habits. The study was approved by the Hospital's Ethical Committee. Only people between the ages of 25 and 65 years, who could not conceive, and who were not taking diuretics or any selenium-containing supplements were enrolled.

[^{75}Se-L]selenomethionine (Amersham International PLC) was chosen as a tracer of whole-body selenium kinetics as organic selenium is known to be the principal component of dietary selenium (4). Each subject received 20 kBq (0.5 μCi) of [^{75}Se-L]selenomethionine intravenously and a shadow shield whole-body counter (WBC) was used to measure total body retention 7 days later. The WBC measurements were used to determine the rate of endogenous [^{75}Se-L]selenomethionine excretion over this period. On the seventh day, each subject received an oral dose of 100 kBq (2.5 μCi) of [^{75}Se-

Table I. *Pharmacokinetics of [^{75}Se-L]selenomethionine*

SEM = standard error of the mean, NS = Not significant, *p*-value = Psoriasis or atopic dermatitis versus controls

	Psoriasis	Atopic dermatitis	Controls
Endogenous excretion (7 days)			
Mean	10.1%	10.0%	10.6%
SEM	0.79	0.94	0.82
p-value	NS	NS	
Gastrointestinal absorption			
Mean	95.2%	95.6%	94.7%
SEM	0.71	1.33	1.38
p-value	NS	NS	
Exchangeable total body selenium, mg			
Mean	8.02	10.12	10.89
SEM	1.17	1.84	1.84
p-value	NS	NS	
Plasma selenium concentration, μmol/l			
Mean	1.09	1.04	1.12
SEM	0.05	0.06	0.04
p-value	NS	NS	

L]selenomethionine after starving for 4 h. WBC measurements were again made after 7 days and compared with those obtained after intravenous administration to infer gut absorption of selenomethionine.

The concentration of chemical selenium in plasma was measured using hydride generation and atomic absorption spectroscopy (2). Total-body retention of ^{75}Se and plasma ^{75}Se were measured at 6-weekly intervals for 24 weeks after the oral dose and these data combined with the measurements of the chemical plasma selenium concentration to infer exchangeable total-body selenium. The statistical significance of the differences between patient and control groups was evaluated using the Mann-Whitney U-test.

RESULTS

One subject with atopic dermatitis did not complete the study. Values for the gut absorption and the rate of endogenous excretion of [^{75}Se-L]selenomethionine, the exchangeable total-body selenium and plasma selenium concentration showed no significant differences between either patient group and the controls (Table I).

DISCUSSION

The failure to find any significant difference for selenium absorption, excretion, or total-body selenium between patients and controls suggests that there was no flagrant abnormality in selenium pharmacokinetics in the patients. Three previous studies have suggested that plasma selenium concentrations are reduced in psoriasis and dermatitis (1, 2, 3). In the present study, however, no significant difference was found between the patients' mean plasma selenium concentration and that of the controls. The plasma selenium concentrations in the controls were lower than expected. It is possible, therefore, that the controls were not a representative group.

Although selenomethionine is the principal form of selenium in food (4), selenomethionine dissolved in water may not be a satisfactory index of the absorption of die-

tary selenium, as most selenium in food is bound to large molecules that must be digested before being absorbed. Further studies on the absorption of dietary selenium in psoriasis and atopic dermatitis are needed. Such studies may reveal a malabsorption of dietary selenium equivalent to the asymptomatic malabsorption of fat (5) found in these diseases.

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Is the Effect of Phototherapy in Psoriasis Partly Due to an Impact on Vitamin D Metabolism?

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Staberg B, Oxholm A, Klemp P, Hartwell D. Is the effect of phototherapy in psoriasis partly due to an impact on vitamin D metabolism? Acta Derm Venereol (Stockh) 1988; 68: 436–439.

To elucidate the effect of phototherapy on vitamin D metabolism in psoriatics, the serum concentrations of the major vitamin D metabolites (25-hydroxy-vitamin D (25(OH)D), 1,25-dihydroxy-vitamin D ($1,25(OH)_2D$), and 24,25-dihydroxy-vitamin D ($24,25(OH)_2D$)) were studied in 10 patients with disseminated psoriasis, both before and after phototherapy. Some 3–4 weeks of Goeckerman therapy induced significantly increased serum levels of 25(OH)D (mean: 24.6 ng/ml versus 54.4 ng/ml; ($p<0.001$)) and $24,25(OH)_2D$ (mean: 2.01 ng/ml versus 3.49 ng/ml; ($p<0.001$)). After phototherapy the mean serum level of $1,25(OH)_2D$ increased nearly to the level found in healthy controls (mean: 23.8 vs. 32.2 pg/ml). However, this increase was not significant. It is shown that conventional phototherapy does have an impact on vitamin D metabolism in psoriatics. Since previous investigations have indicated an abnormal vitamin D metabolism in patients with psoriasis, it is possible that the beneficial effect of phototherapy in this disease might be due partly to an impact on vitamin D metabolism. (Received December 23, 1987.)

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The cutaneous synthesis of cholecalciferol in response to ultraviolet (UV) irradiation is considered to be the most important factor in maintaining vitamin D status in man (1, 2). Vitamin D is hydroxylated in the liver to 25-hydroxyvitamin D, followed by hydroxylation