Psychopharmacology (1990) 102:549–550

Psychopharmacology

Selenium supplementation improves mood in a double-blind crossover trial

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Received July 13, 1990

Abstract. The possibility that a sub-clinical deficiency of the trace element selenium might exist in a sample of the British population was examined by giving a selenium supplemeted for 5 weeks. Using a double-blind crossover design 50 subjects received either a placebo or 100 μg selenium on a daily basis. On three occasions they filled in the Profile of Moods state. Mood did not change when taking the placebo, whereas when taking the selenium the subjects reported a substantial improvement after both 2.5 and 5 weeks.

Key words: Mood – Selenium – Trace element – Nutritional deficiency

The level of the essential trace element selenium in the food chain depends on the amount in the soil: as soil levels vary throughout the world so do the levels of selenium found in the human body (Burk 1976). The significance of low levels of bodily selenium is unclear, in fact some argue that there seem to be few problems associated with any but the very lowest levels (Robinson 1988). The present study reports that the taking of selenium supplements, in a controlled trial, very markedly increased reports of well-being in a British sample.

The amount of selenium in a food varies largely with its protein content and with the area in which it is grown (Burk 1976). In 1978 the average British diet was calculated to provide approximately 60 μg of selenium per day (Thorn et al. 1978), of which half was derived from cereals and another 40% from meat and fish. The amount of selenium in most British foods is lower than in most other countries, probably reflecting the comparatively low levels of this element in British soil (Thorn et al. 1978). More recently it has been suggested that the intake of selenium has decreased to 43 μg/day (Barclay and MacPherson 1986), as the wheat used for flour making is increasing grown in the United Kingdom rather than imported from Canada. The trend to eating less bread is another pressure decreasing the intake of selenium. An intake of 43 μg/day fails to meet the estimated safe and adequate daily intake of 50–200 μg/day for adults (US Food and Nutrition Board 1980).

It was argued that although the evidence was that a sub-clinical deficiency of selenium, if it existed, would not produce pronounced symptoms, the cumulative effect of many minor enzymic deficiencies might result in a decreased feeling of well-being as indicated by lowered mood. The impact of selenium supplementation on mood was therefore studied.

Method

Seventeen males and 33 females, aged from 14 to 74, who all reported being in good health, were subjects in a study that used a double-blind cross-over design. The active tablets contained selenium as "organic bound protein" and each yeast based tablet contained 100 μg selenium: the placebos were Brewers yeast that contains negligible selenium (supplied by Larkhall Laboratories, Putney, London). Subjects were randomly allocated to groups that were given a selenium tablet, or a placebo, each day for 5 weeks. A 6-month washout period followed to allow levels to fall to basal values (Schrauzer and White 1978), after which the subjects received the other tablet each day for a second 5-week period.

In both 5-week experimental periods, before starting to take the tablets, after 2.5 and 5 weeks, the subjects completed the bipolar form of the Profile of Moods questionnaire. The questionnaire consists of 72 adjectives describing feelings and moods. The subjects, by ticking a point on a four point scale, indicate how they have been feeling over the last week. The manual suggests that a total mood score can be calculated (McNair et al. 1971) such that those with a high score are composed rather than anxious, agreeable rather than hostile, elated rather than depressed, confident rather than unsure, energetic rather rather than tired and clearheaded rather than confused.

The data were analyzed using a four-way analysis of variance; sex × order (selenium or placebo first) × selenium/placebo × time (before taking the tablet, 2.5 or 5 weeks afterwards) with the last two as repeated measures factors.

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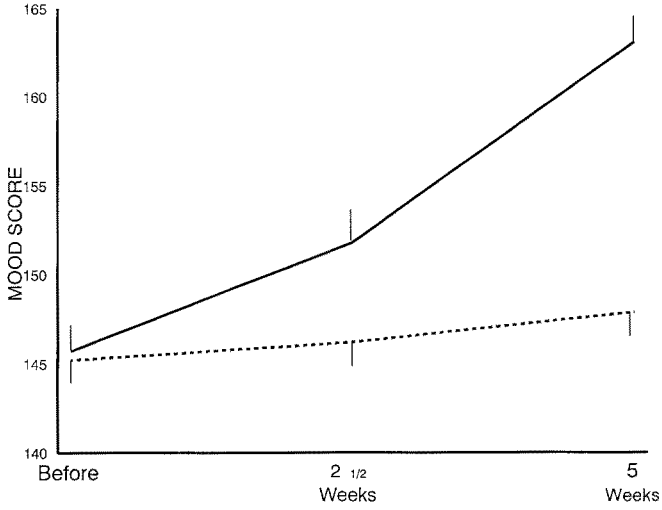

Fig. 1. The influence of selenium on mood. The data are means +SE for 50 subjects. Higher scores are associated with feeling less anxious, less depressed and more energetic. —— Selenium; ---- placebo

Results

The selenium/placebo × time interaction reached statistical significance [$F(2,92)=47.33$, $P<0.0001$] and is illustrated in Fig. 1. Simple main effects were calculated to explore the nature of the interaction . The scores while taking the placebo did not chage over time [$F(2,92)=2.97$. n.s.]; in contrast, when taking the selenium supplement there was a significant increase in mood scores [$F(2,92)=158.65$, $P<0.0001$]. The baseline mood scores did not differ prior to the taking of one type of tablet rather than the other [$F(1,46)=0.38$, n.s.]. However, after 2.5 [$F(1,46)=12.93$, $P<0.001$] and 5 weeks of taking the tablets [$F(1,46)=113.43$, $P<0.0001$] the mood scores of those taking selenium were significantly greater. No other interaction reached statistical significance.

Discussion

It has been argued (Thorn et al. 1978) that it is unlikely that selenium deficiency exists, as New Zealand women with intakes of the order of 20–25 μg/day, lower than those in Britain, do not report any improvement in health even after large doses. Robinson (1988), after reviewing the topic, concluded that although many New Zealanders have low activity of the selenium containing enzyme glutathione peroxidase (E.C. 1.11.1.9), and that activity increased following supplementation, their general good health makes it hardly justified to regard them as even sub-clinically deficient. The use of a sensitive psychological measure for the first time in the present study suggests otherwise.

Mertz (1981) defined a deficiency, not as the absence of a trace element, but that its presence in suboptimal concentrations results in impaired function such that a condition responds to supplementation. The marked increase in the feelings of well being that resulted from selenium supplementation suggests that the possibility that a deficiency exists in the United Kingdom diet should be considered. In particular, it would be instructive to relate reported changes in well-being to selenium dependent biochemical measures.

The importance of the present observation is a matter for speculation. In the present study there is no way of knowing whether the reported improvement in mood is a reflection of improved physical well-being or alternatively a reflection of a direct neural action. The latter possibility is suggested by the finding of differing levels of selenium in various areas of the human brain (Larsen et al. 1979).

Acknowledgements. The support by Larkhall Laboratories, Putney, London is gratefully acknowledged.

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