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METAL IONS

A POSSIBLE NEGATIVE EFFECT OF IRON-CONTAINING SUPPLEMENTS FOR IRON INSUFFICIENCY CORRECTION

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Introduction

Biological active supplements and some drugs that contain different forms of iron (heme, organic and inorganic salts, elemental, nonion) with or without one or several vitamins, are usually administrated for iron deficiency prophylaxis and therapy. Unabsorbed iron may increase free radical production in the colon to a level that could cause mucosal cell damage or increased production of carcinogens. It has been shown that the concentration of weakly bound iron in feces (1.3% of total fecal iron) increased from 60 mmol/l before to 300 mmol/l during 2 wk supplementation (19 mg elemental Fe/d) and the production of free radicals increased significantly (40%) (Lund et al., 1999).

Iron in excess is an active participant in the reaction, which results in the production of free radicals and oxidative damage (McCord, 1996), that may be associated with increased oxidative product formation and the initiation of various pathogenic processes such as cardiovascular disease, neuropathologies, and cancer (Sempos et al., 1997; Klipstein-Grobusch et al., 1999). Epidemiological study of eastern Finnish men demonstrated that high concentrations of serum ferritin and dietary iron were positively associated with the incidence of myocardial infarction (Salonen et al., 1992). While no association with risk of myocardial infarction was observed for serum iron, serum transferrin, or total dietary iron (Beard, 2000).

Taking into consideration that the main contribution to common antioxidant activity makes such serum proteins as ceruloplasmin and transferrin, which concentration decreases under iron deficiency, the most reasonable is to propose that iron containing supplements administration makes worse the body antioxidant status.

Thus, the implications of adding a large amount of fortificant iron or the provision a very large dose of supplemental oral iron, need to be reconsidered.

The aim of this research was to estimate the influence of different iron containing supplements intake on anti-

TABLE. VITAMIN AND MINERAL CONTENT IN DAILY DOSE OF THE USED SUPPLEMENTS (mg).

Component	1	2	3	5	6
C	300	60	30	–	–
B_1	1.5	1.05	–	–	–
B_2	1.7	1.2	–	–	–
B_6	2.0	1.05	–	–	–
Niacinamid	20	13.5	–	–	–
Calcium pantothenate	10	–	–	–	–
Folic acid	0.4	0.3	–	0.5	–
B_{12}	0.006	0.0045	–	0.3	–
E	30	15	5	–	–
A	5000 ME	2500 ME	–	–	–
D	400 ME	400 ME	–	–	–
Biotin	0.045	–	–	–	–
K	0.01	–	–	–	–
Iron	18	15 (fumarate)	20 (sulfate)	34.5 (sulfate)	100 (Fe III nonion)
Minerals or other components	Cu (2), Zn (15), Mn (1), I (0.15), Mo (0.02), Cr (0.02)	–	EDTA (20)	Serine (129)	–

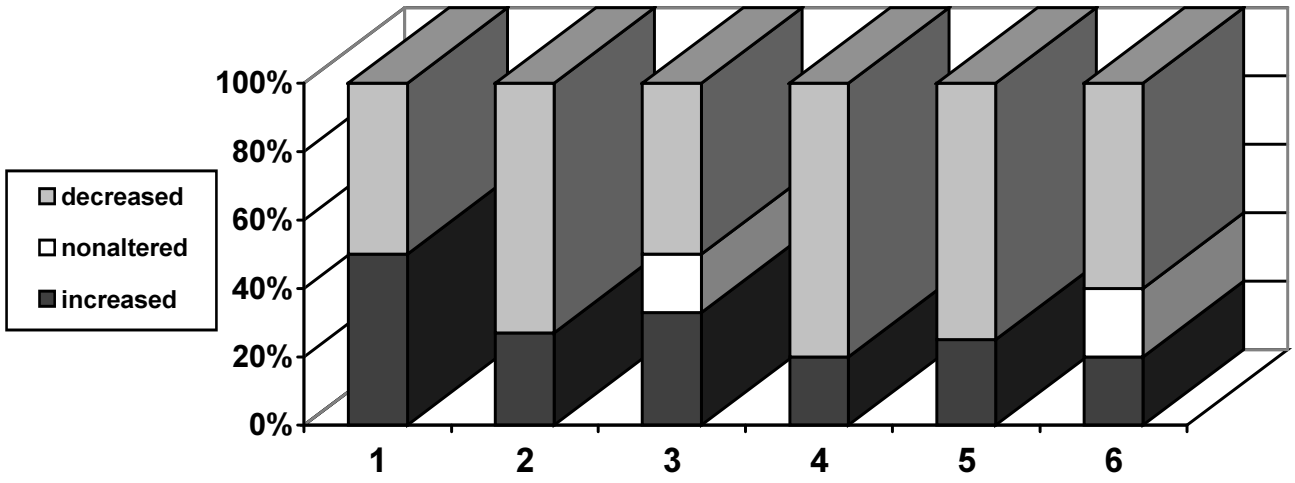

Figure. THE INFLUENCE OF THE SUPPLEMENTS ON SERUM MDA LEVEL.

oxidant status of children with decreased hemoglobin level.

Materials and Methods

Vitamin and antioxidant status was determined in 96 children 4–15 years old with decreased hemoglobin level (less 120 g/l) before and after 5–6-wk supplements intake.

The extent of lipid peroxidation in blood serum was measured in terms of malonaldehyde production (MDA). Plasma vitamins A, E, individual carotenoids and pyridoxal-5'-phosphate were measured by reversed-phase HPLC (Yakushina et al., 1993). Plasma vitamin C level was measured by usually used method of visual titration. Plasma riboflavin was determined by riboflavin-binding apoprotein titration (Kodentsova et al., 1995).

Results

Most of the children (67%) had the combined deficiency of B group vitamins (70%) and carotenoids (85%) while they were sufficiently supplied with vitamin C (deficit 11%). Adequately supplied with all vitamins were only 2 per cent of children.

The composition of the used supplement that contains iron is submitted in Table.

Children's antioxidant status worsening took place more often under the similar iron fumarate intake (Fe^{2+} 15–18 mg/d.) combined with Cu, Zn, Mn, I, Mo, and Cr despite 2–5 fold raised vitamins-antioxidant content (C, A, E) as compared with RDA (Figure).

Supplements numbers are the same as in the Table. Number 4 corresponds to number 3 with additional intake of multivitamins.

The presence of complexone EDTA or serine and folic acid and vitamin B_{12} high doses in iron sulfate (Fe^{2+} 20–34 mg/d) containing supplements as well as the additional multivitamins intake not only deteriorated antioxidant status indexes but lead to MDA serum content decrease in 50–80 per cent of the examined children.

Conclusions

Antioxidant status deterioration has been found more often under the combined iron and other minerals intake. Negative influence of iron intake on oxidative damage indices decreased under additional vitamins administration in particular vitamin B group. Liquidation of existing vitamin deficit which may be considered as risk factor of iron deficiency development is one of the benefits of the combined iron and vitamins intake.

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