Influence of manganese on growth, somatomedin and glycosaminoglycan metabolism

Day-old chicks were fed control or manganese (Mn deficient diets ad libitum for 25 d. The chicks subsequently were refed control diet for up to 5 d. Mn deficiency significantly decreased growth rate and feed intake compared to controls. After 25 d of depletion, bone Mn concentration was 2% that of controls and 88% of the deficient chicks exhibited signs of perosis. Sulfate (35SO4) uptake into uronic acid was significantly depressed in cartilage from the Mn-depleted chicks and increased rapidly with refeeding, which may indicate increased glycosaminoglycan (GAG) biosynthesis or increased sulfation of the GAG molecule. In vitro activity of glycosyltransferases suggest that GAG synthesis may be interrupted by Mn deficiency. Somatomedin activity, serum insulin and glucose levels were not influenced significantly by Mn deficiency. Thus, while Mn deficiency decreased growth and GAG synthesis these effects were not mediated by somatomedin. Bolze MS, Reeves RD, Lindbeck FE, Kemp SF, Elders MJ. J Nutr 1985 Mar;115(3):352-8.

Manganese, iron and lipid interactions in rats

The interactive effects of manganese, iron and lipid on mineral status, manganese-dependent superoxide dismutase (MnSOD) activity and lipoprotein composition were investigated by feeding weanling rats two levels of manganese (0.4 or 56 micrograms Mn/g diet), two levels of iron (29 or 109 micrograms Fe/g diet) and either 12% high-linoleic acid safflower oil or 12% high-oleic acid safflower oil for 8 wk. Rats fed the manganese-deficient diets had decreased heart MnSOD activity; depressed tibia and kidney manganese concentrations; lowered plasma and high density lipoprotein (HDL) cholesterol, HDL protein and HDL apo E concentrations; and elevated HDL protein/cholesterol ratios. Ingestion of supplemental iron slightly decreased heart MnSOD activity and tibia and kidney manganese concentrations but had no effect on hematocrits or on plasma and HDL cholesterol levels. Rats fed the linoleic acid-rich rather than the oleic acid-rich oil had increased heart MnSOD activity but had unchanged plasma and HDL cholesterol levels. The decrease in plasma and HDL cholesterol levels with manganese deficiency appeared not to be a result of increased lipid peroxidation but may have resulted from decreased cholesterol synthesis and/or secretion. Davis CD, Ney DM, Greger JL. J Nutr 1990 May;120(5):507-13. J Nutr 1994 Mar;124(3):340-4.

Longitudinal changes of manganese-dependent superoxide dismutase and other indexes of manganese and iron status in women

The effect of dietary factors on manganese-dependent superoxide dismutase (MnSOD) activity in humans has not been studied. We longitudinally evaluated changes in MnSOD activity and other indices of manganese and iron status in 47 women during a 124-d supplementation study. Subjects received one of four treatments: placebo, 60 mg iron, 15 mg manganese, or both mineral supplements daily. Manganese supplementation resulted in significant increases in lymphocyte MnSOD activity and serum manganese concentrations from baseline values but no changes in urinary manganese excretion or in any indices of iron status. Oral contraceptive use and the stage of the menstrual cycle did not confound the use of lymphocyte MnSOD activity or serum manganese to monitor manganese status, but fat intake affected both indices. This work demonstrated that lymphocyte MnSOD activity can be used with serum manganese concentrations to monitor manganese exposure in humans. Davis CD, Greger JL. Am J Clin Nutr 1992 Mar;55(3):747-52.

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