

The Combined Effect of Different Levels of Fe(III) in Diet and Cr(III) Supplementation on the Ca Status in Wistar

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Abstract : The inappropriate trace elements supply such as iron(III) and chromium(III) may be risk factors of many metabolic disorders (e.g., anemia, diabetes, as well cause toxic effect). However, little is known about their mutual interactions and their impact on these disturbances. The effects of Cr(III) supplementation with a deficit or excess supply of Fe(III) in vivo conditions are not known yet. The objective of the study was to investigate the combined effect of different Fe(III) levels in the diet and simultaneous Cr(III) supplementation on the Ca distribution in organs in healthy rats. The assessment was based on a two-factor (2x3) experiment carried out on 54 female Wistar rats (*Rattus norvegicus*). The animals were randomly divided into 9 groups and for 6 weeks, they were fed semi-purified diets AIN-93 with three different Fe(III) levels in the diet as a factor A [control (C) 45 mg/kg (100% Recommended Daily Allowance for rodents), deficient (D) 5 mg/kg (10% RDA), and oversupply (H) 180 mg/kg (400% RDA)]. The second factor (B) was the simultaneous dietary supplementation with Cr(III) at doses of 1, 50 and 500 mg/kg of the diet. Iron(III) citrate was the source of Fe(III). The complex of Cr(III) with propionic acid, also called Cr₃ or chromium(III) propionate (CrProp), was used as a source of Cr(III) in the diet. The Ca content of analysed samples (liver, kidneys, spleen, heart, and femur) was determined with the Atomic Absorption Spectrometry (AAS) method. It was found that different dietary Fe(III) supply as well as Cr(III) supplementation independently and in combination influenced Ca metabolism in healthy rats. Regardless of the supplementation of Cr(III), the oversupply of Fe(III) (180 mg/kg) decreased the Ca content in the liver and kidneys, while it increased the Ca saturation of bone tissue. High Cr(III) doses lowered the hepatic Ca content. Moreover, it tended to decrease the Ca content in the kidneys and heart, but this effect was not statistically significant. The combined effect of the experimental factors on the Ca content in the liver and the femur was observed. With the increase in the Fe(III) content in the diet, there was a decrease in the Ca level in the liver and an increase in bone saturation, and the additional Cr(III) supplementation intensified those effects. The study proved that the different Fe(III) content in the diet, independently and in combination with Cr(III) supplementation, affected the Ca distribution in organisms of healthy rats.

Keywords : calcium, chromium(III), iron(III), rats, supplementation

Conference Title : ICTEMB 2022 : International Conference on Trace Elements in Medicine and Biology

Conference Location : Paris, France

Conference Dates : April 14-15, 2022