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Pectin Structure and Normal Iron Absorption Determined by Erythrocyte Incorporation of Ingested Stable Iron in Rats

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Iron deficiency is the most common human nutritional deficiency in the world. It is caused not only by low intake but more often by poor bioavailability from the diet, due to iron interaction with other dietary components. Dietary fiber has forced its way to our attention in recent years. The effects of pectin on absorption of cholesterol, bile acids and other lipids, on the digestion and utilization of protein and on utilization of β-carotene have all been shown to depend on the pectin's molecular weight (MW) and degree of esterification (DE). However, there has been no attempt to elucidate what effects, if any, the nature of dietary pectin (e.g. DE and MW) would have on the absorption of iron from the diet. Therefore, the effects of DE and MW of pectins on iron bioavailability and erythrocyte incorporation were investigated in growing rats. The pectins prepared differed (in DE and MW, respectively) as follows : P-A (73%, 860,000), P-B (75%, 89,000), P-C (22%, 1,260,000), and P-D (24%, 114,000). After all the rats were forced-fed stable ^{58}Fe solution during the meal, they were pair-fed the ferrous sulfate-supplemented basal diet (47 mg Fe/kg diet) or fed with *ad libitum* access the basal diet containing one of the pectins (80 g/kg diet) for 9 days. Erythrocyte $^{58}Fe/^{57}Fe$ ratio was determined by inductively coupled plasma mass spectrometry. None of the pectins used caused any significant reduction in the bioavailability of ferrous sulfate. Rats fed P-B showed significantly higher hematocrit, serum iron concentration, and transferrin saturation, compared to the P-C group ($P < 0.05$). Also, the group of rats fed P-B had significantly higher liver and spleen iron concentrations than all other groups except the one fed P-A. Pectins P-A and P-D slightly improved the bioavailability of ferrous sulfate compared with P-C and control. The addition of pectin B significantly increased erythrocyte incorporation of ingested ^{58}Fe, compared to the its pair-fed and pectin C groups ($P < 0.05$). Rats fed P-C showed the least effect on iron absorption and erythrocyte incorporation. The observed effects were dependent on the physicochemical properties of each pectin as determined by its MW and DE.