FINAL COMMENT

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As mentioned in practically all the papers presented in this supplement, Iron Deficiency and Iron Deficiency Anemia persist as the most important single nutrient deficiency in the world, in spite of several decades of efforts to achieve its control.

Food fortification with iron has been mandatory in a number of countries but no overall improvement has been obtained. We know now that the iron compounds used in countrywide fortification programs show low bioavailability, which is further reduced by compounds normally present in the diets.

Through the years, CELANEM has devoted a significant amount of time and effort to stimulate research on uses of Ferrochel (iron amino acid chelate, iron bis-glycinate chelate, which include formal bioavailability studies in water and in different food matrixes. These studies have consistently shown that Ferrochel is well absorbed, even in the presence of inhibitors, does not produce gastric discomfort, has low toxicity, is well tolerated, and its absorption is regulated by the iron stores of the body.

In this supplement work is presented on the chemistry of chelation, on the absorption, metabolism, regulation and toxicity of Ferrochel, and on important applications when the chelate is given as a supplement or in fortified foods, presenting further evidence of the effectiveness of the iron amino acid in the control of iron deficiency anemia.

When pharmaceutical preparations were marketed in the early 1990s (in tablets, syrups and pediatric drops) they rapidly gained recognition, confidence and support from the medical profession due to its great effectiveness in the control of iron deficiency anemia using smaller doses than with any other iron compound. The mean treatment time was reduced to 4-6 weeks. At the present time, in Central and South America and in South Africa, these preparations have gained medical recognition and have become the treatment of choice for iron deficiency anemia.

The application of iron bis- and tris-chelates in food fortification has been extensively studied and its effectiveness evaluated after short times of consumption of the fortified foods. The pioneering studies of milk fortification with low levels of iron proved to be so effective that in the State of Sao Paulo, Brazil, fortification became mandatory for state supported assistance programs for small children. At the present time, milk and dairies are fortified with Ferrochel in Argentine, Chile, Paraguay, Ecuador, Brazil, Colombia, Venezuela, Central America, Mexico, Europe, Saudi Arabia, South Africa, and Thailand and the use of Ferrochel is rapidly gaining recognition in a number of other countries.

The studies by Cornbluth, *et al* on pregnant women supplementation with Ferrochel's iron, presented in this supplement, show that 15 mg of iron from the chelate are more effective than 40 mg of iron from ferrous sulfate.

In food fortification two further examples are presented, fortification of bread and fortification of sugar. The consumption for six months of sweet rolls fortified with iron from Ferrochel resulted in a highly significant improvement in the iron status of the tested population. Studies carried out by Bovell-Benjamin, *et al,* have confirmed that even in the presence of high concentrations of phytates, the iron of Ferrochel is absorbed 4-7 times better than that of ferrous sulfate (1).

Regarding sugar fortification, the only other trial we are aware off is that of Viteri, *et al*, (2) carried out in the early 1970s and in which after 4 years of consumption of sugar fortified with NaFeEDTA, there was only a marginal improvement in the iron status of the tested populations. Furthermore, the organoleptic characteristics of the sugar were significantly altered.

In contrast, the studies by Cardoso de Paula and Fisberg presented here show a great effectiveness in improving the iron condition of the population tested, when 20 g per day of sugar fortified with low levels of iron tris-glycinate chelate (10 and 100 mg of iron per kg of sugar) were consumed. With the tris-chelate there was no detectable change in the organoleptic characteristics of the fortified sugar. Its effectiveness evaluated after only six months of sugar consumption showed highly significant improvements in the iron condition of the population tested.

It has been shown, that Ferrochel added to multivitamin preparations does not affect the stability of the vitamins. This is especially important in preparations containing vitamin A that deteriorates very rapidly in the presence of inorganic

iron compounds (3,4). As shown by Garcia-Casal and Layrisse, in this supplement, Ferrochel remains soluble at different pHs, and its bioavailability is not altered.

The characteristics and effectiveness of Ferrochel in clinical studies and field trials either presented here or previously published indicate that Ferrochel is, at the present time, the best available iron compound to use in the control of iron deficiency and iron deficiency anemia.

We consider that the information presented here will assist the public health community in gaining a better understanding of the chemical characteristics of the iron chelates and on its physiology, and stimulate its use in programs geared to a better control of iron deficiency and iron deficiency anemia in a short time.

REFERENCES

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