CARTAS AL EDITOR

Drinking water as an iron carrier in Brazil

Water is the largest component of the human body. From 60% to 70% of our weight is water. It is the solution were all nutrients are carried, interact and where metabolic processes take place. The organism keeps its balance through life. Water is available and drank by everyone and everywhere in the world. Iron, on the other hand, is also an essential nutrient with major roles in human physiology. It acts as oxygen carrier, is present in hemoglobin and myoglobin and is involved in several metabolic mechanisms. It is present in the cytochrome and many proteins of all cells, interchanging, gaining or lossing electrons.

In November 2003, the World Health Organization assembled in Geneva, a group of nutrition experts, medical and scientific specialists to address questions related to drinking water and nutrients. The proceedings of that meeting appeared at the end of 2005 (1); it pointed out the health benefits and risks of water, its content of nutrient and toxins, the contribution of drinking water to dietary intake, its minerals related to cardiovascular health, its role as fluoride carrier, etc. The World Food Program called the attention for the need to have local mass food carriers to be fortifiyed in order to really attend the iron need of many iron deficient groups in developing and underdeveloped countries (2).

Considering drinking water to be a locally and possible micronutrient vehicle we have been using it to carry iron ad supply iron to the population at low socio economic community groups. Since the earlier 90's, our group have been working on the use of drinking water as an iron carrier to control and prevent iron anemia in young children (3,4,5,6,7). Fortification of drinking water can have an important impact on the nutritional status, anemia and well being of many population groups, especially children in developing countries. Much is known concerning helpful effects of food minerals and vitamins fortification for the prevention of deficiency diseases, but and in spite of these global efforts, its benefits are not reaching all the needed people.

Iron deficiency, and consequent iron anemia, are known as a major, worldwide nutritional problem. Iron deficiency is prevalent in developing countries, mostly affecting women and children. In Brazil it is currently the most important nutritional problem. Iron anemia is present both in the less and the most developed areas of our country, often affecting 30-50% of children one to four years old in poor families. Its presence is linked to inadequate food-borne iron intake and to low bioavailability of most dietary iron. Its prevention and control are to be achieved through improved, iron well bioavailable balanced diets, iron supplements and iron fortification of locally mass consumed foods. Food fortification is currently considered as the best public nutritional preventive approach to this problem. Several experimental and community enriched food studies have been carried out with iron compounds added to many commercial products. Wheat and corn flour, cow's milk, cheese, soya products and rice have shown their carrier effectiveness. Unfortunately, these solutions have not reached most of the needy groups, mainly at underdeveloped countries and regions. They cannot bye the fortified products from developed countries. Pharmacological iron supplements supplied to children and women have also shown to be effective, but has a difficult distribution problem. The fact is that despite of these efforts and known solutions, the prevalence of iron deficiency and iron anemia are still very high and continues to grow.

Drinking water as an iron carrier has shown by our group to have a great potential to prevent and control iron deficiency and anemia. Water is available everywhere, and people drink it every day. We have shown that drinking water can be locally fortified by several bioavailable organic and inorganic iron compounds, and such fortified water can be offered daily with small effort to people at community level and at a low price, only the compound has to be bought. We first demonstrated that iron anemia is prevented in rats that drank iron-fortified water. In consequent studies at community level, we provided iron-fortified drinking water to preschool children attending daycare centers at medium and small communities. These studies lasted for six to eight months, each. Various iron compounds and parameters, such as hemoglobin levels, ferritin, transferrin receptor and ferrous sulfate, iron chelate, iron NaEDTA were used and proved the benefits of iron water fortification to improve

the blood picture of small children. It was shown that drinking water is accepted, efficient, cheaper and easily made available locally to supply iron to a need population in several communities. This fortification can be implemented using local people and community facilities. It is efficacious, effective and economically viable. It is to point out that this same iron fortified water can also be used to prepare all the family food, and also to dilute powder infant food, increasing their iron content. Besides iron, we have also been testing whether other essential nutrients, such as iodine, zinc or other micronutrients, may be supplied by drinking water.

REFERENCES

1. World Health Organization Nutrients in Drinking Water. Water Sanitation and Health. The World Health Report, Geneva, WHO, 2005.
2. World Food Program. Micronutrient: WFP experiences and ways forward. Food Nutr Bull 2006;27:67-75.
3. Dutra-de-Oliveira JE, Ferreira JB, Vasconcellos VP, Marchini JS. Drinking water as an iron carrier to control anemia in preschool children in a day-care center. J Am Coll Nutr 1994;13:198-202.
4. Dutra-de-Oliveira JE, Scheid MMA, Desai ID, Marchini S. Iron fortification of domestic drinking water to prevent anemia among low socioeconomic families in Brazil. Int J Food Sci Nutr 1996;47:213-219.
5. Almeida CAN, Dutra-de-Oliveira JE, Crott GC, Cantolini A, Ricco RG, Del Ciampo LA, Baptista MEC. Effect of fortification of drinking water with iron plus ascorbic acid or with ascorbic acid alone on hemoglobin values and anthropometric indicators in preschool children in day-care centers in Southeast Brazil. Food Nutr Bull 2005;26:259-265.
6. Beinner MA, Lamounier JA, Tomaz C. Effect of iron-fortified drinking water of daycare facilities on the hemoglobin status of young children. J Am Coll Nutr 2005;24:107-114.
7. Dutra-de-Oliveira JE, Marchini JS, Desai I. Fortification of drinking water with iron: a new strategy for combating iron deficiency in Brazil. Am J Clin Nutr 1996;63:612-614.

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