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Iron Fortification: Overcoming Technical and Practical Barriers

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Iron fortification of foods is often referred to as the best long-term strategy to combat iron deficiency. It is, however, much more complicated than often assumed and many current iron fortification programs might not be effective. While the provision of extra dietary iron in food vehicles such as fish sauce, soy sauce, sugar, curry powder and commercial infant foods has been demonstrated to improve iron status, the efficacy of salt and corn flour fortification has not been convincingly demonstrated, and the efficacy of wheat flour and rice fortification has never been demonstrated. Iron is the most difficult mineral to add to foods and to ensure adequate absorption. Soluble iron compounds of high relative bioavailability such as ferrous sulfate often cause unacceptable sensory changes in the food vehicle and are replaced by organoleptically inert elemental iron powders. These powders are often collectively referred to as ‘reduced iron ‘ and are widely used to fortify cereal flours. They are manufactured, however, by five different processes (H-reduction, CO-reduction, water atomization, carbonyl or electrolytic) and can differ widely in absorption. Based on current evidence, only electrolytic iron has been demonstrated to be an effective fortificant, although electrolytic iron is at best only about half as well absorbed as ferrous sulfate. Ferrous fumarate and encapsulated ferrous sulfate are alternatives.

Another major problem, which could limit the success of fortification programs particularly in developing countries, is the high phytic acid content of the diet in general and of the cereal fortification vehicles themselves. Phytic acid is a potent inhibitor of iron absorption which can be counteracted by the simultaneous consumption of ascorbic acid or EDTA. Ascorbic acid has been demonstrated to increase the absorption of all iron compounds from cereal foods but is highly susceptible to processing and storage losses. EDTA is more stable but has so far been demonstrated to increase the absorption of soluble iron compounds only. Phytic acid degradation is an option in weaning cereals. It is noteworthy that successful iron fortification programs with infant foods have also added ascorbic acid to the food product and that NaFeEDTA is being used in soy sauce, fish sauce and sugar fortification. Iron fortification of salt and cereal products is technically more difficult and still remains to be satisfactorily resolved.