

# The Micronutrient Initiative



## *Activity Highlight*

### **DOUBLE FORTIFICATION OF SALT**

#### ***Announcing A Major Breakthrough...***

After five years of research and testing at the University of Toronto and field studies in Ghana, Bangladesh and Guatemala, the Micronutrient Initiative is pleased to announce the successful development of a stable iron and iodine fortified salt that is acceptable to consumers and shown to be efficacious in maintaining iron status in women and children among populations with high prevalence of iron deficiency anemia. Field studies indicate that foods prepared with double fortified salt are as accepted as those made with local salt.

#### **Why double fortified salt?**

One of the preventable tragedies in the world today is micronutrient malnutrition. Affecting more than one third of the world's population, micronutrient malnutrition results from the deficiency of minute quantities of vitamins and minerals in diet. Two key micronutrients: iron and iodine are present in inadequate quantities in the diet of more than a billion people in developing countries.

In the bid to reach micronutrients to large undernourished and impoverished populations around the world, the availability of a suitable food vehicle has always posed a challenge. In most countries there are only a handful of staple foods: cereals, oils, sugar and salt that are widely consumed and available for central processing to be fortified with nutrients. For this very reason the only true example of a food that is globally fortified is salt. Within a span of a decade a major proportion of the world's salt has been iodized. In many remote parts of the world salt is the only food that comes in from outside. All other foods are locally grown and consumed. Salt was therefore chosen as a suitable vehicle for double fortification with both iodine and iron considering the global success achieved with salt iodization.

The idea of adding both iron and iodine to salt is not a new one. The challenge has been to prevent the loss of nutrients when these two micronutrients are combined and added to salt. Moreover, the varying qualities of salt consumed and packaging and storage conditions enhance the challenge.

#### ***How was double fortified salt produced?***

Double fortified salt (DFS) is high-purity, dry table salt fortified with ferrous fumarate and encapsulated potassium iodide. The iodate is encapsulated with dextrin using a spray-drying technique. Encapsulated fumarate is commercially available. The coating prevents the iodine and iron from interacting with one another or coming into contact with moisture in the salt. The premix containing iron and iodine is then mixed into salt in dry condition at a specified rate. Water resistant packaging is critical to ensure the stability of the nutrients. MI is working with the University of Toronto to simplify the technology and make it more robust to work with inferior quality salts and packaging. The salt has passed tests on at least four counts:

**Stability:** Over one year of storage under different temperature and humidity conditions, the salt has been shown to be stable with a very mild coloration that has not been found objectionable in consumer acceptability tests.

**Consumer Acceptability:** A study designed to test the acceptability of the salt in Bangladeshi, Ghanaian and Guatemalan foods concluded that foods prepared with the salt were as acceptable as those made with local and iodized salts. The only exceptions were certain vegetable dishes such as those made with plantain which darkened when cooked with the double fortified salt. Encapsulation of the ferrous fumarate is expected to overcome this problem.

**Efficacy:** A double-blind placebo-controlled study was conducted in Ghana to test the efficacy of the double fortified salt in preventing anemia and IDD in mildly anemic women and their families. The use of DFS proved to be as efficacious as a weekly iron supplement in preventing anemia in women. DFS also prevented and alleviated anemia in children and iodine deficiency in both women and children.

**Production feasibility:** Premix production tests in Guelph, Canada have shown that centralized premix production can be organized in most countries and then distributed to individual salt producers. The success of this test has prompted efforts to simplify technology, to allow for its transfer and use in developing countries. The goal is to simplify the technology so as to enable centralized facilities in developing countries to manufacture a premix which could then be distributed to local salt suppliers to be mixed with local salt. This phase is currently in progress and once complete, the technology will be applied on a commercial scale.

**Next steps:** MI is prepared to offer to governments and salt industries around the world the following assistance in a phased manner.

- ❖ An assessment of salt production and packaging to determine the feasibility of double fortification and recommend additional processing and investment to enable fortification
- ❖ Provision of limited quantities of premix from the Guelph Food Technology Centre facility to enable pilot production testing and stability studies.
- ❖ Technical information to enable local production of premix
- ❖ Production and quality assurance guidelines

***Double fortified salt...  
One intervention  
controlling two problems***

#### **ABOUT THE MICRONUTRIENT INITIATIVE**

The Micronutrient Initiative (MI) is an international development agency working to control micronutrient malnutrition throughout the world. MI is based in Ottawa, Canada and operates as a secretariat within the International Development Research Centre. MI is governed by a steering committee comprised of the Canadian International Development Agency (CIDA), the International Development Research Centre (IDRC), the United Nations Children's Fund (UNICEF), the US Agency for International Development (USAID) and the World Bank.

MI supports nutrition programs in over 75 countries, working with aid agencies, governments, non-governmental organizations, research institutions, and the food industry, working together to enhance the world's population's access to micronutrient-rich foods and to improve the quality of food fortification and dietary supplementation programs and to enhance their impact on the health and well-being of vulnerable populations.

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#### ***What Would Double Fortified Salt Cost?***

The cost of adding iron and encapsulants would be approximately 2-3 cents per kg of salt. When this is applied to a well-packaged refined salt that retails at anywhere between 20-50 cents/kg, the additional cost would be marginal. Applied to unrefined salt in low-quality packaging that retails at 5-7 cents/kg, the minimum additional processing and packaging cost would be 10-15 cents/kg over and above fortification cost. However this would still imply anywhere in the range of 15-75 cents per person per year (depending upon the extent of additional processing and packaging required) - a bargain that delivers iron and iodine to large populations on a continuous, self-sustaining basis.