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Flour fortification with vital vitamins and minerals Micronutrient deficiencies & the consequences

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Chronic malnutrition endangers millions of lives throughout the world. A lack of essential vitamins and minerals causes health conditions typically manifesting as impaired energy, stunted growth, damage to the nervous system and heightened susceptibility to infection.

Vitamins, minerals and trace elements serve to maintain important bodily functions and act as biocatalysts in almost all of the body's metabolic processes.

Vitamins are involved in breaking down and converting carbohydrates, protein, fat and minerals. Minerals control the transmittal of nerve impulses and muscle activity. But although vitamins, minerals and trace elements are so important, the body is unable to synthesize and store them in sufficient quantities. People must therefore rely on their daily food to supply these essential micronutrients.

Since wheat, maize and rice flour are staple foods almost everywhere in the world, an ideal way to prevent malnutrition is to fortify flours with micronutrients. Baked goods and pasta products are firmly anchored in the traditional diet of almost every country.

The success of flour fortification

Contrasted with the great benefit to a nation's health and economy that can be gained by tackling the issue of malnutrition, flour fortification is a low-cost remedy.

According to Emory, Rollins School of Public Health, it costs US\$0.50 per person and year to fortify flour. Depending on the type of fortification and the volumes required, the costs can be reduced to US\$0.10.

Since modern mills are generally well equipped for flour fortification, the only costs incurred in the further course of the fortification process are for the purchase of premixes at a price of a few US dollars per tonne of flour.

One success, documented by the Food Fortification Initiative (FFI), shows that fortified wheat flour has led to a reduction in the number of newborns with neural tube defects. (see Figure 1).

Increasing numbers of countries therefore mandate flour fortification.

Depending on local eating habits, the fortification of wheat, maize or rice flour is decreed. The FFI reports in May 2014 that

79 countries require flour to be fortified with at least iron and/or folic acid.

Tailored to countries and customers - ELCOvit premixes

The requirements are as varied as the countries and cultures. The mix of additives must be adjusted to meet the exact needs of the country.

The first step is to identify what nutrient deficiencies exist, how widespread they are, how high the per capita consumption of bakery products and pasta is, and how finely or coarsely ground the flour will be when the premix is added.

Whereas, for example, minerals make up 1.7 percent of whole wheat, this share falls to 0.5 percent in fine white flour. Figures can be extrapolated to the various grinding degrees. Depending on how finely the flour is ground, greater or smaller quantities of nutrients are lost.

For decades Mühlenchemie has cooperated closely with mills and knows about their particular circumstances on site.

ELCOvit premixes are customised mixes of micronutrients, chosen to meet the exact requirements of the specific country. The combination of micronutrients reflects regional deficits, eating habits and the availability of food. The bioavailability of the micronutrients is also taken into consideration, to ensure that the fortified flour has the desired effect.

Selecting the raw materials for the perfect premix

Apart from cooperating with the mill, Mühlenchemie has the advantage of access to the group's trials laboratory, where the analysis parameters as well as substances' use in the finished product can be tested.

The selection of raw materials is of prime importance in order to create premixes that can be easily and reliably dosed in a range of climatic conditions.

At the Sten-Wywiol Gruppe Technology Centre a variety of raw materials are tested for suitability and stability.

Sieve or particle size analysis is a basic test procedure. It is an important quality criterion in selecting the raw materials because only the correct distribution of particle sizes will pre-

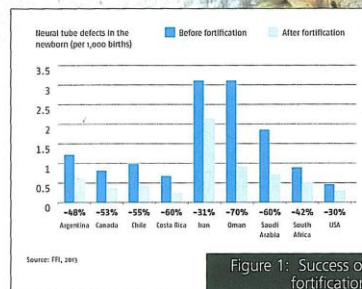


Figure 1: Success of fortification

vent the additive and the flour from demixing.

Because many vitamins and minerals are sensitive to UV light, oxygen, heat or humidity, the raw materials are tested for stability and flowability, in order to select the best ingredients.

Vitamin A, for example, is very easily oxidised and is therefore used in the stable form ELCOvit A 250.

This form of vitamin A was developed in cooperation with BASF using their beadlet technology; it is dried in an especially gentle process and stabilised with an effective antioxidation system. The special granulation which makes it suitable for the milling industry was developed in cooperation with Mühlenchemie. Compared with other products, it is far less likely to form lumps.

Testing the finished products

Apart from selecting the raw materials, it is necessary to investigate how the premixes behave in flour and the finished products. Are there any undesirable colour changes, by-products, discernible tastes or such like? Mühlenchemie has a wide range of technical resources which can be used to test these matters.

In the trial bakery, for example, tests reveal whether an iron preparation leads to black specks on the bread's crust.

The impact of colouring vitamins on pasta can be examined in the pilot plant where pasta can be produced using industrial methods. Does riboflavin turn the water in which noodles are boiled yellow, or does it colour rice?

These and many other issues can be examined and the results used to produce the optimum premixes.

Apart from standard premixes that match



statutory requirements, customers may choose from special mixes which can be integrated into existing grinding and blending processes.

Precision feeder EMCetec GLD 87 - Easy to use, sturdy dosing devices are part of the full service package of skilled support that Mühlenchemie offers mills to assist the process of achieving reliable flour fortification. The precision feeder can be integrated into any existing grinding or flour processing system.

Quick test for iron, zinc and vitamin A - Portable quick tests complete the range of methods to ensure that flour fortification schemes are efficient and sustainable.

Here Mühlenchemie cooperates with the

established manufacturer BioAnalyt, which develops innovative measuring instruments for the rapid quality analysis of vitamins, minerals and trace elements.

The iCheckTM test kits are easy to use and reliably show the iron, zinc and vitamin A content of a substance within a few minutes.

Dedicated partner with know-how

Close cooperation between Mühlenchemie, the Food Fortification Initiative, Hellen Keller, the Spina Bifida Society and other organisations ensures that training and workshops are available to the

employees of mills or state organisations throughout the world.

Part of the mission is to impart knowledge of the options for flour fortification and why it is necessary, besides teaching the correct handling and storage of ELCOvit premixes and, obviously, how to use the test kits for analysis.

Applications engineers visit the local millers to offer all the advice and support they want when putting their flour fortification programmes in place.

MORE INFORMATION:

Website: www.muehlenchemie.de