This .pdf file is made from a PowerPoint® presentation given at the 2003 INACG Symposium: Integrating Programs to Move Iron Deficiency and Anemia Control Forward, Marrakech, Morocco, 6 February 2003.

"The 2003 INACG Symposium was co-hosted by INACG and the Local Organizing Committee of the Moroccan Ministry of Health and representatives of the United Nations technical Agencies, the private sector, multilateral agencies, and nongovernmental organizations in Morocco. Funding was provided from the Micronutrient Global Leadership project of the Office of Health, Infectious Disease and Nutrition Bureau for Global Health, U.S. Agency for International Development. The International Life Sciences Institute Research foundation's Human Nutrition Institute serves as the INACG Secretariat.

COMPLEMENTARTY FOOD SUPPLEMENTS:

NEW APPROACHES TO ACHIEVE MICRONUTRIENT ADEQUACY IN COMPLEMENTARY FEEDING

- André Briend
- Boussingault meeting
- Paris 9-10 July 2002

Background

Micro nutrient deficiencies are common during the complementary feeding period. Currently proposed solutions:

- Education with optimal use of local food
- Use of centrally processed cereal based fortified complementary foods (ex: Corn Soy Blend).

These two approaches have limitations

Towards “Complementary Food Supplements” (CFS)

- New food based approaches are being proposed based on adding micro nutrients supplements to complementary food by either:

-Tablets

-Sprinkles

-Spreads

All these approaches aim at reducing the cost of a balanced diet during the complementary feeding period compared to processed or local foods

All proposed CFS

- Use products with high levels of vitamins and minerals packed in a small food volume
- At the border between food and pharmaceutical technology
- Can only be produced with at least some input from the industry

Objectives of the meeting

- **Review technological aspects of CFS development**
- **No attempt was made to choose between the possible approaches**

These approaches are at the development / field testing stage

Optimal solution may vary according to situation: cost constraints, distribution channels etc...

Tablets CFS

Two models tested /being tested. Both are dispersible tablets with taste of micro nutrients hidden

- IRIS / UNICEF Tablet: large tablets with Fe, Zn, Cu and I + 10 vitamins

- WHO dispersible tablets: Fe + Zn + folic acid

Tablets rely on well known pharmaceutical technology.

Questions: will they be perceived by families as a medicine, limiting their acceptability ?

Sprinkles CFS

Can be regarded as “uncompressed tablets”

Technology is well known. Inclusion of multiple micro nutrients possible.

Shown to be effective in treating anemia.

Question: how will they be perceived by families, as they do not look like a usual food ?

Supplefer

Sprinkles

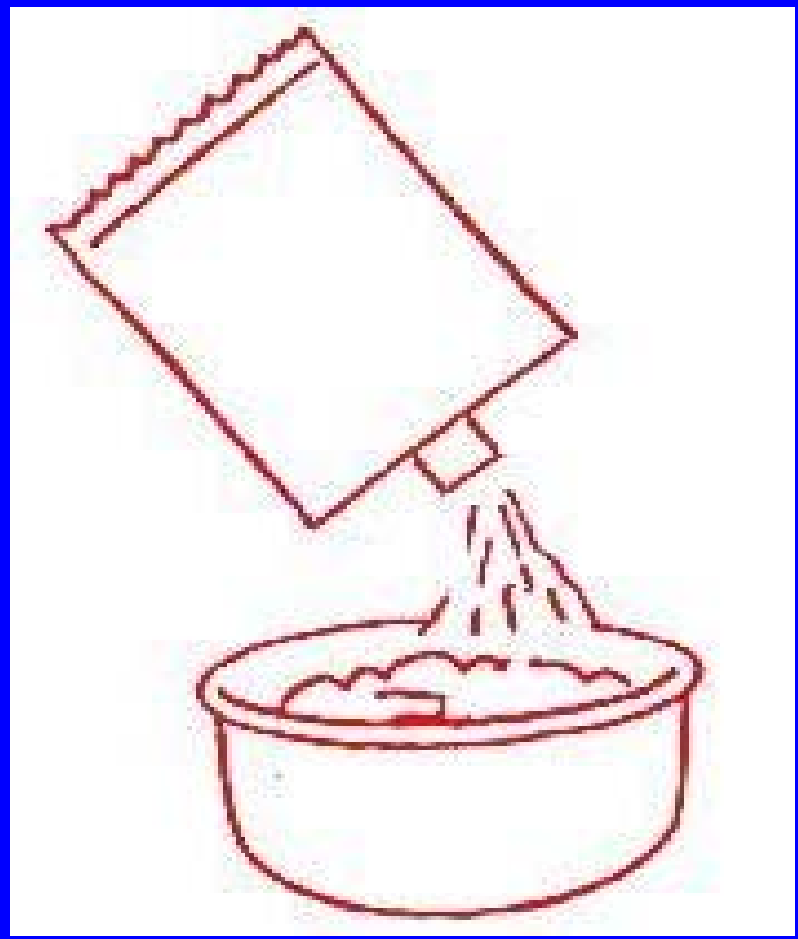
Spread CFS

Spreads can be reagarded as very large multinutrient tablets with vegetable fat + powdered ingredients as “filler agent”

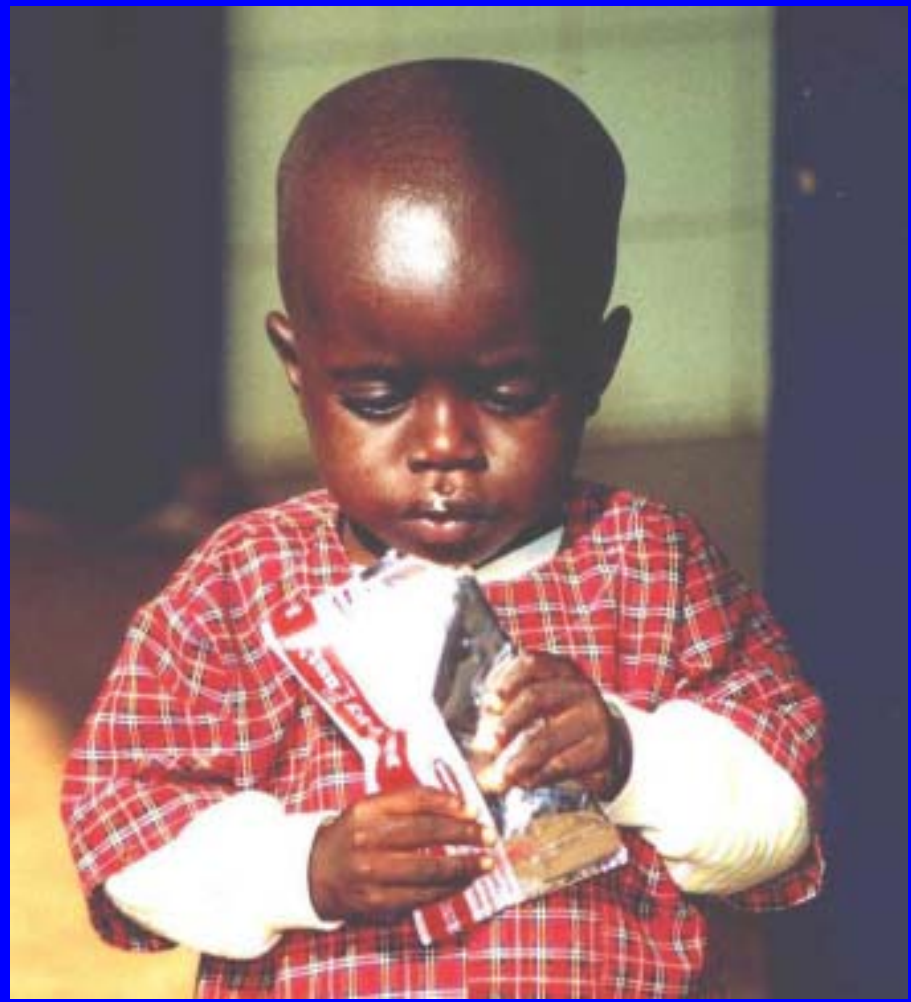
Can be prepared with peanut butter

Or with other ingredients, such as cocoa powder + added fat

Spreads can be mixed with food...



… or eaten directly as it is, as a snack, by the child



How the idea of using a spread for infant feeding came in ?

- Failed attempts to develop a bar, instead of a liquid feed (WHO F100), to feed severely malnourished children
- When high fat WHO F100 formula was used, the bar always melted in high temperature.
- Decision was taken to make a spread instead of a bar and to put it into a sachet

Spreads CFS

Simple technology

Can be used to produce highly fortified foods with a cost in relation to the nutrient content (iron, zinc, but also K, Mg, P, Cu, … and all vitamins) lower than most locally available animal foods

Questions:

- **optimal balance between macro and micro nutrients ?**
- **acceptability in young well nourished children ??**

Conclusions of the meeting

- CFS represent a promising approach for preventing micro nutrient deficiencies in children
- Still many knowledge gaps before large scale prevention programs can be developed
- Tablets, sprinkles: known technologies, but potential for prevention to be tested
- Spreads: new technology, development work needed to get a spread optimized for prevention

Complementary Food Supplements to Achieve Micronutrient Adequacy in Infants and Young Children

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Paper presented at the INAGC meeting in Marrakech (Morocco) on February 6th, 2003

This presentation will be about complementary food supplements. It is based on the proceedings of a meeting, organized jointly by USAID and INSERM, with WHO support, which took place in Paris, in July 2002 on new approaches to achieve nutritional adequacy during the complementary feeding period. This meeting was named after Boussingault, the first nutritionist who had the idea of artificially adding a nutrient to a food to prevent a nutritional deficiency. Boussingault advised to add iodine to salt to prevent goiter, early in the XIXth century. The report of this meeting will be published in the next issue of the Journal of Pediatric Gastroenterology and Nutrition, in March.

Micro nutrient deficiencies are common during the complementary feeding period. Currently proposed solutions are either nutritional education relying on optimal use of local food or the use of centrally processed fortified complementary foods such as for instance: corn soy blends, or Unimix or Actamine in Morocco or similar blended flours.
These two approaches have limitations. Micronutrient requirements, especially for iron but also for zinc, calcium, retinol and riboflavin are so high during the complementary feeding period, that they are often difficult or impossible to provide without using large amounts of animal source foods, especially liver, which are quite expensive and not always easily available. For instance, in most countries, one often needs to buy the whole chicken to give its nutritious liver to a child. Centrally processed fortified complementary foods are also often too expensive for the poor and in many countries do not reach the most vulnerable part of the population unless they are heavily subsidized.

To try to move forwards, new food based approaches are being proposed based on adding micro nutrients supplements to local foods. These complementary food supplements may be either:

-Tablets
-Sprinkles
-Spreads

All these approaches aim at reducing the cost of a balanced diet during the complementary feeding period compared to industrially processed complementary foods or even to local foods. The idea is to provide macro nutrients from the local diet, always less expensive than any fortified foods, and to provide the missing nutrients under an inexpensive chemical form. This approach requires no major change of traditional complementary feeding patterns, which should make their adoption by poor families relatively easy. In terms of cost, these products may be self sustainable, since they make possible the design of balanced complementary feeding diets at a lower cost than with locally available nutrient dense foods.

All complementary food supplements use high levels of vitamins and minerals packed in a small volume. This may lead to complex chemical interactions between different ingredients, and especially between vitamins and minerals contained in these supplements. As a result, these products are at the border between food and pharmaceutical technologies. Also, all these supplements can only be produced with some input from the industry.

The objective of this Paris meeting was to review the technological aspects of complementary food supplements bringing together specialists from the food and the pharmaceutical industries. No attempt was made to choose between these possible approaches: none of these three approaches is yet ready for large scale interventions: spreads are still at the development stage and tablets and sprinkles have been used so far in small or medium scale pilot projects. Also, the optimal solution may vary according to the local conditions and in particular according to cultural factors, cost constraints and distribution channels.

Tablets

Two models of tablets suitable for infants have been or are being tested as complementary food supplements. Both are dispersible tablets with the taste of micro nutrients hidden with a flavoring agent. The first was used in the IRIS project, in 4 countries, Peru, Indonesia, Vietnam and South Africa. This is a large chewable tablet containing iron, zinc, copper, iodine and 10 different vitamins. The second tablet contains zinc, iron and folic acid. It is designed to be dissolved in about 30 seconds in a teaspoon of water and then to be swallowed as a syrup by the child. It is currently used in a WHO supplementation trial in India, Nepal and Zanzibar. Since the meeting took place, I heard that another chewable multivitamin and mineral tablet produced in Denmark had been tested in Benin, in children. \

Tablets rely on well known pharmaceutical technology and they are at an advanced stage of development. These tablets can be produced in most developing countries. The IRIS tablet was made in Peru. The iron and zinc WHO tablet was made in France, but the technology is now being transferred to a pharmaceutical company in Bangladesh. A major question, however, is whether these tablets will be perceived as food supplements, which can be used by families on a day to day basis, and not as medicines to be given only when the child is not growing well.

Sprinkles

Sprinkles were developed by Stan Zlotkin, from the University of Toronto, with support from the Heinz company. They can be regarded as “uncompressed tablets” prepared with encapsulated iron and packaged in a sachet for a single dose. It also relies on a well known technology which could be transferred to a developing country. Inclusion of multiple micro nutrients is also possible by this technique. Sprinkles are added to the food, after cooking, before it is given to the child, and they are made in such a way that the color of the food and its taste are not changed by the addition of sprinkles. Sprinkles have been shown to be effective in treating children with anemia in a field trial in Ghana. Their acceptability has been tested in different communities in pilot projects and seems to be good. Their use on a larger scale in a preventive strategy still raise the same query as for tablets: how will sprinkles be perceived by families ? Will they be

perceived as a food to be used on a day to day basis for several months ? Or will their sustained use require permanent educational input ?

Spreads

Spreads are made of vegetable fat and powdered ingredients. They can be regarded as very large multinutrient tablets using fat and other ingredients as “filler agents”. Spreads can be prepared with peanut butter mixed with dried skimmed milk and vegetable fat. In this case, the spread looks like and taste like sweet peanut butter. Spreads can also be prepared without peanut butter but with cocoa powder and added fat instead. In this case, the spread looks like, and almost taste like, the famous Nutella. Children can eat the spread mixed with local foods or if they are old enough they can eat the spread as it is, as a snack.

Spreads are not traditionally used for infant feeding. The idea came after failed attempts to develop a bar, instead of a liquid feed prepared from powdered milk (the WHO F100 rehabilitation diet), to feed severely malnourished children during the recovery phase. Bars formulated along WHO nutritional recommendations for the severely malnourished child had a high fat content and they always melted at high temperature, that is above 37°C. Bars with a higher melting point tasted like a candle. To avoid this problem, it was decided to make a spread instead of a bar and to put this spread into a sachet. Acceptability of the spread was excellent, despite high fortification levels with unpalatable micro nutrients, such as potassium, magnesium, soluble forms of zinc and iron. It was then attempted to make an even more concentrated version which could be used as complementary food supplement.

Spreads preparation is based on a simple technology: they are prepared by mixing ingredients at room temperature. The therapeutic version of the spread designed for nutritional rehabilitation is now being produced on a large scale in Malawi by a local company without apparently any difficulty. This technology can be used to produce foods with a cost in relation to nutrient content, namely iron, zinc, retinol, water soluble vitamins, lower than most locally available animal foods, and in particular at a cost lower than that of liver. Formulation of a spread used as a supplement is yet to be optimized, in particular the optimal ratio between the spread itself which provides a useful additional energy and the micro nutrients needs to be determined. Also, its acceptability needs to be assessed in infants in different age groups and in different cultures.

Conclusions

In conclusion, complementary food supplements represent a promising approach for preventing micro nutrient deficiencies in children. Still many knowledge gaps remain before large scale prevention programs can be developed. The potential of tablets and sprinkles for prevention needs to be assessed in large scale projects. Spreads represent a promising new technology, but it is still under development, and their formulation has still to be optimized for prevention. Whether spreads will be perceived by families as a food that a child can eat on a regular basis remains an open question.