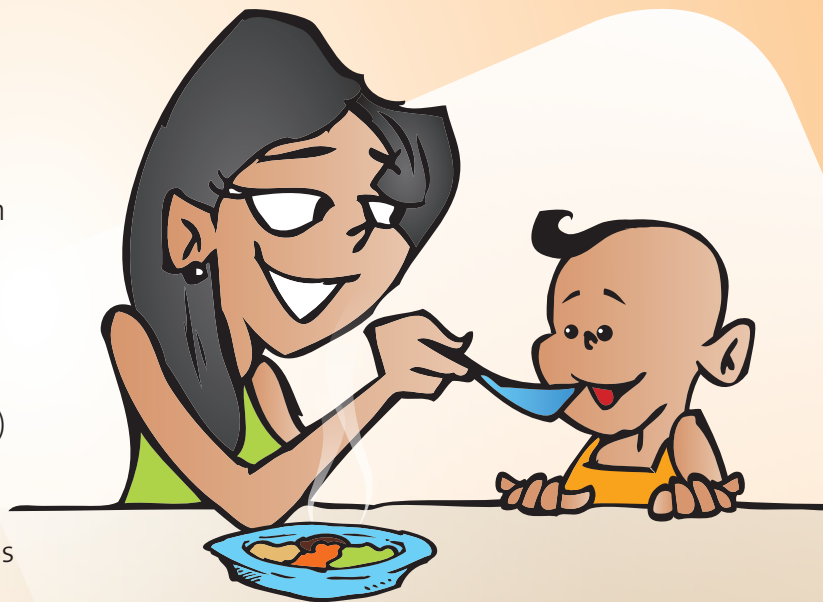


How to prevent anemia and micro-nutrient deficiencies in childhood

Food fortification with micronutrients in powder could be an alternative

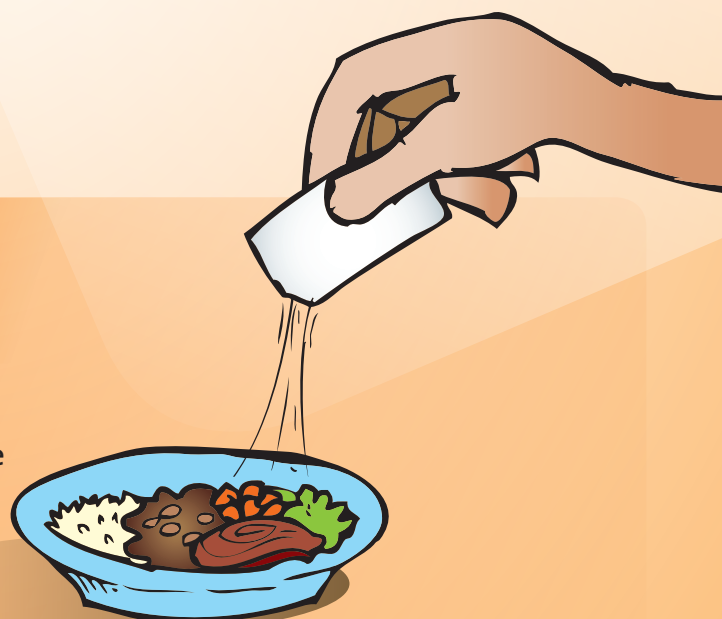
In recent decades, numerous strategies for the prevention and control of anemia and iron deficiency in childhood have been adopted by different countries, albeit without great success. Recently, the World Health Organization (WHO) suggested the use of sachets of micronutrients in powder for addition in child feeding, integrated with basic healthcare actions and adoption of a healthy diet.

Based on this recommendation, four Brazilian cities – Goiânia (GO), Olinda (PE), Porto Alegre (RS) and Rio Branco (AC) were involved in the Brazilian Study for Home Fortification of Complementary Feeding (ENFAC), which assessed the effectiveness of the micronutrient sachet, its adherence by mothers and acceptability among infants aged 6-8 months attended at basic health units, the target population of the study. This newsletter presents the main results of the ENFAC study.



Advantages of micronutrient sachet

- Prevents iron deficiency and anemia;
- Contains other vitamins and minerals to enhance the nutritional value of the food;
- Easy to use;
- Does not alter the flavor, color or smell of the food;
- Does not stain teeth or cause gastric irritation.



editorial

The Coordination Team of ENFAC is proud to present this newsletter reporting its main results. This study involved infants aged 6-15 months, resident in four Brazilian cities (Rio Branco, Olinda, Goiânia and Porto Alegre) attended at Basic Health Units (UBS). The effectiveness of this strategy was assessed by comparing the nutritional status of the children in the intervention group, who received sachets of micronutrients (vitamins and minerals in powder), versus children from the control group, who received routine care under the public health system, i.e. without the use of the sachet.

In addition to guidance on how to use the multiple micronutrients in powder, mothers, fathers and caregivers of the children in the intervention group were given information on healthy eating practices, based on the Dietary Guidelines for Children under the Age of Two, published by the Ministry of Health of Brazil.

The children who participated in the home fortification of infant feeding exhibited a superior health and nutritional profile than their control counterparts. The boys and girls that received the sachets had a lower prevalence of anemia and of iron and vitamin A deficiencies. The level of adherence and acceptability of home fortification of infant feeding by caregivers was good by the children upon addition to semi-solid foods, such as fruit and purée mash.

A qualitative assessment of the perceptions of mothers and healthcare professionals regarding the use of the sachets was also carried out. The results revealed that the quality of the information received by mothers can enhance adherence to the fortification.

Enjoyable reading!

Coordination Team of ENFAC

What is anemia?

A condition in which the concentration of hemoglobin in the blood is below normal.

And nutritional anemia?

Deficiency in one or more essential nutrients for the body – iron, folic acid, copper, vitamins A and B12 – can cause anemia. The WHO estimates that around 50% of cases of childhood anemia are due to iron deficiency.

In Brazil, around **50%** of all children under the age of **five** have anemia

The highest incidence of anemia cases occurs in children between **six months** and **two years** de idade

Main consequences of iron deficiency

- Stunted growth and reduced psychomotor development, affecting learning capacity;
- Impaired immune system, increasing susceptibility to infections;
- Risk of vitamin A deficiency

Main causes of iron deficiency in childhood

- Premature clamping of umbilical cord;
- Low iron stores at birth caused by, among other factors, iron deficiency in the mother;
- Short duration of Exclusive Breastfeeding (under 6 months of life);
- Consumption of cow's milk before six months of age;
- Not introducing healthy complementary feeding from 6 months of age (mashed fruits and vegetables with grains, beans, eggs and meat);
- Low intake of foods containing iron or that facilitate iron absorption (e.g.: sources of vitamin C such as citric fruits and foods rich in animal-derived protein);
- High intake at main meals – lunch and dinner – of foods with factors that inhibit iron absorption (e.g.: milk and dairy products, coffee and black tea);
- Chronic loss of iron due to infections or illnesses associated with blood loss.

How was the study performed?

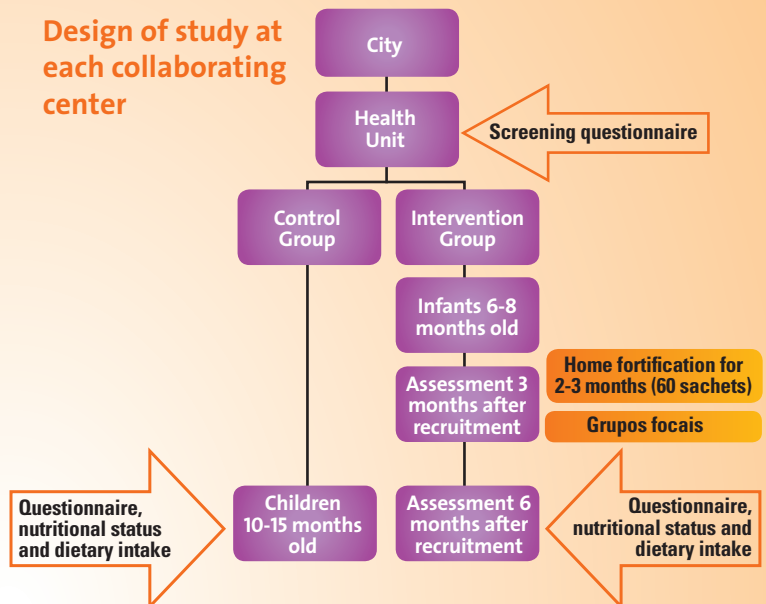


Data collection for the study “Effectiveness of home fortification with vitamins and minerals in the prevention of iron deficiency and anemia among infants under one year of age: a multicenter study in Brazilian cities” took place between June 2012 and July 2013 at basic health units in the cities of Rio Branco (AC), Olinda (PE), Goiânia (GO) and Porto Alegre (RS). In order to assess the effectiveness of the micronutrient sachet, a “multicenter pragmatic controlled trial” study design was adopted, allowing observation of the strategy in practice.

Control Group + Intervention Group

The study compared two groups: **control**, comprising 521 children aged 10-15 months that received routine pediatric care from basic health units, and **intervention**, with 462 infants aged 6-8 months. The intervention group was also treated by the public health system but was given the sachets of micronutrients (vitamins and minerals) in powder for addition to their usual food. The comparison between the two groups was performed when the children from the intervention group reached the age of 10-15 months.

Design of study at each collaborating center



Concomitant with the sachets of micronutrients, the caregivers of the children from the intervention group received guidance on healthy eating practices based on the Dietary Guidelines for Children Under the Age of Two by the Ministry of Health of Brazil.

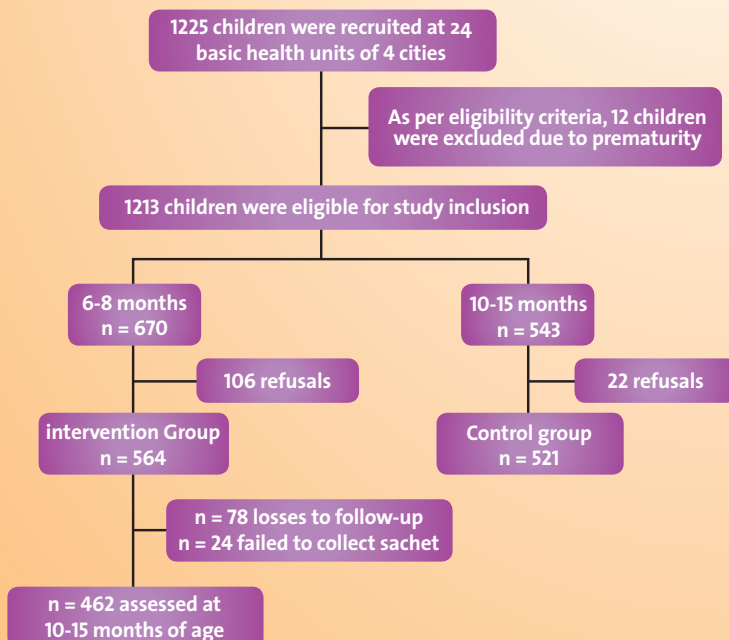
Basic health care professionals were trained to provide information to mothers on adequate complementary feeding and use of the sachets.

Characteristics of study sample

	Control (n=521)	Intervention (n=462)	P-value
Female gender, n (%)	258 (49,50)	234 (50,70)	0,724
Age in months, mean (sd)	13.51 (1.01)	12.68 (1.10)	< 0.001
Weight at birth (g), mean (sd)	3241.04 (493.20)	3280.54 (492.49)	0,213
Race/ethnicity, n (%)			0,685
Mulatto	386 (74.40)	351 (76.80)	
White	86 (16.50)	67 (14.70)	
Black	32 (6.20)	29 (6.40)	
Maternal Schooling < 9 years, n (%)	204 (40.10)	153 (33.80)	0.039

sd = standard deviation

Study flowchart



Composition of sachet

ENFAC used a sachet containing 15 micronutrients in powder to be added daily to semi-solid foods for a period of 2-3 months. The quantities of these nutrients were in accordance with WHO recommendations.

Micronutrient	Quantity
Iron	10 mg
Zinc	4,1 mg
Folic acid	150 µg
Vitamin A	400 µg RE
Vitamin C	30 mg
Vitamin D	5 µg
Vitamin E	5 mg TE
Vitamin B1	0,5 mg
Vitamin B2	0,5 mg
Vitamin B6	0,5 mg
Vitamin B12	0,9 µg
Niacin	6 mg
Copper	0,56 mg
Iodine	90 µg
Selenium	17 µg

Study Results:

The prevalence of anemia was lower in the children who used the sachet of micronutrients

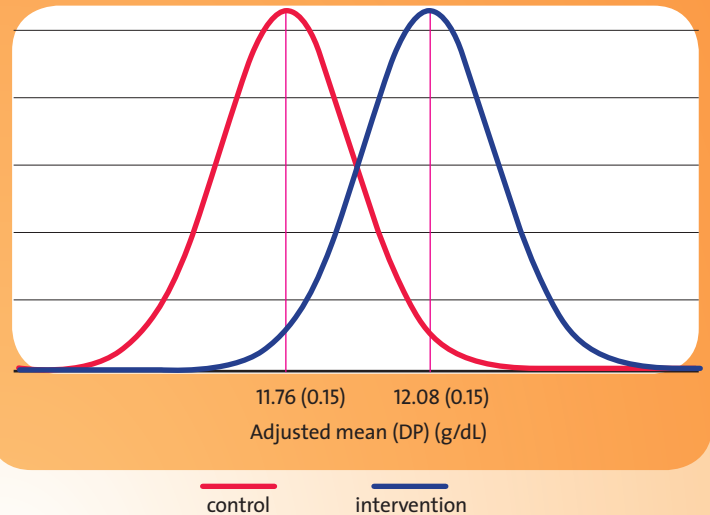
The numbers

Anemia was **38% lower** in the children who received fortification

In the children who used the sachet of micronutrients, the prevalence of vitamin A deficiency was **55% lower**

Iron deficiency in the intervention group was **20% lower** than in the control group

Distribution (normalized) of adjusted Hb values



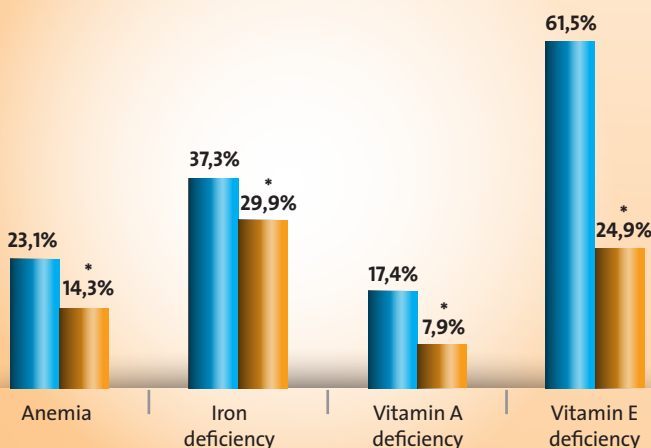
Distribution of adjusted blood hemoglobin (Hb) values in a multi-level model by basic health unit, city, child age and maternal schooling.

The intervention group is skewed to the right on the distribution of Hb values compared to the control group, with an increase of 0.32g/dL in the adjusted mean.

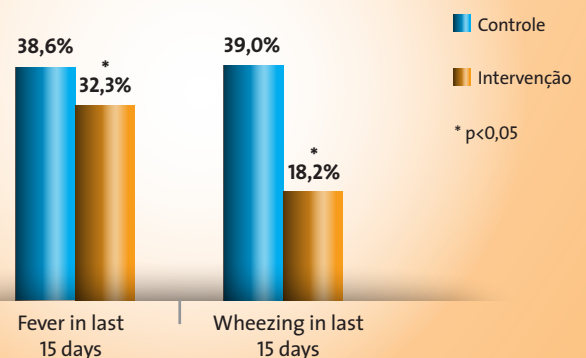
Better health profile

A better health profile was observed in children from the **intervention group**, who had lower frequencies of fever and wheezing in the last 15 days. Vitamin E deficiency was 60% lower, suggesting good adherence to the use of the sachet together with a range of different foods.

Prevalence of anemia, iron deficiency, vitamin A deficiency and vitamin E deficiency by control and intervention groups



Prevalence of fever and wheezing in last 15 days by control and intervention groups



* p<0,05

Use of micronutrient sachets: adherence, acceptability and side-effects

Around **96%** of the children adhered to the strategy of fortification of complementary feeding.

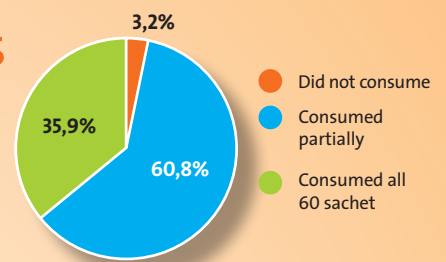
Approximately **72%** of mothers/ caregivers reported that acceptability of sachets by the child was good or excellent.

The main reasons for leftover sachets were: rejection by the child, mother/caregivers forgot to offer the sachet or felt it was unnecessary, difficulty in introducing complementary feeding, presence of side-effects and medical indication.

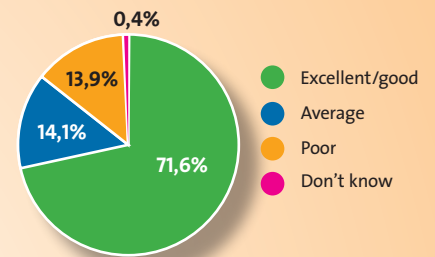
Collateral effects were reported in **12,5%** of the children.

Among reported collateral effects, gastrointestinal alterations (hardening of stool or diarrhea) were the most frequent, which tend to occur during this phase of life.

Adherence to consumption of sachets after 6 months of intervention



Acceptability of sachets by children who consumed them, after 6 months of intervention



Focus Groups

To assess the perception of parents and health professionals on the strategy of home fortification of infant feeding, 20 Focus Groups were held in the four cities in which the study was conducted, attended by 144 people.

The groups consisted of mothers who adhered to use of the sachet, mothers who did not, as well as community health workers and professionals from basic healthcare teams, including pediatricians, nurses, nursing assistants, administrative supervisors and pharmacists.

The perception of mothers

Guidance received

The clear and accessible guidance provided by the health professionals on the use of home fortification was a significant factor in the adherence of the mothers.

"She explained everything clearly, and they even gave me an explanatory booklet. They told me how to offer it and explained it was to be mixed into the mash". AMC, Porto Alegre (RS)

"[...] but the people who work at the health clinic of the Unified Health System (SUS), always gave me the orientation to carry on. For any doubts that cropped up, I could also seek them out, as they would be available at the clinic". CF, Rio Branco (AC)

Associated collateral effects

The presence or otherwise of side-effects secondary to the sachet was an important factor in mothers' adherence to fortification.

"[...] after the appointment I took the sachet home and my baby has never rejected it. She can't get enough of it, she likes it and has already finished her sachet". GTS, Goiânia (GO)

Influence of caregivers and family

Having support from the family in using the micronutrient sachets and the child having a caregiver were factors determining adherence to the strategy.

"Everywhere I went the mother would repeat: 'Have you put in Ana's sachet?'. LB, Rio Branco (AC)

"I think she (child-minder) stopped due to negligence". ASF, Olinda (PE)

Change in flavor

Many mothers reported that the flavor of the sachet did not affect its use.

"My baby daughter didn't think it was too bad as I put all of it in. And because my baby is a good eater, she really eats well, she would eat it no problem, no problem at all". BLF, Olinda (PE)

"[...] I put all of it and mix it in using a spoon. I then give it to my baby and she doesn't even realize it's in there. She eats it all without grimaces, you know". SRO, Olinda(PE)

The perception of health professionals

Training

Before embarking on the study, training courses were held for the health professionals about fortification. The attendance of the health professionals at these meetings was key to mothers' adherence to the sachet.

"I think this training shouldn't have been done for each individual team, it would be more motivating if all the teams were involved, nurse and physician, to clear up any doubts together. You know that when you split it up, some teams do it and other teams don't (...)". MS, Goiânia (GO)

Adherence of mothers

"[...] I think that for something that nobody had known or heard about before, it was very well accepted [...]" GFM, Olinda (PE)

Interview: Marly Augusto Cardoso

Since the beginning of 2012, Marly A. Cardoso, from São Paulo and mother of three children (Gabriela 19, Matias 13 and Tomás 10), has been working with a team of 17 to measure – through a study involving some 1,200 Brazilian children from four different cities located in four contrasting regions of the country – the effectiveness of a sachet of multiple micronutrients in powder which, when added to food, can prevent a disease that is affecting childhood health in Brazil: anemia. Over half of Brazil’s children aged up to five have the disease, with the greatest number of cases among the very young in the 6 months to 2 years age group. This is why the work of Marly and her team is so important to public health.

Head of the Department of Nutrition at the University of São Paulo (USP) and a researcher at the Center for Epidemiologic Studies in Nutrition and Health (NUPENS/ USP), Marly is the general-coordinator of the National Study of Home Fortification of Complementary Feeding (ENFAC), whose results are published in this bulletin and should help in the strategy of consolidating a national campaign

for distributing sachets containing 15 micronutrients in powder, including vitamins and minerals, to public day care centers.

The results of the study coordinated by Marly are encouraging and go beyond the powder added to the foods: “Since the use of the sachets requires its addition to foods suitable for the baby (such as mashed fruits and vegetables or even rice and beans), this strategy offers an opportunity to promote healthy complementary feeding, further enhancing the benefits of fortification”, affirms the nutritionist who holds a PhD in Food Science and a visiting scholar at the Harvard School of Public Health, who here gives tips on how to use the content of the sachet that can save the lives of many children.



What is the main conclusion of the study coordinated by you on the use of micronutrient sachets?

Marly Augusto Cardoso - Many studies conducted internationally and locally in Brazil reinforce the hypothesis of the role of other micronutrients, in addition to iron, as a cause of anemia in infancy. And, based on scientific evidence, it seems that the prevention and control of nutritional anemia requires the adoption of complementary strategies and the use of multiple micronutrients. A number of international studies have reported the efficacy of fortification using multiple micronutrients in different settings, most notably in low-income countries, where nutritional deficiencies are more prevalent. Based on the experience of ENFAC, the use of multiple micronutrients in powder in infant feeding was effective in reducing anemia, was well accepted by the children studied in different realities in Brazil, with few reports of side-effects such as diarrhea or obstipation.

Besides combatting anemia, a disease that in extreme cases can prove fatal, what other benefits were found by ENFAC in using the micronutrient sachets?

MAC - In addition to the impact in reducing anemia, there was also a reduction in iron and Vitamin A deficiencies, with an improvement in the health profile of the children – lower occurrence of chesty wheezing and increased height-for-age. In the qualitative assessment involving the mothers and health professionals who participated in the ENFAC study, factors such as the practicality of using the sachets, children’s increased appetite and weight gain helped ensure that the micronutrient sachets had good acceptability with mothers expressing interest in continuing their use and recommending them to other mothers.

The target population of this program are children commencing the phase of discovering new foods and tastes. Of the foods comprising the staple diet of Brazilian households, which work best with the micronutrient sachets?

MAC - The sachet should not be heated and its content should

be mixed into a small quantity of ready-to-eat food on the child’s plate, upon serving, offering the portion with the sachet contents first to guarantee its consumption. The sachet should be mixed into preparations having a mushy consistency such as mashed fruits, like bananas and apples, and mashed vegetables such as carrots, pumpkins, potatoes, yams and sweet potato or in rice and beans.

Can the sachet of micronutrients be mixed into paps and feeding bottles? Why?

MAC - The sachet should not be mixed into liquids such as water, milk or juices that alter the flavor of the food, impacting the acceptability and the effect of the product. The sachet should not be used in hard foods such as bread and cookies which do not allow the acceptance and total consumption of the amount offered.

In addition to the health aspect, what can be expected in terms of changes in habits with the use of micronutrient sachets?

MAC - The results of the ENFAC were achieved with the use of the micronutrient sachets as a strategy integrated into infant healthcare in primary health units, promoting maternal breastfeeding and healthy complementary feeding, with the introduction of usual foods from the age of 6 months having adequate consistency and nutritional value. Since the use of the sachet requires its addition to foods suitable for the baby (such as mashed fruits and vegetables or rice and beans), this strategy offers an opportunity to incentivize healthy complementary feeding, further improving the benefits of fortification.

What side-effects were observed with the use of the sachet? How can these be avoided?

MAC - The amount of iron in the sachet is low (10mg). The iron from the micronutrient sachet is encapsulated with lipids, thereby preventing gastric irritation. Reports in the international literature of cases of diarrhea, stomach problems, vomiting or dry stool related exclusively to the use of the micronutrient sachet are rare. In the event this occurs, the mother or caregivers should seek the nearest health service as these symptoms may not be related exclusively to the sachet but to other health problems. ■

“The use of the multiple micronutrients in powder in infant feeding proved effective for reducing anemia”

Interview: Patricia Constante Jaime

In the second half of this year, Brazil's Health Ministry will start distributing 20 million micronutrient sachets to public day care centers across the country to fortify the food of children aged 6 months to 3 years and 11 months. The action is the main strategy to combat diseases such as anemia, which affects more than half all boys and girls in Brazil up to the age of 5, and other nutritional deficiencies. This major initiative is spearheaded by the nutritionist Patricia Constante Jaime, from Anápolis (Goiania) and general-coordinator of the Food and Nutrition Division at the Ministry of Health of Brazil since 2011.

According to Patricia, the data from the National Study of Home Fortification of Complementary Feeding (ENFAC) published in this bulletin, are an important thermometer not just of the efficacy of the sachet but also of its acceptance by the population, which should benefit from fortification via multiple micronutrients in powder – around 330,000 children in the 6 months - 3 years and 11 months age bracket. "It was

important to assess the acceptability and adherence by children, mothers, caregivers and professionals involved with child care in the context of the National Unified Health System and, especially, of primary healthcare in Brazil, which was made possible by conducting the study", explains the nutritionist who holds a Master's degree and PhD from the University of São Paulo (USP) and specialist in Public Policies of Food and Nutrition from the London School of Hygiene and Tropical Medicine.

In this interview, Patricia Jaime talks about the importance of the ENFAC in determining the strategy for distributing sachets and also about the results that the government hopes to achieve in terms of the health of our children with the campaign for the fortification of food in the infant population.



Why did the Ministry of Health decide to carry out a study assessing the fortification of infant food?

Patricia Constante Jaime – In the public health agenda, we seek to base out actions and programs on the best evidence available. To this end, we seek to exploit existing studies and trials and, whenever necessary, to produce new evidence. Assessing fortification of infant feeding centers on recognizing the need to investigate novel strategies for the prevention and control of nutritional deficiencies, given that anemia and hypovitaminosis A, in particular, are among the leading nutritional problems in childhood in the country.

In terms of public health, the relevance of anemia due to iron deficiency is not only due to its widespread occurrence, but also to its harmful effects on health.

What is there in terms of international evidence on the fortification of child feeding and how does ENFAC stand out in the face of this evidence?

PCJ - Internationally, a large body of evidence has been gathered over the last decade on the efficacy of applying fortification of child feeding as a strategy in the child healthcare agenda. This evidence demonstrating the reduction in risk of iron deficiency, anemia and other morbidities in children and especially for maximizing healthy infant development, has been extensively reported. Currently, approximately 40 countries have adopted fortification of child feeding, including Peru, Bolivia, Ecuador and Uruguay. Therefore, in support of the discussion of the strategy in Brazil, it is unnecessary to reassess its efficacy – which is already recognized. However, it was important to assess the acceptability and adherence by children, mothers and/or caregivers and professionals involved in childcare in the context of the National Unified Health System and particularly, of primary healthcare in Brazil, which was made possible by conducting the National Study of Fortification of Complementary Feeding (ENFAC).

Currently, what strategy for the prevention and control of deficiencies in micronutrients is implemented in Brazil and how can the fortification of child feeding be introduced under this policy?

PCJ - The prevention and control of anemia due to iron deficiency involves a set of strategies and therefore multiple strategies are adopted in Brazil, ranging from the promotion of healthy feeding to preventive supplementation in health services for children and pregnant women, as well as the compulsory fortification of wheat and corn flours with iron and folic acid. The fortification of complementary feeding with micronutrients would thus be introduced as an additional strategy to reinforce this set of measures.

How do ENFAC results contribute to this initiative?

PCJ - The use of micronutrient sachets (vitamins and minerals in powder) in child feeding is considered an opportunity to link a strategy of preventing anemia and iron deficiency with the adoption of adequate and healthy feeding. The composition of the sachets ensures the intake of other micronutrients, in addition to iron, since insufficient iron intake can be accompanied, in many cases, by minimal or insufficient consumption of other micronutrients essential for the adequate growth and development of the child. Based on the ENFAC results, we shall have supporting evidence to expand the anemia prevention actions through fortification of child feeding, both within health services as well as other establishments, including crèches, optimizing implementation in the Brazilian milieu. ■

“The use of multiple micronutrients in powder is considered an opportunity to link a strategy of prevention with the adoption of adequate and healthy feeding”

How to use the sachet of vitamins and minerals

STEPS

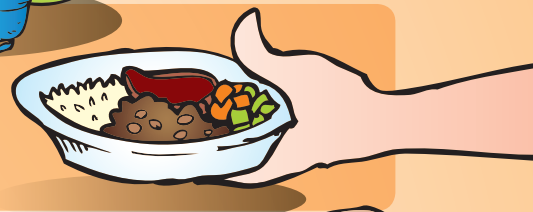
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Prepare the child's lunch or dinner;



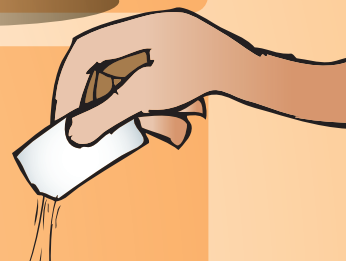
2

Serve the food amount that the child usually eats;



3

Mix the sachet powder into a small amount of the food and immediately offer this portion to the child;



4

Next, offer the rest of the meal.



After mixing in the powder, the food should be offered within 1 hour at most. You do not need to force or press the child to eat.



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