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## REVIEW ARTICLE

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# *Complementary feeding*

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### Abstract

**Objective:** to present an updated review about complementary feeding in infants and children under 2 years old.

**Methods:** relevant materials from scientific journals, technical books and publications by international organizations were used. The most important source of data was a publication by the World Health Organization on complementary feeding carried out in Montpellier, France, in December 1995.

**Results:** in recent years, new findings on ideal infant feeding have buried former concepts and practices. The value of exclusive breast-feeding during the first months of life and the introduction of timely and adequate complementary feeding has been acknowledged. Complementary foods are defined as any solid or liquid foods with nutritional value other than breastmilk, offered to breast-fed infants. It is recommended that complementary feeding be initiated around the 6th month of life. These foods should be rich in energy, proteins and micronutrients, free from contamination, easily digestible and in adequate amount. On recommending a healthy diet, the availability, accessibility and cultural values of food should be taken into consideration.

**Conclusion:** health professionals have an important role in the improvement of infant nutrition. Those in charge of child care have to be properly advised and warned of the importance of a healthy diet for current and future health status.

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### Introduction

New findings on the ideal diet for infants under the age of 2 years have buried several concepts and recommendations used by pediatricians for a long time. In the last 10-15 years, there has been scientific evidence confirming the importance of exclusive breast-feeding on demand during the first 6 months of life, adequate and well-timed complementary feeding, and maintenance of breast-feeding for two or more years.

This article reviews complementary feeding of breast-fed infants aged 6 to 24 months, a critical period for the promotion of adequate nutrition. This is the stage at which there is a higher prevalence of malnutrition and deficiency of certain micronutrients.<sup>1</sup> After the second year of life, it is difficult to reverse growth retardation resulting from an early age.<sup>2</sup>

Complementary foods are defined as any solid or liquid foods with nutritional value other than breastmilk, offered to breast-fed infants. The foods especially prepared for infants before they start to eat family food are called transition foods. These foods correspond to the formerly called "weaning foods". This term has not been used in

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order to avoid confusion as to its objective, which is to complement breastmilk and not to replace it, thus initiating weaning.

### When to start

The World Health Organization recommends that complementary feeding be initiated after 4-6 months of life.<sup>3</sup> The current tendency is to recommend complementary feeding around 6 months. Several countries, including Brazil, have already officially adopted this recommendation, based on the evidence that complementary feeding before 6 months of life (except in some special cases) does not bring any advantage and could even be harmful to infant health.

The main argument against early complementary feeding initiation is the increase in morbi-mortality, especially in regions where sanitation conditions are poor. Early intake of complementary foods reduces the intake of breastmilk.<sup>4</sup> and, as a consequence, infants receive fewer protection factors. In addition, complementary foods can be a dangerous source of contamination for infants. In Pelotas, state of Rio Grande do Sul, hospitalization rates due to pneumonia were significantly higher in infants who received complementary foods before 6 months of life, for either breast-fed or artificially-fed infants.<sup>5</sup> In another study carried out in Porto Alegre and Pelotas,<sup>6</sup> the supplementation of breastmilk with any other food was associated with an increase of diarrhea-related death rates. The prevalence of diarrhea,<sup>7</sup> dysentery and fever<sup>8</sup> was positively associated with complementary feeding in infants aged between 4 and 6 months of life in Ghana and in India.

There is no agreement on the relationship between exclusive breast-feeding and growth within the period of 4-6 months. Some studies showed that the use of complementary feeding after 4 months in breast-fed infants did not improve their growth, even when the complementary foods offered were of good quality.<sup>1,9-11</sup> On the other hand, Brazilian studies suggest that infants who receive complementary feeding may have more rapid growth at this age than exclusively breast-fed infants.<sup>12,13</sup>

Complementary feeding before 6 months of life makes infants ingest less breastmilk, that is, breastmilk is replaced with complementary foods<sup>4,14</sup> even when breast-feeding frequency is maintained.<sup>9</sup> Many times, complementary foods given to infants during the first months of life are less adequate than breastmilk in terms of nutrition. Thus, early complementary feeding initiation is a drawback on infant nutrition, in addition to reducing breast-feeding duration,<sup>15-19</sup> interfering with the absorption of important nutrients found in breastmilk such as iron and zinc<sup>20-22</sup> and reducing the efficacy of breast-feeding in the prevention of new pregnancies.<sup>23</sup> It is interesting to observe that the replacement of breastmilk with complementary foods is less important after 6 months.<sup>1,24</sup>

In many countries, the nutritional recommendations for infants include delaying supplementation with certain foods as these are highly allergenic.<sup>24</sup> Among these foods, we find cow's milk (responsible for 20% of food allergies), which should be introduced at 9-12 months. Whole milk should be used instead of non-skimmed milk. The United States recommends avoiding certain kinds of food such as eggs, peanuts, nuts and fish during the first year of life when there is a family history of food allergy. The use of honey in the diet is usually recommended after the first year of life, thus preventing the risk for botulism.<sup>24</sup>

In short, although there is no controversy on the ideal duration of exclusive breast-feeding, current evidence advise that exclusive breast-feeding be maintained up to 6 months. The American Academy of Pediatrics has recently endorsed this recommendation.<sup>25</sup>

In individual cases, complementary feeding initiation before 6 months may be recommended, especially when infants do not present satisfactory growth with exclusive breast-feeding and/or present evident hunger signs despite frequent breast-feeds. However, it is necessary to take into consideration that current growth curves are predominantly based on artificially-fed infants and, as appropriately shown, the growth of healthy breast-fed infants aged between 3 and 9 months is usually inferior to that of weaned infants.<sup>26,27</sup> Therefore, the uncritical use of current growth patterns may lead to unnecessary food supplementation in healthy infants.

### What kind of complementary foods should be offered

Infants have to be fed adequate complementary foods at the right time so that they can grow up in health. An adequate diet has to be rich in energy, proteins and micronutrients (especially iron, zinc, calcium, vitamin A, vitamin C and folates), free from contamination (without pathogenic germs, toxins or harmful chemicals), not too salty or spicy, easily eatable (adequate for the age), in adequate amount, easily available and accessible. It is of paramount importance that infants be fond of the diet and that this diet be culturally acceptable.<sup>28</sup> Some characteristics of an adequate diet for infants under 2 years are described next.

#### *Energy density*

The energy density of a food means the amount of calories per unit of volume or weight of the food.

At the age of 6 months and there on, infants' energy density has to be provided through complementary foods. Figure 1 shows that the amount of energy that needs to be obtained from complementary foods increases with age.

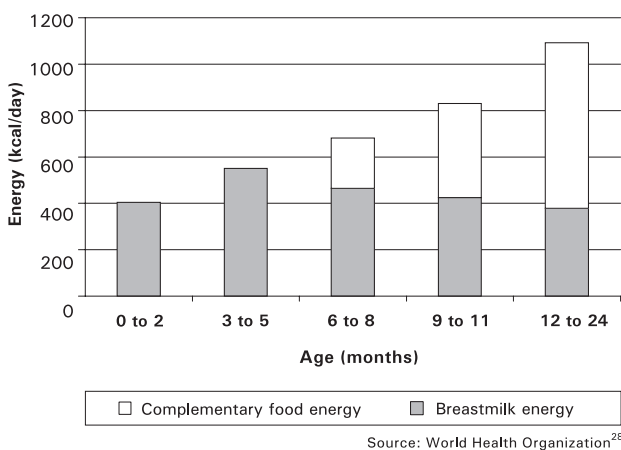
The amount of energy found in complementary foods necessary to fulfill infant nutritional requirements varies according to the volume and energy density of the breastmilk ingested by infants. In developing countries, human milk

energy content ranges from 0.53 to 0.70kcal/g, whereas it is higher, between 0.60 and 0.83kcal/g,<sup>1</sup> in industrial countries. Infants usually compensate for this variation in energy concentration in breastmilk by varying their intake of breastmilk. Anyway, infants in poorer countries usually require more energy from complementary foods if compared to their peers in industrialized countries. Table 1 presents estimates of the energy from complementary foods required by infants in different age groups (up to 2 years), taking into account place of residence and the volume of ingested breastmilk.<sup>1</sup>

Infants have a self-regulating mechanism that controls their daily energy intake. As a consequence, infants tend to eat smaller amounts of high-calorie foods. In spite of this, infants on a high energy density diet tend to have higher daily energy intake.<sup>29</sup> The limited gastric capacity of infants (30-40ml/kg of weight) may prevent them from meeting their energy requirements if they have a low energy density diet.<sup>1</sup> On the other hand, if infants obtain a large amount of energy from complementary foods, they can reduce the intake of breastmilk, which is not advisable, especially for younger children.

The amount of energy obtained from fats in the diet of infants under 2 years is arguable. Most authors state that fatty energy probably covers between 30% and 45% of total energy intake in infants under 2 years.<sup>30</sup> It is important to remember that 40% to 55% of the energy found in human milk derive from fats.

As breastmilk fat content presents variation, the percentage of energy obtained from fats in complementary foods may also vary. This way, the percentage of energy obtained from fats in complementary foods may be higher in the diets of infants whose mothers present low fat milk, as in many populations from developing countries. Assuming that the desired percentage of energy from fats (breastmilk and complementary foods) is 30%, it is estimated that complementary foods contain 14 to 21% of energy derived from fats in infants aged between 6 and 11 months and 26% in infants between 12 and 23 months when milk fat content is low (2.8g/100g). The diet for infants whose mothers have adequate fat reserves (average milk fat concentration around 3.8g/100g) should contain from 5 to 9% of energy obtained from fats in infants aged between 6 and 11 months and 19% in infants aged between 12 and 23 months.<sup>1</sup>



**Figure 1 -** Energy requirements and required complementary food energy to supply the nutritional needs of children younger than 2 years

**Table 1 -** Common complications in children with DKA, causes and treatment

Age group (months)	Industrialized countries Breastmilk intake*†			Developing countries Breastmilk intake		
	Low	Average	High	Low	Average	High
0-2	110	0	0	125	0	0
3-5	188	2	0	236	76	0
6-8	408	196	0	465	269	73
9-11	789	455	121	673	451	229
12-23	1092	779	423	1002	746	490

\* Up to 5 months of life, estimates were based on exclusively breast-fed infants; for infants over 6 months, breast-feeding pattern was not important.

† The Low, Average and High categories correspond to energy intake from breastmilk, in which: low (mean-2SD), average (mean + 2SD) and high (mean + 2SD).

In short, the amount of energy that infants should receive through complementary foods depends on their age, amount of ingested breastmilk, and frequency of complementary feeding. The recommended energy density for infants with an average intake of breastmilk, who receive at least three meals of complementary foods a day, ranges between 0.6kcal/g in the 6-8 months of life to 1.0kcal/g in the 12-23 months. When breastmilk intake is lower or infants have growth retardation, energy density must be higher, ranging from 0.8 to 1.2kcal/g.<sup>1</sup> The necessary amount of fat obtained from complementary foods also varies and depends on breastmilk fat content. Nevertheless, groups of experts in several countries believe that fat intake during the first two years of life may not have restrictions.<sup>30</sup>

A multicenter study on food consumption carried out in Brazil<sup>31</sup> showed that, usually, the diet of Brazilian infants under 2 years is adequate in terms of calories. However, energy density was low, which could be associated with the kind of food ingested or also the consistency of this food. Infants are commonly fed “soft”, diluted foods.

**Protein density**

In general, the amount of proteins in a diet is adequate if it contains an adequate energy content, except in populations which eat foods that are predominantly poor in proteins e.g.: yam and cassava.<sup>1</sup> Isolated protein deficiency, in opposition to former beliefs, does not seem to determine

height deficiencies in infants who belong to a low socioeconomic level in developing countries.<sup>32,33</sup>

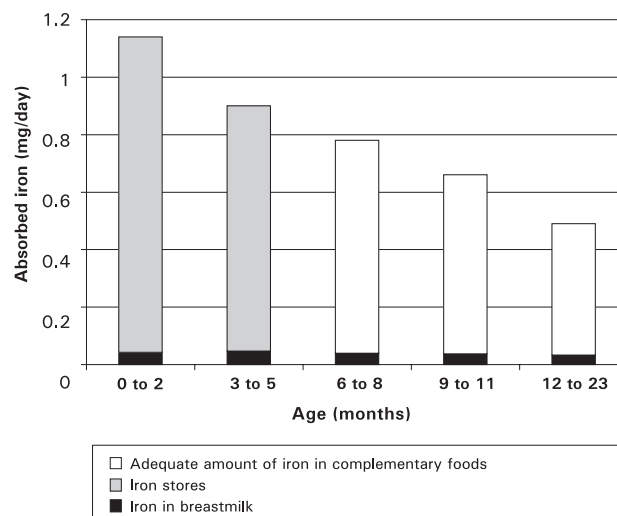
The protein density (grams of proteins per 100kcal of food) recommended for the complementary feeding of infants aged between 6 and 24 months is 0.7g/100kcal.<sup>34</sup>

The amount and digestibility of proteins should be taken into consideration when assessing complementary feeding adequacy. Proteins of highest biological values and best digestibility are found in human milk, followed by proteins of animal origin (meat, milk, eggs). A proper combination of vegetables can also provide high-quality proteins as in mixing rice and beans.<sup>35</sup>

According to the Multicenter Study on Food Consumption,<sup>31</sup> the diet of Brazilian infants under 2 years usually contains a concentration of proteins above recommendations, increasing with age.

**Iron content**

Although the amount of iron found in breastmilk is low, it is enough to meet iron requirements during the first 6 months of life, in full-term babies, thanks to iron stores. After 6 months, iron stores are depleted, and it is necessary to provide iron through complementary foods (Figure 2). Preterm babies presenting low weight at birth have fewer body iron stores, and need supplementation with iron before the 6th month of life.



Source: World Health Organization<sup>28</sup>

**Figure 2 -** Iron requirements and required iron necessary to complementary food energy to supply the nutritional needs of children younger than 2 years

Iron bioavailability, that is, how much of the ingested iron is really absorbed by the body and available for use, is extremely important. The iron that is best absorbed and used by human species is that found in breastmilk, with a rate of up to 70% when breast-feeding is exclusive.<sup>36</sup> The iron found in foods of animal origin is better absorbed (up to 22%) than the iron of vegetable origin (1 to 6%). The latter is better absorbed in the presence of meat, fish, fructose and ascorbic acid, and less absorbed when eaten with egg yolk, milk, tea, maté tea or coffee.<sup>37-39</sup>

Among the products of animal origin, meat (especially red meat) and some organs (especially liver) contains higher iron density and better bioavailability than milk and its by-products. Egg yolk is rich in iron, but its absorption is poor. Some products of vegetable origin contain reasonable amounts of iron, but present low bioavailability. Among these products we find beans, lentils, soy beans, and leafy vegetables (Swiss chard, kale, broccoli, mustard, chicory).

A diet with high iron bioavailability (over 19% of absorption) is usually a diversified diet with reasonable amounts of meat, fish and poultry (over 90g) and foods that are rich in ascorbic acid (25-75mg).<sup>1</sup>

The recommended iron density (mg/100kcal) in complementary foods is 4mg/100kcal for infants between 6 and 8 months of life, 2.4mg/100kcal between 9-11 months and 0.8mg/100kcal for infants between 12 and 24 months. The Multicenter Study on Food Consumption<sup>31</sup> revealed that the average iron density in the diet of Brazilian infants under 2 years is way below recommendations: from 0.49 to 0.69 for infants between 6 and 12 months and from 0.53 to 0.69 for infants in the second year of life. These findings are coherent with high anemia rates presented among Brazilian infants.<sup>40-42</sup>

Acknowledgedly, the iron density of complementary foods in developing countries does not meet the iron requirements of infants under 2 years.<sup>1</sup> The adequate amount of iron in complementary foods can only be achieved through the consumption of iron-fortified foods or through animal products in large amounts. Infants hardly eat iron-rich foods (liver, meat, fish). Therefore, it is necessary to use some strategies to increase iron intake among infants between 6 and 24 months such as food fortification, and supplementation with iron. The intake of vitamin-C-rich foods (orange, guava, lemon, mango, papaya, melon, banana, passion fruit, peach, tomato, green pepper, green leaves, cabbage, broccoli, cauliflower) at meals increases the amount of iron that is absorbed. Do not forget that cooking destroys part of vitamin C.

### **Zinc content**

The role of zinc in the prevention of morbi-mortality caused by infectious diseases had not been recognized until recently.

In developing countries, the average zinc density (mg/100kcal) in foods eaten by infants under 1 year of life

is lower than the recommendation (0.8mg/100kcal for infants between 6 and 8 months and 0.5 mg/100kcal for infants between 9 and 11 months).<sup>1</sup> Similarly to what occurs with iron, infants between 6 and 8 months have difficulty meeting their body zinc requirements through complementary feeding.<sup>1,43</sup> Infants over 8 months can meet their body zinc requirements by ingesting relatively high amounts of liver and dry fish.

Zinc density and bioavailability is higher in products of animal origin, especially meat and organs (mainly liver) and egg yolk. Vegetable products are usually poor in zinc and have low bioavailability, especially in grains and legumes with high concentration of phytates. Differently from iron, ascorbic acid does not increase zinc bioavailability.

### **Vitamin A content**

In several developing countries, infants ingest adequate amounts of vitamin A.<sup>1</sup> Infants who are fed breastmilk with adequate concentrations of vitamin A meet their daily vitamin A requirement in a relatively easy way through adequate complementary foods. However, in vitamin A deficiency endemic areas, complementary feeding is an important source of vitamin, since vitamin A concentration in breastmilk may be low in these regions. In addition, vitamin A absorption may be hindered when infants have a low-fat diet; this often occurs in poverty-stricken populations. Carotene and retinol absorption may probably be improved if complementary foods are fed together with breastmilk (some time before or after that).<sup>1</sup>

In endemic areas, where the concentration of vitamin A in breastmilk may be low, infants need a higher amount of vitamin A to meet their needs. This can be achieved through supplementation of mothers with vitamin A and/or with increased intake of foods that are rich in vitamin A such as liver, egg yolk, dairy products, leafy vegetables, vegetables and orange-colored fruits (carrots, pumpkin, red or yellow pepper, mango, passion-fruit, papaya).<sup>1</sup>

Basically, there are no studies in Brazil on vitamin A ingestion by infants under 2 years. It is known that in endemic areas (Northeast and some communities outside this region) ingestion may be low since the prevalence of vitamin A deficiency is high.<sup>44</sup> The Multicenter Study on Food Consumption<sup>31</sup> showed that, in general, the average intake of vitamin A was adequate in infants under 2 years. However, when families were categorized according to their income, the diet of infants whose families had a monthly income less than or the same as 2 minimum wages revealed to be deficiency in vitamin A.

### **Amount and frequency**

At the beginning, the amount of complementary foods must be low and then gradually increased. New foods also need to be gradually introduced, one at a time, with an

interval of 3 to 7 days so that possible adverse reactions of each food can be observed separately. It is important to say that breast-feeding frequency does not have to be changed because of complementary feeding.

In the 9th month, infants can already be fed a diversified diet. Frequent and bulky meals should be avoided in breast-fed infants since the more foods they eat, the less breastmilk they will ingest. Do not forget that infants' gastric capacity is low and that infants adapt the intake of foods according to energy density.<sup>45,46</sup>

Complementary feeding frequency in infants varies according to the energy density of foods in the diet, amount of breastmilk ingested, and size of infants. Medium-sized infants aged between 6 and 8 months with average intake of breastmilk need 2 meals a day if energy density of foods is higher than or equals 0.9kcal/g, or 3 meals if energy density is less than 0.6 to 0.9 kcal/g. Between 9 and 11 months of life, 3 daily meals are necessary if energy density is higher than or equals 0.8kcal/g or 4 meals if energy density is 0.6 to 0.8kcal/g. In the second year of life, 6 meals are enough if the diet includes high energy density (at least 1.0kcal/g). In the case of low-calorie diets, 4 or 5 daily meals are necessary.<sup>1</sup>

Many times, it is difficult to assess the amount of breastmilk ingested by infants; therefore, the World Health Organization recommends that complementary foods with adequate energy density be initially offered 3 times a day. The amount and frequency of feeding should be gradually increased so that 12-year-old infants receive complementary foods 5 times a day (3 meals and 2 snacks). Infants who are not breast-fed or are breast-fed on an infrequent basis need to be fed complementary foods 5 times a day from the time complementary feeding is initiated.<sup>28</sup>

At the beginning, foods should be soft (mashed), without being diluted (it is not advisable to blend foods in a mixer). Soups and watery/soft foods do not provide the calories infants need. At this stage, the so-called transition foods should be especially prepared for infants. After 8 months of life, infants can be fed the same foods the family eats provided that they are mashed, shredded, chopped or cut into small pieces.

The best period for introducing complementary foods, whether before, during or after breast-feeds, is not well-established. There is at least one study showing that total suction time and daily energy intake do not vary according to the order in which complementary foods are offered.<sup>47</sup> In an attempt to prevent a substantial reduction in the amount of breastmilk intake, many authors recommend offering complementary foods after breast-feeds. Others advocate that complementary foods should be given before breast-feeds in order to facilitate recognition of new tastes and textures.<sup>1</sup>

There is little information about the number of daily meals fed to infants under 2 years in Brazil. The Multicenter Study on Food Consumption<sup>31</sup> revealed that over 90% of

infants in this age group are fed at least 4 times a day. Most infants have 5 to 6 meals a day after the sixth month of life.

### Hygiene of complementary foods

Hygiene of complementary foods, which includes preparation, later storage and administration, is important for the promotion of infant nutrition<sup>48</sup> It is believed that more than half of diarrhea bouts in infants under the age of 5 is associated to infant nutrition;<sup>49</sup> and complementary foods play a vital role in the transmission of diarrheal diseases.<sup>50</sup>

Contamination of complementary foods is very common in developing countries due to contaminated water, poor personal hygiene (contaminated hands of whom is preparing the food) and inadequate cleaning of eating utensils (especially baby bottles and their nipples) and inadequate storage of foods after preparation. Food contamination is common when it is stored at room temperature as the proliferation of pathogenic bacteria is favored.<sup>50</sup> Frequently, in poverty-stricken populations, foods that are stored under unfavorable conditions are given to infants without being heated or are inadequately reheated, resulting in the intake of a great number of pathogenic germs.<sup>49</sup>

The following hygiene practices should be adopted when handling foods: washing hands with soap before their preparation; using always fresh food; washing raw foods properly; using clean utensils; avoiding the use of bottles and their respective nipples; storing perishable or freshly prepared foods in the refrigerator whenever possible; cooking foods properly; eating foods within 2 hours after preparation if not stored in a refrigerator; properly reheating prepared foods or foods stored at room temperature for over 2 hours; and protecting foods and utensils against animals (rats, cockroaches, flies) and dust.<sup>28</sup> Interestingly, in Uganda, the use of cups was more efficient in reducing bacterial counts than the cleaning of eating utensils, since bottles and nipples which were washed in cold or hot water were more contaminated than cups that were submitted to the same procedure.<sup>51</sup>

### Factors that facilitate/interfere with adequate complementary feeding

Some factors should be considered so that infants can have an adequate diet. These factors include appetite/anorexia, variety/monotony and taste/smell.

Lack of appetite could lead to a significant reduction in energy intake and, consequently, growth deficiencies. The incidence of anorexia during the first year of life increases with age - from 2.2% in the first month to 31.7% in the 12th month.<sup>1</sup> The factors that cause anorexia or low intake of complementary foods include repeated diets;<sup>1</sup> micronutrient deficiencies, especially iron and zinc; and emotional problems.<sup>28</sup>

When breast-fed infants are anorexic, the intake of energy from complementary foods is markedly reduced if compared to the energy intake from breastmilk itself.<sup>1</sup>

Even infants who are healthy and have good appetite should be assisted and encouraged to eat at mealtime. This requires patience since infants eat slowly, spread food about the place, and get easily distracted. Adults should encourage infants to eat by themselves, always making sure that they are ingesting enough food. Infants who are sleepy or have waited too long for being fed may lose their appetite and not feed properly. Adults cannot force or blackmail infants into eating.

If infants are anorexic due to a disease, a more flexible attitude towards eating hours and habits can help them to feed more properly. During these periods, they should be fed more frequently (preferably breast-fed); they should be offered their favorite foods; and foods that have high energy density and a consistency that facilitates swallowing and does not irritate the mucosas (acid foods) if they feel pain when swallowing and/or chewing. In the event of diseases that cause vitamin A depletion such as measles, diarrhea and acute respiratory infections,<sup>52</sup> infants should be fed foods that are rich in this vitamin.

After an infection, during rehabilitation, infants have an appetite that is above normal levels, as an attempt to compensate for weight loss. In this period, foods that are rich in energy and that contain a protein/energy ratio above normal should be offered more frequently. Additional protein should contain, preferably, high biological value (meat, dairy products and eggs), also offering more iron, zinc and vitamin A.<sup>52</sup>

Only a diversified diet can provide infants with adequate nutrition. The diet of Brazilian infants is usually repetitive. The Multicenter Study on Food Consumption<sup>31</sup> showed that 70% of calories ingested by infants between 6 and 12 months are supplied by 5 to 8 products. In the second year of life, the diet is a bit more diversified, including 8 to 11 products, which provide 70% of the energy ingested. According to this same study, the intake of fruits, vegetables and legumes is low among infants under 2 years.

Infants should be early exposed to different kinds of food on a regular basis so that they easily accept them and do not reject new foods.<sup>53</sup> Therefore, if they are exposed to these foods on a regular basis, they end up accepting them, and then these foods may be incorporated into their regular diet.<sup>46,54</sup> Initial rejection of food is often interpreted as permanent aversion, and as a consequence, that kind of food is excluded from the diet. It was reported that breast-fed infants accept new foods more easily than non-breast-fed ones, which could be associated with exposure to different tastes infants experience through breastmilk intake.<sup>55</sup>

The way in which foods are initially presented to infants is also important for their future eating habits as they start to enjoy the food that way.<sup>56</sup> Therefore, it is advisable to

offer infants foods with low sugar and salt contents at the beginning.

Infants have the tendency to prefer high energy density foods.<sup>45,46</sup> However, an exaggerated intake of calorie-rich foods may restrict the ingestion of a diversified diet, since infants get satiated quickly and start to reject other foods.

Intrauterine experiences are likely to contribute to infants' preferences for taste later on. An offspring of mice submitted to diets with different concentrations of sodium showed higher or lower preference for this mineral, according to the intake of sodium during pregnancy.<sup>58,60</sup> In addition, amniotic fluid is aromatic and its smell is influenced by mothers' diet.<sup>61</sup> The similarity of aromas between amniotic fluid and breastmilk may be involved in the preference of new-borns for the smell of breastmilk.<sup>62</sup>

Experiments with mammals suggest that taste preferences may be influenced by mothers' diet.<sup>63</sup> Chemical compounds that provide foods with taste and smell are ingested by infants through breastmilk; this way, infants are gradually introduced to their family eating habits.<sup>36</sup> Breast-feeding, in addition to all its advantages, is "an important source of information and way of learning about the different tastes associated with mothers, families and cultures".<sup>64</sup>

Composition of breastmilk changes as lactation progresses. Lactose levels reduce and increase levels of chloride, making breastmilk have a slightly salty taste.<sup>36</sup> Such a change may help infant to accept complementary foods at the right time.

### **How to offer complementary foods**

Complementary foods should be offered with a spoon and cup. Today, the use of bottles is not recommended since it is a source of infection, reduces breast sucking time, interfering with breast-feeding on demand, and may alter the dynamics of oral feeding.<sup>65</sup> Bottle-feeding, when initiated before the onset of lactation, may be confusing to infants as breast sucking and bottle sucking techniques are distinct.<sup>66</sup> Sucking milk out of the breast requires muscle movements to lower, protract, elevate and retract the jaw, besides tongue movements used to extract the milk. In bottle-feeding, there is no need for protracting and extruding jaw movements or tongue movements.<sup>67</sup> There is evidence that some new-borns, after exposure to bottle-feeding, have difficulty in breast-feeding.<sup>68,69</sup> Several studies report the association between bottle-feeding and early weaning.<sup>65</sup>

Differently from expectations, infants accept well being fed with a spoon and cup.

### **Final considerations**

A lot has been learned about adequate infant feeding throughout the last years. Consequently, many concepts and practices that had been preconized for a long time are now outdated, for instance, rigid breast-feeding schedules, use

of water and teas during the first months of life, early introduction (before 6 months) of juices and other foods, and undue importance to breast-feeding in the second year of life. The present article, based upon scientific evidence, presents an updated review on complementary feeding of infants under two years. Health professionals have the duty of incorporating and advertising these new findings, with the aim of providing infants with adequate nutrition. The Brazilian Ministry of Health in association with the Panamerican Health Organization hired a group of experts to design the "Dietary Guide for Brazilian Infants under 2 years". This document, which is being printed, contains technical and scientific bases, dietary and nutritional diagnostics of Brazilian infants under the age of 2, and recommendations through "Ten steps to a healthy diet in infants under 2 years". This document and also the present review have important information that could serve as guidelines for organizing the information that is going to be conveyed to the target population.

The text below was written by Gabriela Mistral, and is food for thought on the urgent need for actions that can improve infant health and nutrition.

*"We are at fault for many mistakes and errors,  
but our most appalling crime is the abandonment of  
children, neglecting the source of life.  
Many of our needs can wait.  
Children's cannot,  
Now that their bones are under formation,  
Their blood is being formed  
Their senses are developing.  
To them we cannot say "tomorrow"  
"Today" is what we must say.*

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