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COMPLEMENTARY FEEDING AND THE CONTROL OF IRON DEFICIENCY ANAEMIA IN THE NEWLY INDEPENDENT STATES

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EUROPEAN HEALTH21 TARGET 11

HEALTHIER LIVING

By the year 2015, people across society should have adopted healthier patterns of living

(Adopted by the WHO Regional Committee for Europe at its forty-eighth session, Copenhagen, September 1998)

ABSTRACT

The WHO Working Group on Complementary Feeding and the Control of Iron Deficiency was invited to present an overview of current infant and young child feeding practices in the WHO European Region at a Joint UNICEF/WHO Consultation on Iron Deficiency Anaemia. A number of nutritional recommendations from the former Soviet era, which differ from international standards, were identified. Poor complementary feeding practices help to explain the poor iron status of infants and young children in the WHO European Region, particularly in the countries of the former Soviet Union and the central Asian republics. The Working Group outlined guidelines for the revision and updating of recommendations on complementary feeding, to facilitate the establishment of good complementary feeding practices in the Region. If these recommendations are embraced, they should have a significant positive impact on the general nutrition and iron status of young children.

Keywords

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Summary

A review of current infant and young child feeding practices in the WHO European Region, focusing particularly on countries of the former Soviet Union and the central Asian republics (CAR), has identified a number of nutritional recommendations from the former Soviet era which differ from international standards. Poor complementary feeding practices are a partial explanation of the poor iron status of infants and young children in the European Region, particularly in the countries of the former Soviet Union and the CAR. The main findings of the surveys on feeding practices for infants and young children in countries throughout the WHO European Region, particularly in the latter countries, are that:

1. exclusive breastfeeding is not widely practised;
2. liquids such as water and tea are introduced before the age of four months;
3. cow's milk is introduced before the age of four months;
4. semi-solids such as curds, kefir and yolk, are introduced before the age of four months;
5. the late introduction of meat and liver into the infant diet is a common practice.

International standards recommend that liquids (tea and water) should not be introduced before the age of four months. Introduction of these liquids hinders the successful initiation and continuation of breastfeeding and is an obstacle to the promotion of *exclusive* breastfeeding which offers the maximum benefits to both infant and mother.

Poor feeding practices, especially the early introduction of cow's milk and tea, have a negative impact on the bioavailability of iron in infants and therefore on their iron status. The widespread belief in, and recommendation for, a lot of protein in the diet to ensure optimal growth appear to have encouraged the too early introduction of foods such as curds, kefir and egg yolk in some countries.

In the former Soviet countries there is evidently a strong belief that maternal anaemia is a contraindication to breastfeeding. However, published scientific evidence supports the fact that anaemia does not prevent women from breastfeeding. Furthermore, lactation helps reduce the likelihood of anaemia in a number of ways: (i) breastfeeding accelerates the contraction of the uterus to its pre-pregnant size, reducing the risk of haemorrhage and thereby preserving maternal iron stores; (ii) the iron cost of breastfeeding is generally less than in menstruation, as a result of the lactational amenorrhoea produced by exclusive breastfeeding for several months; (iii) the absorption of iron from the gastrointestinal tract is enhanced in lactating women; and (iv) lactation increases mobilization of the body's iron stores.

It is clearly important for women to enter pregnancy with an optimal nutritional status and good iron stores. However, it should be remembered that the low rates of breastfeeding are not likely to be due to physiological barriers but to psychological ones. Thus, improvements in nutritional status alone and the prevention of anaemia will not automatically result in increased levels of breastfeeding. Extensive campaigns are needed to promote, protect and support breastfeeding, concentrating especially on counselling and psychological support.

The complementary feeding recommendations in most countries in the European Region require revision, particularly those in the countries of the former Soviet Union and the CAR. It is the belief of the WHO Working Group on Complementary Feeding and the Control of Iron

Deficiency Anaemia¹ that revision and updating of recommendations on complementary feeding could have a significant positive impact on the general nutritional and iron status of young children. Therefore, the establishment of good complementary feeding practices should be considered a major priority in the control and prevention of iron deficiency and associated anaemia.

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Current infant feeding practices in the WHO European Region

Results from a comprehensive survey of infant and young child feeding practices in Armenia show the early introduction of liquids and semi-solid foods during the period when exclusive breastfeeding is recommended. Water and herbal teas are introduced at around 1–2 months, with tea at 2–3 months and fruit juices at about 3–4 months.

Of particular concern, is the introduction of cow's milk at about 4–5 months. This is likely to have a negative impact on the iron status of infants, firstly because cow's milk has a low iron content; secondly, compared with breast-milk the iron in unmodified cow's milk has poor bioavailability; and thirdly, several studies have shown that the early introduction of cow's milk can cause micro-bleedings of the infant's immature gastrointestinal tract leading to blood loss. Compounding these problems, tea which is also introduced into the infant's diet at a very early age, has an inhibitory effect on iron absorption, and furthermore, the too early introduction of supplementary drinks including tea, water and cow's milk, causes displacement of breast-milk intake.

In addition, meat and liver, which represent the best sources of haem iron for infants over six months of age and contain a "meat factor" believed to enhance the absorption of non-haem iron, are introduced at a relatively late age (about 8–9 months). Together these factors make a major contribution to the poor iron status of Armenian infants and children. Evidence from qualitative surveys conducted in other countries such as Azerbaijan, Bulgaria, Lithuania, Kazakhstan, Kyrgyzstan and Uzbekistan, suggest that the Armenian data are probably representative of the Region as a whole, particularly the practice of early introduction of tea and cow' milk.

From 1983 to 1992, Salvioli et al (1) found a considerable reduction in the prevalence of iron deficiency without anaemia (20.7% to 10.3%) and iron deficiency anaemia (5% to 1.3%), associated with the decrease in infants fed cow's milk before six months of age (73.3% to 7.6%). Moreover, there had been an increase in breastfeeding incidence at five months (21.6% to 50.6%) in Italian infants over the same period. The promotion of exclusive breastfeeding for the first months of life, coupled with the timely introduction of cow's milk, is therefore anticipated to have a dramatic positive effect on the improvement of iron status in infants within the WHO European Region.

The main findings of the surveys on feeding practices in the central Asian republics (CAR) for infants and young children are summarized below.

1. Exclusive breastfeeding is not widely practised. Available data indicate that only 4–31% of infants in the CAR are exclusively breastfed at <4 months.
2. Liquids such as water and tea are introduced earlier than four months. Tea displaces breast-milk intake and contains tannins which inhibit the absorption of non-haem iron.
3. Cow's milk is introduced before six months of age. This practice may have a negative impact on the iron status of infants and young children due to the low bioavailability of iron in cow's milk, its effects on the gastrointestinal tract, and through the displacement of breast-milk which contains highly bioavailable iron.
4. Semi-solids such as curds, kefir and egg yolk are introduced earlier than four months.
5. The late introduction of meat and liver into infants' diet is also a common practice.

It is recommended that feeding patterns and nutritional status of infants and young children should be monitored regularly. This will enable problems to be identified and strategies to be developed to optimize the health of young children.

Possible explanations for the current feeding practices in the Region

In most of the former Soviet countries semi-solids appear to be introduced at less than four months of age when the infant's digestive, renal, immune and neuromuscular systems are immature and designed to cope with breast-milk alone. The early introduction of semi-solids clearly either precipitates and/or exacerbates the prevalence of anaemia. Data from Lithuania highlight the widespread view held within the Region on the importance of protein (2,3). There appears to be concern that infants may become protein-deficient perhaps because breast-milk is seen to have a relatively low protein concentration (see next paragraph). Consequently, by the age of four months, 73% of Lithuanian infants were receiving egg yolk and 57% were receiving curds. By six months of age when, according to WHO recommendations complementary feeding should just be starting, these figures had risen to 95% and 92% respectively. Can this practice, which is so at odds with international recommendations on infant feeding, be explained?

By looking at the protein content of breast-milk compared to other milks, it can be seen that breast-milk has a much lower protein concentration (0.9 g/100ml) than other milks offered to infants such as infant formula (1.5 g/100ml) and cow's milk (3.5 g/100ml). When these values are examined in the context of the former USSR recommendations for protein (Table 1), it can be seen that the recommendations are three times greater than international standards for children up to six years of age. Therefore breast-milk could be considered deficient in protein, leading to recommendations for the early introduction of semi-solids, particularly those rich in protein such as curds, egg yolks, kefir and cow's milk, to ensure this deficit is covered.

Table 1. Protein recommendations

	Europe (1991) ^a g/d	USA (1989) ^a g/d	Former USSR (1991) ^b g/d
Children			
1–3 years	15	16	53
4–6 years	20	24	68
7–10 years	28	28	77
Women			
Non-pregnant	47	46–50	58–87
Pregnant	48–60	60	88–117
Lactating	60	65	

Sources: ^aGarrow & James (4). ^bBaturin, A. Personal communication (5).

Is protein deficiency a public health problem in the Region?

Some of the former Soviet physiological norms are significantly greater than the values recommended by international committees. The use of these physiological norms to assess the adequacy of protein intake in countries of the former USSR has led to erroneous claims of widespread protein deficiency. For example, in Kazakhstan an estimated 28–33% of the

population were found to be protein-deficient using the former Soviet recommendations, compared with only 7–8% of the population when international standards were applied. Furthermore, although Kazakh women had a relatively low mean intake of meat and meat products (68 g/day) compared with women from other European countries, the mean protein intake of non-pregnant Kazakh women of childbearing age (15–49 years) was 50 g/day which falls within the upper range of international recommendations (Table 1). Indeed, the mean population protein intakes in Kazakhstan were found to be approximately 0.77 g/kg body weight if average body weight is assumed to be 70 kg, and are thus in line with the international recommendation of 0.75 g/kg body weight (6). If an average body weight of 65 kg is used, the value increases to 0.83 g/kg body weight. Thus, there is as yet no evidence to support claims that widespread protein deficiency exists in some former Soviet countries, including the CAR. It is vital that all countries within the Region adopt international nutrient standards outlined in the FAO/WHO/UNU publication (6), to facilitate assessment of the nutrient intake of the population.

Meat is a major component of the diet in countries of the former USSR. From the 1960s to 1990, there was a steady increase in Soviet meat production and consumption and by 1990 production levels had almost reached the desired former Soviet target of 80 kg meat/person/year (7). A linear regression performed in 1990 on 44 market nations, together with former Soviet countries, illustrates the emphasis placed on meat in the former USSR (7). Despite the strong correlation between gross domestic product (GDP) and meat availability for the majority of countries, the countries of the former USSR did not fit this model. Despite having a low GDP similar to most developing countries, the availability of meat was far higher in former Soviet countries than would be expected and was similar to that in industrialized countries.

With the collapse of the former Soviet Union and the resulting economic problems, there has been a significant decrease in the availability of meat. This is likely to have resulted in a reduction in the quantity consumed. It is important to view this reduced meat consumption against the background of the very high meat intake before 1990. Thus, despite the dramatic reduction in meat intake in the Region, meat remains relatively accessible and there are still sufficient amounts of meat available to satisfy the needs of the population and ensure a healthy diet. Indeed, if the present trend continues, meat consumption may reach levels similar to those recommended in the so-called Mediterranean diet. This Mediterranean dietary pattern is considered the most optimal for health. It comprises an annual meat availability of approximately 30–40 kg/person compared with the 80 kg aspired to in the former USSR. A lower meat consumption with a concomitant increase in vegetable and fruit intake should be promoted as part of a healthy diet for most populations (8,9). It should be remembered that it is possible to attain normal growth without eating animal protein. However, since meat is available, small amounts 2–3 times per week or liver once per week, in the complementary feeding diet, is likely to improve growth and help prevent the development of iron deficiency anaemia.

The two main recommendations for protein intake cited from the new WHO complementary feeding publication (10) are that:

1. a sufficient protein intake with a balanced amino acid pattern is important for the growth and development of the infant and young child; however, protein quantity and quality is seldom a limiting factor during the first years of life if the child receives a varied diet, and especially not if the diet contains even small amounts of protein from human milk or animal protein;
2. a high protein intake above that recommended provides no extra benefit, and levels above four to five times the requirements might have adverse effects.

Is energy deficiency and resulting weight loss a public health problem in the Region?

Given the high nutrient recommendations for protein, it is valuable to compare other former Soviet nutrient recommendations, for example energy, with international standards (Table 2).

Table 2. Recommendations for energy intake in children

Age (years)	Europe (1991) ^a kcal/d	USA (1989) ^a kcal/d	Former USSR (1991) ^b kcal/d
1–3	1200	1300	1540
4–6	1630	1800	1970
7–10	1860	2000	2350

Sources: ^aGarrow & James (4). ^bBaturin, A. Personal communication (5).

The former USSR recommendations for daily energy intake are greater than those in the European Union and the United States (Table 2), although not to the same magnitude as those for protein. Thus, similar to protein intake, these high recommendations could lead to claims that low energy intake is a widespread public health problem if intakes are compared with high recommended intakes or norms. Data on energy intake (kcal) can be validated by anthropometric data and nutritional status, i.e. weight in relation to height. A low weight compared with height in children is termed wasting. There is a very low prevalence of wasting in infants and young children in the Region (Table 3), with the majority of countries having a prevalence below the 5% cut-off used to identify potential public health problems of energy deficiency. The exceptions to this are Tajikistan and Uzbekistan where the prevalence of wasting is between 10% and 12%. This is classified as a serious public health concern and steps should be taken to ensure adequate food/energy supplies for the population in Tajikistan and Uzbekistan.

It would seem unlikely that energy deficiency and associated weight loss and wasting is a widespread public health problem in the Region except in Tajikistan and Uzbekistan. Indeed, data from some countries on the prevalence of obesity in children would suggest the opposite scenario. Thus, the excess consumption of energy from fat and sugar may be a greater problem in the Region, with approximately 18% total energy intake of the Russian diet provided by sugar (5). The prevalence of obesity among Russian boys aged between six and eight is on a par with those observed for boys in the USA, at about 12% (11). Similarly for women, a comparison of data from a 1992 Former Soviet Multicenter (Moscow, Kiev, Almaty) Nutritional Assessment (12) with data for western European women, suggests there is no evidence of widespread undernutrition among women in the Region. Indeed, the percentage of adult women who are overweight (body mass index >25) is considerably higher in the former USSR (30–51%) than in the United Kingdom (24%) (Table 4).

Table 3. Prevalence of wasting in Europe in 0–5-year-old children

Country and year of survey	Age (years)	Prevalence of wasting (W/H <-2sd) (%)
<i>CAR and Turkey</i>		
Tajikistan, 1996	0.5–5	10.9
Uzbekistan, 1996	0–3 (rural)	12.2
	0–3 (urban)	10.2
Turkey, 1993	0–3 (rural)	3.0
	0–5 (urban)	2.9
Kazakhstan, 1995	0–3 (rural)	3.0
	0–3 (urban)	3.7
<i>CIS</i>		
Armenia, 1998	0–5	3.8
Azerbaijan, 1996	0–5	2.9
Russian Federation, 1993	0–5	3.5
<i>Balkan countries</i>		
Federal Republic of Yugoslavia, 1996	0–5 (rural)	2.2
	0–5 (Belgrade area)	3.5
Croatia, 1995–1996	1–6	0.8
Bosnia & Herzegovina		1.3
<i>CCEE</i>		
Czech Republic, 1991	0–5	2.1
Hungary, 1980–1988	0–5	1.6

Criteria used to describe the magnitude of prevalence of wasting:
<5%: no cause for concern; >5%: cause for concern; 10–14%: serious; >15%: critical.

Source: WHO/UNICEF guidelines on infant and young child feeding in the WHO European Region (10).

Table 4. Body mass index and prevalence of overweight in women

Country	Age (years)	Body mass index (mean)	Body mass index >25 (%)
Estonia ^a	19–64	23.3	30
Latvia ^a	19–64	25.8	50
Lithuania ^a	19–64	25.9	51
Kazakhstan ^a	15–48	24.1	32
	15–80	25.8	41
United Kingdom ^b	16–64	24.6	24

Source: ^aNational survey data submitted to WHO. ^bGregory, J. et al. (13).

WHO recommendations on complementary feeding

Since it has been suggested that the nutrient recommendations in the former Soviet countries may not be in agreement with international standards, a WHO task force was established to conduct a review of other former Soviet feeding recommendations. For example, the former Soviet infant and young child feeding guidelines were compared with international recommendations. One of the objectives was to identify practices likely to precipitate or exacerbate the prevalence of anaemia. The following recommendations were identified from earlier literature.

Breastfeeding recommendations

- Late initiation of breastfeeding, up to 6–12 hours after birth was recommended, particularly in sick women, including those with anaemia.
- Pre-lacteal feeds of 5% glucose were recommended until lactation was established.
- *Exclusive* breastfeeding was recommended for the first month (although not widely practised).
- Breast-milk was recommended as the main feed until 4–4.5 months of age.
- Breastfeeding was recommended to cease completely by 10–11 months of age.
- Breastfeeds were recommended to follow a strict schedule, such as:
 - 7 feeds/day (for newborn babies) at 6, 9, 12, 15, 18, 21 and 24 hours
 - 6 feeds/day (for infants aged 2–4 months) at 6, 9.30, 13, 16.30, 20 and 22.30 hours
 - 5 feeds/day (for infants aged 5–12 months) at 6, 10, 14, 18 and 22 hours.

The importance of a night break between feeds was often emphasized. Following the six feeds/day regimen, a 6.5 hour break was advised, and this break increased to eight hours on the five feeds/day schedule. From reviews of former USSR literature (3), it was noted that some authors allowed feeds to deviate by 10–15 minutes from the above schedule.

Non-adapted formulas in the former USSR comprised of:

- diluted fresh or fermented cow's milk with added sugar, vitamins and minerals;
- the introduction of cow's milk diluted with cereal water was recommended at 2–3 months (see recipes from Vingraité, J. (14), e.g. 50 ml pure cow's milk or kefir, 45 ml cereal-water and 5 ml 100% sugar syrup).

Former USSR recommendations for the introduction of weaning foods included:

- additional fluids, primarily tea and water with sugar, were recommended for breastfed infants;
- the introduction of vegetable and "fruit" juices (jam with water) was recommended at one month of age;
- introduction of unmodified cow's milk (at four months) and pure kefir (three months);
- recommendations on the introduction of solids included fruit to be introduced at two months, egg yolk (hard boiled) at three months and curd at four months;
- the addition of sugar and salt solutions to infant foods was sometimes recommended;
- the introduction of cereal porridges with added sugar, syrup, salt and butter was recommended at four months.

It is of particular concern that in cases of diagnosed anaemia (and rickets), porridge and other solids were recommended to be introduced earlier than four months.

Therefore revision of complementary feeding guidelines within most countries in the Region are recommended because:

- the introduction of liquids (tea and water) to supplement breast-milk before four months hinders the successful initiation and continuation of breastfeeding and is an obstacle to the promotion of *exclusive* breastfeeding which offers the maximum benefits to both infant and mother;

- the widespread belief in and recommendation for a high protein diet to ensure good growth and development may result in the early introduction of foods such as curds, kefir and egg yolk which can restrict growth by providing too much protein and insufficient energy for growth.

Recommendations addressing all these issues are covered in detail in the new WHO/UNICEF publication *Guidelines on infant and young child feeding in the WHO European Region* (10), drafts of which are available from the WHO Regional Office for Europe, Copenhagen.

National nutrient and feeding recommendations

International recommendations should be adapted to take into account what kind of food is available and the various cooking methods and traditions in each country. It is also essential to consider specific local availability, accessibility and acceptability of any foods or feeding practices.

The question was raised during the consultation in Geneva (February 1999) on which international nutrition standards should be adopted by former Soviet countries as a basis for their new national recommendations. For protein and energy recommendations, the FAO/WHO/UNU publication (6) and WHO Technical Report No. 797 (15) (available in Russian) are recommended for adults. For infants and young children, the new complementary feeding publication (10) will provide a comparison of national and international recommendations, offering a range of standards. These demonstrate the similarities between international recommendations and each country can select those which are most appropriate for them.

How can women who have lost weight, or are underweight, breastfeed or sustain breastfeeding was a question asked during the Consultation.

There is international consensus, based on scientific evidence from countries where protein energy deficiency is widespread and women are severely undernourished, that even very underweight women can breastfeed successfully. Moreover, in countries such as India where women have much lower body mass indices than in the European Region, lactational failure is very uncommon. In contrast there is a belief in the European Region, perpetuated by health professionals, that loss of weight is a contraindication to breastfeeding. However, this view is not supported by scientific evidence and there was general agreement that the health care culture in most CAR and the former USSR must be changed. Health professionals believe that a large number of women are not capable of breastfeeding (because of anaemia, for example), and so have discouraged breastfeeding whilst promoting the use of infant and cow's milk formula. A UNICEF project conducted in Kazakhstan and Uzbekistan to re-educate health professionals to support and encourage breastfeeding has shown that nearly all women can breastfeed, satisfactorily thereby dispelling this long-standing myth. Health professionals require education and training to provide them with the information they need to reassure mothers that neither weight loss nor being underweight or anaemic are obstacles to successful breastfeeding.

It is important that women receive advice on how to improve their nutritional status. The importance of achieving a balanced diet, including plenty of fresh fruit and vegetables, for all women of childbearing age should be stressed. The *Healthy eating in pregnancy and lactation training module* and booklet for mothers (8), provides useful information, as do the WHO CINDI dietary guidelines (9). Sideropenic (iron-deficient) anaemia of pregnancy may be common, especially where iron intake/absorption are low and/or iron requirements are increased.

Substantial expansion of the erythrocyte mass increases iron requirements in the second and third trimester of pregnancy. It is therefore important to inform women which foods are good sources of iron and to recommend foods containing enhancers of iron absorption (liver, meat, vegetables and fruit). Foods rich in inhibitors of iron absorption should also be highlighted (tea, cereals, fibre-rich foods).

In addition to dietary advice, current European recommendations suggest intakes of 100–200 mg of elemental iron daily for at least three months during pregnancy (the dose of 100 mg is preferred as it gives fewer gastrointestinal side effects and a higher compliance with treatment). After anaemia is corrected smaller doses of iron may be taken as a daily or weekly supplement. Appropriate methods of taking iron supplements (between meals, with liquids other than milk, coffee and tea) should be emphasized because incorrect intake can substantially impair iron absorption from supplements.

A recurring question raised during the Consultation related to the inability of anaemic mothers to breastfeed. For example, in Uzbekistan approximately half of the women do not attempt to breastfeed because there is such a high prevalence of anaemia and a widely held view that anaemic women cannot breastfeed. Moreover, it is assumed by the health professionals that with improvements in women's health (in particular, iron status) there will be a spontaneous increase in breastfeeding rates.

There appears to be a strong belief that anaemia is a contraindication to breastfeeding. However, the international literature and published scientific evidence support the fact that anaemia does not prevent women from breastfeeding. Furthermore, lactation helps to reduce the likelihood of anaemia in a number of ways: i) breastfeeding accelerates the contraction of the uterus to its pre-pregnant size, reducing the risk of haemorrhage and thereby preserving maternal iron stores; ii) the iron cost of breastfeeding is generally less than the cost of menstruation, as a result of the lactational amenorrhoea produced by exclusive breastfeeding for several months; iii) the absorption of iron from the gastrointestinal tract is enhanced in lactating women; and iv) lactation increases mobilization of the body's iron stores.

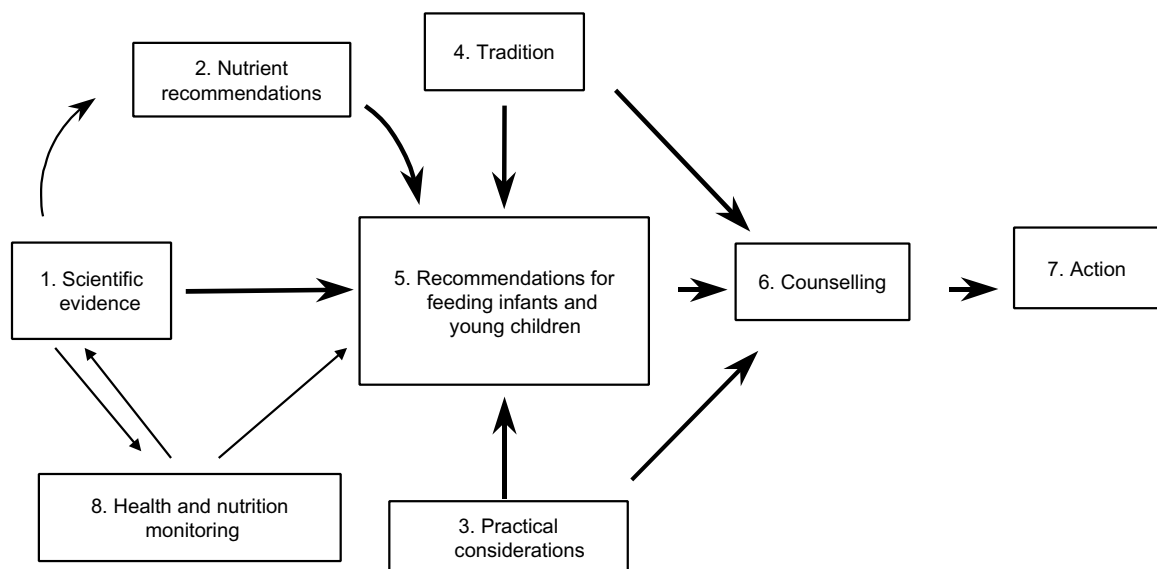
It is clearly important for women to enter pregnancy with optimal nutritional status and for anaemia to be prevented and treated during pregnancy and lactation. However, it should be remembered that low rates of breastfeeding in most countries of the Region are not due to physiological barriers but to psychological ones. Thus, improvements in nutritional status and the prevention of anaemia will not automatically result in increased breastfeeding rates. Extensive campaigns are needed to promote, protect and support breastfeeding, concentrating especially on counselling and psychological support.

In summary, nearly all women if motivated and encouraged can breastfeed successfully even if they are anaemic or underweight. As the countries of the former USSR and the CAR move into a market economy, they represent a new market for infant formula companies to target and exploit. If women are encouraged to buy breast-milk substitutes, this will impede the chances of successful breastfeeding initiation. It is therefore essential that all countries in the Region adopt laws based on the *International code of marketing of breast-milk substitutes* (16) and the Innocenti Declaration (17), in addition to encouraging and supporting all women in their decision to breastfeed. The recommendations in the International Code are primarily for policy-makers but it is vital that health professionals working at the district level understand the importance of this issue.

Importance of infant feeding and outline of the WHO publication on complementary feeding (10)

The WHO publication on complementary feeding provides an overview of current international nutrient recommendations for infants and young children aged 0–3 years (Fig. 1, Box 2). In the publication, practical considerations (Fig. 1, Box 3) and traditions (Fig. 1, Box 4) are discussed in relation to their implications for recommendations on feeding infants and young children (Fig. 1, Box 5). This publication therefore provides a basis for the development of national policies to guide counselling (Fig. 1, Box 6) by health professionals and action by the caregivers (Fig. 1, Box 7).

Fig. 1. Rationale for the development of guidelines on complementary feeding for 0–3-year-olds



Why is the correct and timely introduction of appropriate foods important for infant growth and development?

As the infant grows and becomes more active, breast-milk alone becomes insufficient to meet the infant's full nutritional needs. Therefore other foods are needed to fill the gap in energy and iron and other essential nutrients needed between what is provided by breast-milk and the total nutritional requirements of the child (see diagrams on the transition from exclusive breastfeeding to family foods (18)). This gap increases with age, demanding an increasing contribution of energy and nutrients from semi-solid foods.

Infants do not have the physiological capacity to progress directly from breast-milk to family foods. Transitional foods are therefore necessary to bridge the gap, and are required until about one year of age when the infant is sufficiently mature to consume family foods.

There is increasing evidence that a number of environmental factors which influence early human growth and development have long-term biological or behavioural effects. Examples include the relationship between the intra-uterine environment and adult cardiovascular disease, chronic bronchitis and hypertension; links between infant diet and cholesterol metabolism; and an association between respiratory infection in infancy and chronic lung disease in adult life. It has been proposed that there may be critical periods when environmental factors such as disturbances in nutritional metabolism, may significantly alter the developmental process from its genetic trajectory. This phenomenon is termed “programming”.

Thus, the early human environment encompassing the intra-uterine period and first 18 months of life includes the most critical periods in development. According to the Barker Hypothesis, sub-optimal nutrition during intra-uterine development will not only produce adverse effects in the short term but will also have long-term consequences for health in childhood and into adulthood. It is therefore vital to ensure good maternal nutrition during pregnancy to ensure optimal foetal growth and development. After birth, these foundations should be built on by ensuring that complementary foods are introduced at an appropriate age and offer the best nutrition possible for the growing child. Many recommendations on infant feeding practices in the European Region and CAR are based on former Soviet recommendations which require revision. Furthermore, a number of traditional practices within the Region appear to have adverse effects on nutritional status, particularly of iron. The new WHO complementary feeding publication (10) will offer recommendations on how to improve complementary feeding practices within the Region and demonstrate how such improvements represent a viable strategy for the control and prevention of iron deficiency anaemia.

Recommendations on infant feeding and the control of iron deficiency

Table 5 shows the wide range in prevalence of iron deficiency anaemia (IDA) between different countries in the Region, from 6% in the United Kingdom to 69% in Kazakhstan. If we assume that this difference may be mainly due to diet, changes in the diet should bring about major changes in the prevalence of IDA.

Table 5. Prevalence of anaemia in children

Countries	Year	Age (years)	Mild (%)	Moderate (%)	Severe (%)	Total (%)
Kazakhstan	1995	<3	30	34	5	69
Uzbekistan	1996	<3	34	26	1	61
Kyrgyzstan	1997	<3	24	24	1	49
Azerbaijan	1996	1–2	31	32	3	66
Armenia	1998	<5				30
Bosnia and Herzegovina	1992/1993	<5	19	6	1	26
United Kingdom	1995	1.5–2.5 2.5–4.5				12 6

Source: WHO/UNICEF guidelines on infant and young child feeding in the WHO European Region (10).

Physiological requirements and nutrient recommended intakes (RNI) for iron

Age, gender and physiological status determine iron requirements (Table 6). Iron required before six months is mainly provided by the iron stores of the infant. After this, iron requirements must be provided by iron present in the diet. Requirements are particularly high in infants after six months of age, in young children, and in pregnant and menstruating women. Blood losses during menstruation largely determine the iron requirements of non-pregnant women. The increased iron requirements in infants and pregnant women are needed to meet the requirements due to growth and the formation of new tissues. A small amount of dietary iron is also needed to replace gastrointestinal and dermal losses (approximately 0.2 mg/d in a one-year-old infant).

Table 6. Physiological requirements for iron

Age	µg/kg/day	mg/day
4–12 months	120	0.96
13–14 months	56	0.61
2–5 years	44	0.70
Pregnant women	24	1.31
Menstruating women	43	2.38

Source: WHO/UNICEF guidelines on infant and young child feeding in the WHO European Region (10).

The actual amount of iron absorbed is small compared with the amount usually present in the diet or compared with recommended intakes (Table 7). This is due to the low bioavailability of iron. Usually only 5–15% of the iron present in the diet is absorbed. Absorption is influenced by physiological factors such as an individual's iron status, and by dietary factors including the type of iron (haem or non-haem) and the presence of enhancing and inhibitory factors in the diet. The inhibitors and enhancers in the diet are often stronger determinants of iron status than the actual iron content of the diet (Fig. 2).

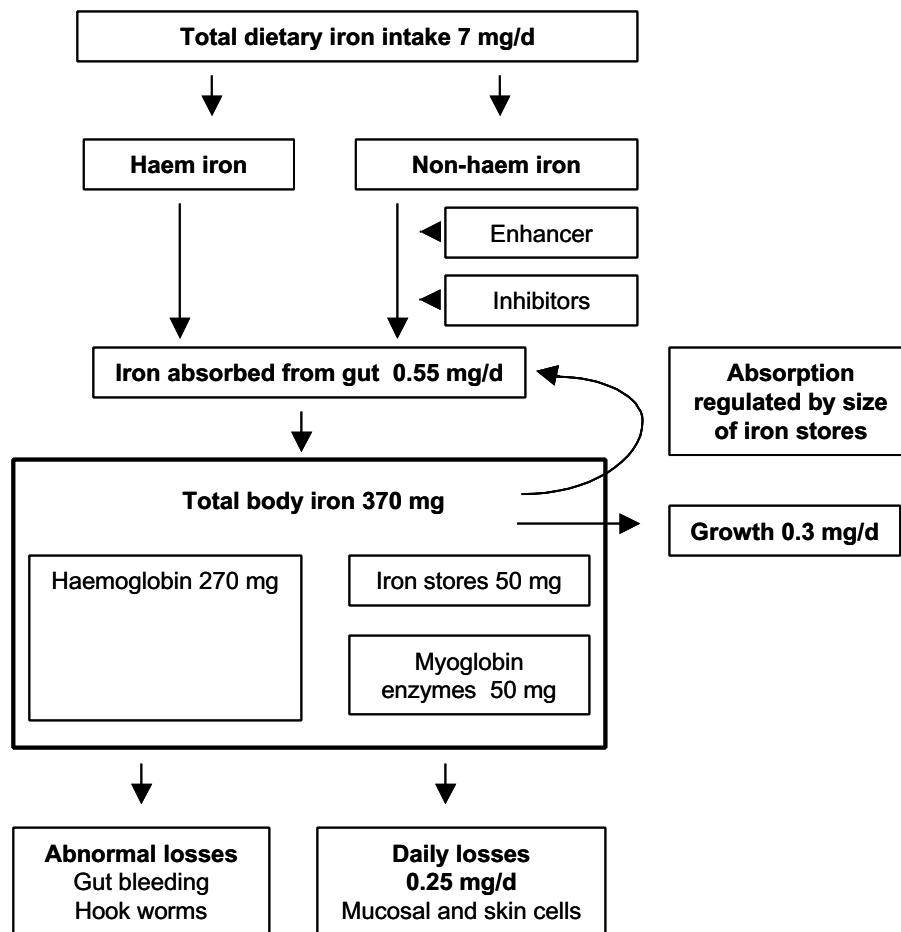
Table 7. Recommended intakes of iron

Age	WHO (mg/g)	USA RDA (mg/d)	European PRI (mg/d)	Nordic (mg/d)	United Kingdom RNI (mg/d)
0–3 months		6.0		5.0	1.7
7–9 months	8.5	10.0	6.0	8.0	7.8
10–12 months	8.5	10.0	6.0	8.0	7.8
1–3 years	5.0	10.0	4.0	8.0	6.9
4–6 years	5.5	10.0	4.0	8.0	6.1

Source: WHO/UNICEF guidelines on infant and young child feeding in the WHO European Region (10).

Examples of four diets demonstrating the increasing net intake of iron with the inclusion of meat or a diet containing both meat and iron-fortified cereal, with the continuation of breastfeeding, are given in Annex 1.

Fig. 2. Iron balance and influencing factors in a 12-month old infant.
The main iron pools are shown. Figures are crude estimates modified from Fomon (19).



Control of iron deficiency

Recommendations 1 and 2

1. Iron deficiency in infants and young children is widespread and has serious consequences for health. Prevention of iron deficiency should therefore be given a high priority.
2. Many studies from the WHO European Region show a high prevalence of anaemia in infants and young children, but its aetiology has not been clearly characterized. There is a need for both regular surveys to monitor the prevalence and studies to determine the degree to which lack of dietary iron is the cause of anaemia in the Region.

Discussion on recommendations 1 and 2

Question to address: what are the right cut off values for Hb in infancy? The cut-off recommended by WHO is 110 g/l, but several groups have suggested a more appropriate value is 105 g/l.

Recommendations 3 and 4

3. Studies on the composition of complementary diets (iron content and other micronutrients and the presence of inhibitors and enhancers) should be carried out with emphasis on the association in children between dietary patterns and anaemia.
4. Optimal iron stores at birth are important for the prevention of iron deficiency in the infant and young child. To ensure this the mother should eat a diet with sufficient iron, including foods which enhance iron uptake and reducing foods which inhibit it.

Discussion on recommendations 3 and 4

Issues concerning the lack of data relating to tea consumption were discussed. This included whether there is any quantitative estimate on what quantity of tea needs to be consumed to significantly inhibit iron absorption? Tea with bread is a traditional meal in the European Region, particularly for poor families. Would the high intake of tea reduce the possible benefits of iron-fortified bread if consumed in the same meal? Studies in adults have shown that iron absorption can be reduced by one third when tea is consumed (20), but the long-term effect of tea-drinking on iron status is not known. There appears to be no quantitative data on the effects of tea on iron absorption during infancy and this is perhaps an area for future research.

In patients with iron overload syndromes such as genetic haemochromatosis, tea has even been used therapeutically, because of its capacity to decrease iron absorption (20). The authors of one study quantified the reduction in iron absorption when tea is consumed in the meal to be 62% compared with water intake (21).

There appears to be a lack of knowledge among the population that tea has an adverse effect on iron status. However, it is now recommended in some campaigns in the Region that children should receive no tea. This is likely to be well accepted and an effective method of improving the iron status of infants and young children, as mothers are very concerned about their child's health.

It was discussed during the Consultation whether a mother is able to sustain milk production of a high nutritional quality during lactation, even when malnourished. Iron in the breast-milk is not greatly affected by maternal diet. However, it is important that a mother's iron status is optimal. If the mother is malnourished and her milk production is compromised, the mother and not the child should receive supplementary food.

Recommendations 5, 6 and 7

5. At birth the umbilical cord should not be clamped and ligated until it stops pulsating.
6. Iron stores at birth in the term infant and the iron provided through human milk are sufficient for the exclusively breastfed infant until complementary feeding is introduced between the end of the fourth and the beginning of the sixth month of life.
7. Pre-term and low-birth-weight infants are born with small iron stores and need more dietary iron. Routine supplementation should be considered.

Discussion on recommendations 5, 6 and 7

7. There was agreement that recommendation 7 should be altered to read: "routine supplementation of pre-term infants should be *recommended*" (i.e. not just *considered*).

Similarly, if the mother is anaemic during pregnancy, she should receive supplements. The following statement should therefore be added to the list of recommendations: “If a mother is anaemic, this should be corrected through supplementation”. If an anaemic mother failed to receive iron supplements during pregnancy, she should still be advised to start breastfeeding and her anaemia should be treated.

Advice to delay the clamping of the umbilical cord until pulsating ceases is particularly relevant to this Region, as this is not generally practised at present. Concerns were raised that late clamping of the umbilical cord may lead to complications in the infant. However, as long as the infant is kept at the same level as the placenta, there will not be an over-transfusion of blood to the infant.

Recommendation 8

8. When complementary feeds are introduced, the need for a dietary supply of iron increases slowly. This can be achieved by introducing good iron sources like meat or pulses, by including foods that improve non-haem iron absorption such as fermented milk products and fresh fruit and vegetables (those containing vitamin C), and by reducing foods or drinks that inhibit iron absorption such as tea (phenols).

Discussion on recommendation 8

The first sentence should be replaced with: “From the time when complementary foods are introduced at about six months, the need (*replace with “requirement” or “the need to provide iron ...” for better translation into Russian?*) for iron from the diet slowly increases.”

Recommendation 9

9. If infants under six months are not breastfed they should receive an iron-fortified infant formula. Cow’s milk should preferably not be given as a major drink before the age of nine months. If infants receive cow’s milk as their main drinking milk before the age of nine months, iron supplementation should be considered.

Discussion on recommendation 9

This may need local adaptation. Since cow’s milk is not only a drink but an important source of nourishment which is widely available and acceptable in the Region, the recommendation to advise against the introduction of cow’s milk as a main drink before nine months may need further consideration. It should be harmonized with current international recommendations.

In summary: breast-milk is best. If breastfeeding is not an option, iron-fortified formula (produced in accordance with standards stated in the Codex) should be used, and where this is not possible and modified cow’s milk is used, people should be made aware of the problems of low iron availability and recommended to use an iron supplement. This recommendation will have to be amended to local conditions and may have to be reconsidered before publication of the final draft of the recommendations.

In addition, something should be included about the importance of fermented milk products in the Region.

Recommendation 10

10. In populations with a high prevalence of iron deficiency anaemia, the establishment of screening programmes for anaemia should be considered.

Discussion on recommendation 10

When there is a high prevalence of IDA, screening is not advised (screening is only implicated when prevalence is low). Therefore replace “screening” with “monitoring”. The recommendation should be amended to “monitoring and treatment”. The issue of who should be screened should be mentioned. The options depend on the epidemiology, i.e. in low-income areas universal screening is advisable, whilst selective screening should be chosen when prevalence is very low, and candidates should be selected depending on certain risk factors.

General discussion

It was recommended that the Baby-Friendly Hospital Initiative (BFHI) should be mentioned in the chapter on iron. Clamping of the umbilical cord could then be incorporated into the context of BFHI because this practice is best for the health of the infant.

It was agreed that the recommendations in the chapter on iron should be cross-referenced to the breastfeeding chapter.

Recent consensus statements on iron supplementation have all indicated that it is not rational to recommend that all pregnant women should receive supplements of iron and folic acid for six months.

In many European countries it is recommended that all pregnant women receive iron supplements as studies indicate that many women have developed anaemia by the third trimester. The importance of achieving uniformity between recommendations was emphasized.

Dietary modifications

In order to prevent iron deficiency in infancy and young childhood the following dietary modifications according to the age of the infant should be recommended:

- before six months:
 - exclusive breastfeeding;
 - avoid unmodified cow’s milk;
 - if breastfeeding is not possible, iron-fortified infant formula is recommended;
 - where formula is not an option, cow’s milk should be modified according to the recipes provided in the publication and an iron supplement should be given;
 - tea should not be given;
- after six months:
 - introduce small amounts of meat
 - increase vitamin C intake by giving puréed vegetables and fruit
 - continue breastfeeding – recommend prolonged breastfeeding for two years
 - cow’s milk should be introduced slowly and intake limited to 500 ml/d
 - use fermented cow’s milk products
 - use iron-fortified foods.

Integrated management of childhood illnesses (IMCI) **WHO Division of Child Health and Development (CHD)**

IMCI is a new approach that provides basic care for the most common childhood illnesses, as well as preventive measures and improved family and community practices. Its aims are to reduce deaths, reduce the frequency and severity of illness and disability among children and contribute to improved growth and development.

The strategy combines aspects of nutrition, immunization and several other important influences on child health, including maternal health. The set of interventions for the integrated treatment and prevention of major childhood illnesses aims to improve practices in both health facilities and the home. The core intervention is integrated case management of the five most important causes of childhood deaths – acute respiratory infections (ARI), diarrhoea, measles, malaria and malnutrition – and of common associated conditions.

Malnutrition is associated with over 50% of childhood deaths. In many settings, inadequate feeding practices have been identified as a major contributor to malnutrition. Given that most severely malnourished children are not hospitalized, developing household approaches to prevent and manage severe malnutrition is a priority. Research will include examining how health facility-based and community-based interventions can promote feasible and sustainable improvements in feeding practices.

The progress of IMCI in the European Region

The official recommendation agreed upon by all experts from the Region attending the Copenhagen meeting (22) was as follows.

Anaemia is a significant problem in pregnant women, women of childbearing age and young children up to three years of age. In the majority of cases, iron deficiency is the most likely cause. However, other possible causes including thalassemia and hookworm (for example, in Azerbaijan 26% of men are also anaemic) and heavy metal absorption due to environmental contamination may also contribute to anaemia. Therefore the primary approach to the anaemia problem should be nutritional. This should include:

- the recommendation of exclusive breastfeeding up to six months of age with the elimination of cow's milk;
- the identification of complementary foods that provide adequate iron, e.g. meat and fish;
- the promotion of vitamin C-containing foods (fruit and vegetables) in the complementary feeding diet;
- the recommendation to limit the consumption of tea, or to consume tea at different times from other complementary foods.

In addition, it was also recommended that where breast-milk substitutes are unavoidable, the second choice should be iron-fortified formula (produced in accordance with standards stated in the Codex). Where cow's milk is unavoidable, prophylactic iron drops should be given.

The adaptation of the feeding recommendations for use in IMCI should use international norms for the energy and protein content.

Based on these principles the WHO Division of Child Health and Development (CHD), in collaboration with ten other WHO programmes, UNICEF and other numerous agencies and institutions, are introducing the IMCI strategy to the WHO European Region, starting in Kazakhstan in 1996. An initial pilot survey conducted for IMCI on the adaptation of infant and young child feeding recommendations found that lack of calories was not a problem. However, maternal knowledge represented a significant barrier to improvements in infant and young child feeding practices. Meals were found to lack variety, were of low frequency, the types of food offered were not ideal, and the preparation of food and how it was given to the child could be improved upon. When these issues were addressed by field workers, mothers were found to be very willing to try new things and some suggestions, for example advice on the inclusion of night breastfeeds, were particularly well accepted. Even with minimal resources it was possible for mothers to find ways to improve the feeding of their child.

Maternal mortality rates

The CAR have the highest maternal mortality in the European Region. With regard to maternal mortality, several studies have found maternal anaemia associated with high maternal morbidity and mortality, as well as intrauterine growth retardation, low birth weight and an increase in perinatal mortality. From the Regional data, it is therefore possible to surmise that maternal anaemia is an underlying cause or co-factor for the high incidence of infant mortality.

It is important to stress that iron deficiency and anaemia are not solely the problems of the haematologists and nutritionists. They should be tackled as a public health issue, with input from obstetricians and health professionals with a neonatal and child development perspective.

- Abortions contribute to between 10 and 30% of maternal mortality, and abortion remains the primary contraceptive method used in eastern Europe and particularly in CAR and the Caucasus.
- Sexually transmitted diseases are increasing in most eastern European countries.

While iron deficiency is likely to be the most important cause of maternal anaemia in the Region, other factors should also be taken into consideration, including repeated abortion, infections and parasites. Thus, when one looks at the measures taken to address the problem from a maternal, neonatal and child perspective, it is possible to identify several interventions which are essential to tackle the problem:

- *family planning objectives*: to prevent unwanted pregnancies, to decrease abortion rates, to decrease the total number of pregnancies, and to increase the time between pregnancies: if achieved, these measures are likely to have a positive impact on maternal iron status;
- *cord clamping*: to increase the iron stores of the newborn baby it is important to ensure the satisfactory iron status of the mother during pregnancy and to avoid early clamping of the umbilical cord; if the umbilical cord is not clamped and then ligated until it stops pulsating, more red blood cells will be transferred from the placenta to the newborn baby;
- *breastfeeding*: from a mother's perspective, the iron cost of breastfeeding is generally less than the cost of menstruation; therefore, the promotion of exclusive breastfeeding until 4–6 months of age causing lactational amenorrhoea will contribute to the control of IDA in women of reproductive age.

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² Countrywide Integrated Noncommunicable Diseases Intervention

Annex 1

FOUR DIETS DEMONSTRATING THE INCREASING NET INTAKE OF IRON WITH THE INCLUSION OF MEAT OR CONTAINING BOTH MEAT AND IRON-FORTIFIED CEREAL, WITH THE CONTINUATION OF BREASTFEEDING³

Iron content and bioavailability

Items	Content (mg/100g)	Absorption (%)	Net absorption (µg)
Breast-milk	0.05	50	25
Cow's milk	0.05	10	5
Rice (cooked)	0.40	2	8
Carrots	0.5	4	20
Beef	1.2 (haem) 1.8 (non-haem)	23 8	460
Fe fortified cereal (cooked)	12.0	4	480

Iron availability. Example 1. Very low iron diet

	Fe (mg)	Absorption (%)	Net absorption
Cow's milk 600 ml	0.3	10	0.03
Cereal 150 ml	0.6	5	0.03
Vegetable 50 gm	0.5	5	0.03
Total			0.09

% requirement $0.1/0.8 = 12\%$

Example 2. Breast-milk-based

	Fe (mg)	Absorption (%)	Net absorption
Breast-milk 600 ml	0.3	50	0.15
Cereal 150 ml	0.6	5	0.03
Vegetable 50 gm	0.5	5	0.03
Total			0.21

% requirement $0.2/0.8 = 25\%$

Example 3. Diet with meat

	Fe (mg)	Absorption (%)	Net absorption
Breast-milk 600 ml	0.3	50	0.15
Cereal 150 ml	0.6	8	0.05
Liver 50 gm	0.8 (non-haem) 1.2 (haem)	10 23	0.08 0.28
Total			0.56

% requirement $0.56/0.8 = 70\%$

³ Source: Presentation by Ray Yip on iron content and bioavailability.

Example 4. Diet with iron-fortified cereal

	Fe (mg)	Absorption (%)	Net absorption
Breast-milk 600 ml	0.3	50	0.15
Fruit/vegetables 50 gm	0.5	5	0.03
Cereal + Fe 120 gm	12.0	4	0.56
Total			0.74

% requirement $0.2/0.8 = 93\%$

Annex 2

PROGRAMME

Wednesday 3 February 1999

Chairperson: R. Shrimpton

Rapporteur: U. Kartoglu

09:00 – 10:00 Introduction and objectives

Opening remarks and welcome statement by UNICEF/WHO (*J. Donohue/A. Robertson*)

Introduction of participants

Consultation goals and mode of work (*A. Tibouti*)

Prevalence of iron deficiency and iron deficiency anemia global trends
(*B. de Benoist/R. Yip*)

10:00 – 11:00 *Break*

11:00 – 12:30 Assessment of the current situation

Existing information on nutrient intake and nutritional status of young children and women in the Region (extent and magnitude of consequences):

CEE/CIS & Baltic States (*A. Baturin/G. Gerasimov*)

CARK (*N. Scrimshaw/A. Sharmanov*)

Armenia/Azerbaijan (*F. Branca/A. Parvanta*)

Russian Federation (*A. Parvanta/M. Lazarev*)

12:30 – 14:00 *Lunch*

Chairperson: V. Mannar

Rapporteur: D. Popovic

14:00 – 16:00 Major intervention approaches for the prevention and control of IDA

Flour fortification options and strategies (*V. Mannar*)

Role of supplementation to prevent IDA (*N. Scrimshaw/R. Yip*)

Programme support and dietary change (*G. Gleason/A. Saparbekov*)

16:00 – 16:30 *Break*

16:30 – 18:00 Programme experience on IDA control in CEE/CIS and MENA/EMRO region

Practices on addressing IDA during USSR (*A. Baturin/ G. Gerasimov*)

CARK experience in addressing IDA (priorities, possibilities, constraints and lessons learned) (*N. Scrimshaw/CARK team*)

MENA/EMRO experience in fortification/challenges in sustainability
(*A. Verster/ S. Shuqaidef*)

18:30 – 20:00 *Reception*

Thursday 4th February

Chairperson: T. Sharmanov
Rapporteur: T. Gotsadze

9:00 – 10:30 Evidence for need to control IDA

Functional consequences of ID and IDA on children and women
(*A. Malaspina and ILSI team/N. Scrimshaw*)

Outcome of UNICEF/WHO/UNU/MI Technical Workshop in preventing IDA among women and children and its implication for CEE/CIS/BS region
(*R. Shrimpton/ N. Scrimshaw/V. Mannar/B. de Benoist*)

10:30 – 11:00 *Break*

11:00 – 12:30 Complementary feeding and the control of IDA

Review of former USSR recommendations (*WHO*)

Current practices in complementary feeding (*F. Branca*)

Complementary feeding and IDA (*K. Michaelsen*)

12:30 – 14:00 *Lunch*

Chairperson: A. Baturin

Rapporteur: R. Elsom

14:00 – 15:30 European recommendations on infant and young child feeding

Outline of new recommendations on complementary feeding in the Region and its role in the improvement of IDA among children (*K. Michaelsen*)

Recommended nutrient intakes (*A. Robertson*)

Healthy eating during pregnancy and lactation (*A. Robertson*)

15:30 – 16:00 *Break*

16:00 – 18:00 Linkages with other programmes and inter-agency collaboration

Linkages with other programmes: IMCI (*I. Lejnev*)

Reproductive and Maternal Health (*V. Mangiaterra*)

Breastfeeding/BFHI (*A. Robertson/H. Khatib*)

Outline of potential technical assistance from participating organizations and their role in the Region. Panel discussion moderated by J.J. Donohue

(*G. Maberly/A. Malaspina/ V. Mannar/N. Scrimshaw/others*)

Friday 5 February

Chairperson: R. Kösa

Rapporteur: A. Malyavin

9:00 – 11:00 Working groups

Background information on the working groups and expected outcome (*G. Gleason*)

Working groups

Advocacy and communication on IDA programmes (*G. Gleason*)

Expanding coverage and improving effectiveness of supplementation programmes for pregnant women, young children and adolescent girls (*N. Scrimshaw/R. Yip*)

Food fortification opportunities/strategies/support measures (communications, regulation, quality assurance) (*G. Maberly/V. Mannar/I. Parvanta*)

Components of national plan of action and regional plans

(R. Shrimpton/A. Verster/ A. Robertson)

Role of complementary feeding in preventing IDA *(K. Michaelsen/A. Robertson)*

11:00 – 11:30 Break

11:30 – 12:30 Session continued: group work continued

12:30 – 14:00 Lunch

14:00 – 15:30 Presentation in plenary

15:30 – 16:00 Break

16:00 – 17:45 Recommendations and conclusions

Drafting of recommendations (representatives of working groups)

Conclusions and recommendations for future action

(J.J. Donohue/A. Roberston/ G. Gleason)

Annex 3

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