NUTRITION DURING LATE INFANCY : THE FOLLOW - ON CONCEPT

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The feeding of the older infant should be a continuation of the good nutrition provided by breast milk of formula feeding.

After four or five months, mothers start including small amounts of semisolid and solid foods into their babies' diets. Foods added to the diet of the older infant should be of the type supporting his development. This way it is possible to introduce a variety of foods as well as develop the infant's chewing and swallowing reflexes. However, the selection of wrong foods during this period, may lead to malnutrition and its consequences. Since there is disagreement on the nutritions for babies during weaning, the nutritional recommendations given in RDA are broadly accepted as safe and appropriate amounts. During the weaning period, milk and milk foods continue to be important.

INTRODUCTION :

The importance of a proper weaning diet : Good nutrition and good feeding habits begin with the baby's first breast or formula feeding and are important for normal physical growth, optimal mental development, and maintenance of good health throughout the baby's early years. After four or five months, mothers usually begin to expand their babies, diets to include small amounts of semisolid and solid foods.

A well - balanced, well - tolerated transition diet is essential to assure continuity in meeting the growing nutritional needs of the older baby during weaning. Sound nutrition during the weaning period provides important advantages in such areas as :

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- weight gain and growth
- resistance to infection
- physical and mental development

Growth fall —off : Recent studies show that, even more than previously expected, improper feeding during weaning may lead to malnutrition and its sequelae. The results of a study (1), conducted among infants in an Asian population indicated that growth fall - off (ie, lethargy, susceptibility to infection, deterioration of muscle tone, and diminished rates of growth) rose among babies during the weaning period - from six to eighteen months of age. These malnutrition - related effects resulted from

- inadequate amounts of solid foods to meet nutritional needs
- the absence or abrupt withdrawal of milk or milk food from the weaning diet.

THE COMPLETE WEANING DIET :

The complete weaning diet should consist of solid or semi-solid foods and should include milk for calorie and protein supplementation. Generally, as the baby grows, neither solid food nor milk alone will provide the quantity of nutrients necessary to sustain rapid growth and increased activity.

Milk or milk food that supplements a weaning diet is sometimes referred to as follow- on food and is useful in providing added protein, calories, iron, and other nutrients necessary for the growing baby.

THE NUTRITIONAL NEEDS OF OLDER BABIES :

Researchers disagree about the appropriate nutritional standards for babies during weaning. However, the nutritional recommendations outlined in **Recommended Dietary Allowances** (2) (RDA) are broadly accepted as safe and appropriate nutritional allotments. They reflect current research on the various nutrients and incorporate a consensus of opinion among experts in the nutrition field.

Because RDA figures apply to the average nutritional needs of a normal population, babies with specific health problems, such as low birth weight, dietary deficiencies or illness, would obviously require special adjustment of the RDA.

Unless otherwise noted, all nutrient values for foods that appear in the following tables are taken from **Recommended Dietary Allowances** (2).

Protein : Perhaps the most important element in the weaning diet is protein, which supports the synthesis of tissues during this period of rapid growth. Although the protein requirment per unit of body weight decrease, overall protein intake is increased as the baby grows. Recommended protein intake is 2.2/kg and 2.0/kg for the age of 4 and 8 months as reference protein.

High quality protein is of particular importance to weaning babies because it provides for

- intake of all essential amino acids
- easy digestion
- rapid absorption
- maximal utilization
- optimal growth

Protein quality is often expressed by one of the following methods.

Protein efficiency ratio : The protein efficiency ratio (PER) is determined in rats and is defined as the weight gain per gram of protein fed; it is a formula used to measure the extent to which a protein is utilized by the body. The standard for protein in terms of PER is considered to be casein, having a PER of 100 %.

Amino acid content : A second measure of the quality of protein is its essential amino acid content. The RDA recommends nine amino acids as essential for growing babies (Table 1).

Tablo 1 : Essential Amino Acid Requirements(*)

Amino Acid	Requirement (mg/kg body weight/day)	Fraction of High Quality Protein (mg/g of protein)
Histidine	33	17
Isoleucine	83	42
Leucine	135	70
Lysine	99	51
Methionine + cystine †	49	26
Phenylalanine + tyrosine †	141	73
Threonine	68	35
Tryptophan	21	11
Valine	92	48

(*) About 35 % of a baby's dietary protein intake must be provided as essential amino acids.

† For infants 4 to months old.

† Cystine can raplace part of the requirement for methionine : tyrosine can replace part of the requirement for phenylalanine.

Chemical score : Chemical score determination is based on the amino acid content of a particular protein in relation to the amino acid content of a standard. Standards used in calculating chemical score are.

- optimal essential amino acid pattern (Table 1)
- whole egg protein

Both of these standards are assigned a chemical score, or nutritive value , of 100. Although this method agrees with the biologic value determined for protein, it does not measure protein digestibility, as does the PER.

Carbohydrates/Fats :

The older baby's increased energy requirements must be supported by an increase in caloric intake. As the baby grows, energy requirements decrease per unit of body weight, but total intake requirements continue to increase. Recommended intake is 115 kcal/kg and 105 kcal/kg for the age of 4 and 8 respectively.

Carbohydrates and fats should be present in a balanced ratio in the weaning diet. Utilized as energy sources by the body, calories support physiologic processes vital to overall body functioning.

Carbohydrates provide energy in the form of starches, monosaccharides, and disaccharides. These are an important energy source for brain tissue. Dietary fats function as carriers of fat - soluble vitamins. In addition they provide essential fatty acids which,

- maintain the function and integrity of cellular and subcellular membranes,
- regulate cholesterol metabolism,
- function as precursors for hormone - like compounds such as prostaglandins.

Current research stresses the importance of linoleic acid for babies. According to one authority, it is recommended that linoleic acid provide 2 % to 3 % of total energy intake (3).

Minerals :

Proper intake of minerals in the weaning diet is necessary to

- support physiologic processes
- replace fetal stores
- prevent deficiencies

The RDA takes into account current research findings in determining the minerals, trace elements, and electrolytes necessary to the human diet (Table 2).

Table 2: Recommended Daily Intake of Minerals, Electrolytes, Trace Elements and Vitamines

	Age	
	0 - 6 mo	6 - 12 mo
MINERALS		
Calcium (mg)	360	540
Phosphorus (mg)	240	360
Magnesium (mg)	50	70
Iron (mg)	10	15
Zn (mg)	3	5
Iodine (μg)	40	50
TRACE ELEMENTS		
Copper (mg)	0.5 - 0.7	0.7 - 1.0
Manganese (mg)	0.5 - 0.7	0.7 - 1.0
Fluoride (mg)	0.1 - 05	0.2 - 1.0
Chromium (mg)	0.01 - 0.04	0.02 - 0.06
Selenium (mg)	0.01 - 0.04	0.02 - 0.06
Molybdenum (mg)	0.03 - 0.06	0.04 - 0.08
ELECTROLYTES		
Sodium (mg)	115 - 350	250 - 750
Potassium (mg)	350 - 925	425 - 1,275
Chloride (mg)	275 - 700	400 - 1,200

	Age	
	0 - 6 mo	6 - 12 mo
FAT - SOLUBLE VITAMINS		
Vitamin A* (μg RE)*	420	400
Vitamin D (μg)	10	10
Vitamin E (mg α — TE)**	3	4
WATER - SOLUBLE VITAMINS		
Vitamin C (mg)	35	35
Vitamin B_1 (thiamine, mg)	0.3	0.5
Vitamin B_2 (riboflavin, mg)	0.4	0.6
Niacin (mg NE) ∅	6	8
Vitamin B_6 (mg)	0.3	0.6
Folic acid (μg)	30	45
Vitamin B_{12} (μg)	0.5	1.5
Vitamin K_1 (μg) +	12	10 - 20
Biotin (μg) +	35	50
Pantothenic acid (mg) +	2	3

(*) 1 Retinol equivalent = 1 μg retinol or 6 μg β - carotene

(**) 1 mg d_α tocopherol = 1 α — TE (tocopherol equivalent).

(∅) 1 NE (niacin equivalent) is equal to 1 mg of niacin or 60 mg of tryptophan.

(+) Because information on which to base these allowances is not available. Figures are not given in the main table of allowances published in Recommended Dietary Allowances (RDA).

Iron : The weaning diet of the older baby should include a proper intake of iron. By the age of four to six months, fetal stores of iron have been depleted, making iron intake imperative. A daily supply of dietary iron is essential to maintain adequate formation of hemoglobin and prevent iron deficiency anemia.

Zinc : Fetal stores of zinc decline during early infancy. Deficiency of zinc can result in

- loss of appetite
- failure to grow
- impaired wound healing
- skin changes.

Calcium : This nutrient, along with phosphorus, is of particular importance to the weaning baby in promoting proper bone and skeletal formation. Calcium is also a necessary nutrient for

- blood coagulation
- myocardial function
- muscle contractility
- controlling the excitability of nerves.

Vitamins

A sound weaning diet must include a balanced profile of vitamins. Vitamins are necessary for

- prevention of infection
- support of tissue growth
- prevention of deficiency states

The RDA recommends that 13 vitamins be included in the weaning diet (Table 2).

Vitamins C and D : The weaning baby has a particular need for vitamins C and D, as both are directly involved in proper tissue growth and neither appears to be synthesized by the body.

Specifically, vitamin C plays a role in the

- metabolism of amino acids
- formation of collagen
- absorption of iron.

Vitamin D increases the utilization and retention of calcium and phosphorus, thereby supporting the normal mineralization of bone.

THE ROLE OF SOLID FOODS :

As babies grow and become more active, solid foods are introduced into the diet to provide larger quantities of basic nutrients. Presenting the baby with a variety of foods during weaning should

- supplement milk in providing the proper balance of essential nutrients
- form the basis of a full adult diet.

Weaning practies :

The schedule by which foods are introduced to the baby's daily diet is influenced by the preference of the mother and doctor, but certain nutritional and practical standards should be met to ensure proper intake of nutrients and to respond to problems that might arise. Some guidelines for proper weaning are :

1. Introduce new foods one at a time, one per week.
2. Make sure the baby is ready for nonliquid foods.
3. Serve solid foods in small portions; portion sizes may be increased as the baby grows.
4. Serve foods at approximately the same times and intervals each day.
5. Food should not be forced if the baby does not readily accept it. Instead, the food should be served again a week or two later.
6. Continue to serve milk food as the baby is weaned. Gradually decrease the amount as solid foods increase.
7. If the baby has any unusual reactions to a new food, it should be withdrawn immediately. Any unusual symptoms should be reported and should receive prompt medical attention.

Serving appropriate solid foods and milk food according to these guidelines helps to ensure

- sound nutritional intake during weaning
- a healthy transition to a full adult diet.

THE ROLE OF MILK FOOD :

Milk food, or follow - on food, provides a nutritious supplement to a regular diet of solid foods during weaning. A properly

balanced milk food provides the correct amounts of all nutrients to help ensure a complete weaning diet.

Milk food is a sound alternative to other types of milk (eg; yoghurt, condensed milk, evaporated milk, dry milk, and whole cow's milk), as these other forms - in the absence of appropriate solid foods - may not provide adequate nutrition for a weaning baby.

Milk food is especially important in the early stages of weaning, when a baby cannot take in enough solid foods to meet his nutritional needs.

ÖZET

BEBEĞİN İLERİ AYLARDAKİ BESLENMESİ : YALNIZ SÜT VERİLMESİNİ İZLEYEN BESLENME DÖNEMİNİN KAVRAMI

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Bebeğin ileri aylardaki beslenmesi, anne sütü ya da formül beslenmesinde kazanılan iyi beslenmenin devamı olmalıdır. Anneler genellikle dördüncü, beşinci aydan sonra bebeklerinin beslenmesine az miktarlarda yarı - katı ve katı yiyecekler ilave etmeye başlarlar. İleri aylardaki bebeğin beslenmesine ilave edilen besinler onun gelişimine yardımcı olacak türde olmalıdır. Böylece hem alınan besinlerin kapsamı arttırılır, hemde çiğneme ve yutma refleksi geliştirilir. Ancak bu dönemde yanlış besinlerin seçimi malnütrisyon ve sonuçlarına neden olabilir. Yalnız sütle beslenme döneminden sonra verilecek besinler konusunda görüşler aynı olmadığı için RDA tarafından önerilen miktarlar genellikle güvenilir ve uygun miktarlar olarak kabul edilmektedir.

Bu dönemde de süt ve sütlü besinler önemini korumaya devam etmektedir.

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