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CURRENT STATUS AND FUTURE TRENDS IN INFANT FEEDING

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Infant feeding and infant nutrition has been and continues to be dynamic. Many changes have resulted from developments in Nutrition Science as it relates to infants. The infant nutrition developments, in turn, influence foods and feeding practices.

An adequate diet is more critical for infants than any other population group because their nutrient requirements per unit body weight are greater than at any other age. Unfortunately, this requirement is complicated by the fact that not all foods are appropriate for infants as a group. Developmental characteristics and nutrient needs vary among infants, and the ability to properly prepare and to present the food must be considered. Additional limitations include cultural preferences and availability of foods. Infants are a unique population group. To quote a frequent cliche, "Infants are not little adults."

For these reasons, infant feeding is a well studied and reasonably well controlled part of Nutrition Science.

The current status of infant feeding has been relatively stable for several years after a decade of dramatic change. Elaboration on current status will take the form of description of recommendations, presentation of recommendations and compliance with recommendations.

Breast-feeding is universally accepted and endorsed as the most desirable method for initial feeding for infants-through the first several months. Dramatic changes have occurred in the incidence of breast-feeding. Attitudes and recommendations surrounding breast-feeding have formed a major basis for the current status of infant nutrition.

The change in breast-feeding frequency was dramatic between 1971 and 1985, changing from approximately 25% of babies breast-fed immediately after birth to almost 60%. The percentage for that age group has been approximately 63% since 1985. The most recent published information is from 1989, which indicates that the level is about the same(Figure. 1).

Even more dramatic were changes in breast-feeding after 6 months. Approximately 28% were still breast-fed at 6 months in 1989, compared to only 5.5% in 1971(Figure. 2).

Several other factors must be considered in these studies; working vs. non-working and ethnic origin. These data are for non-working mothers, and are for purposes of example.

The advantages of breast-feeding have been well established and documented. They will be briefly noted in terms of physiological benefits and nutritional benefits.

The nutritional benefits are ideally suited for the immature infant digestive system.

The disease fighting properties can be further detailed :

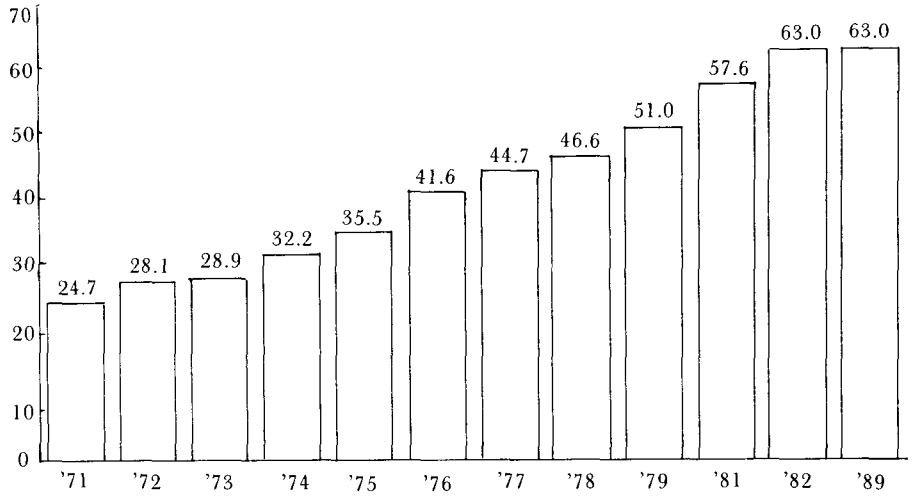

Fig. 1. Percentage of infants receiving human milk in hospital.

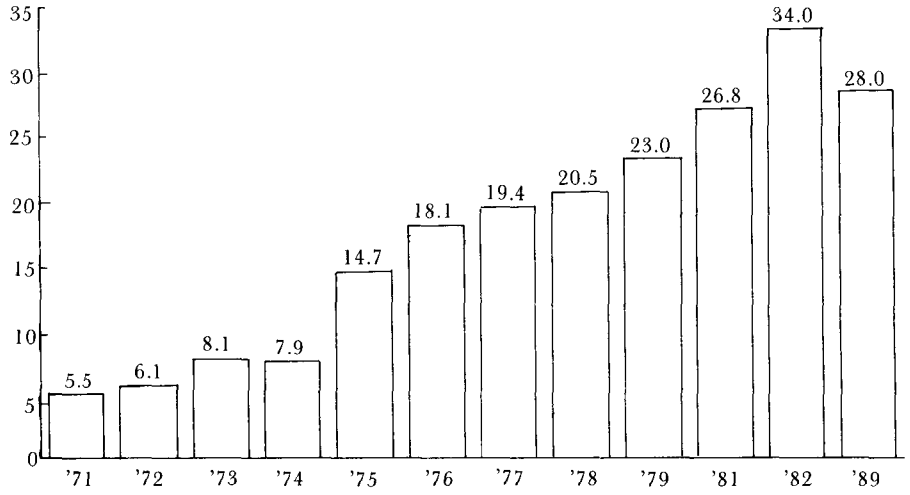

Fig. 2. Percentage of infants receiving human milk at 5-6 months of age.

Breast Milk
Physiological Benefits

- Low renal solute load
- High bioavailability of nutrients
- Disease fighting properties

Breast Milk
Nutritional Benefits

- Fat
- Carbohydrate
- Protein
- Iron
- Zinc
- Calcium/Phosphorus
- Sodium/Potassium
- Vitamins

Breast Milk
Disease Fighting Properties

- Bifidus factor
- Iron binding protein
- IgA antibodies
- Enzymes
- Nonspecific factors

A point to be made is that the frequency has been stable since 1982. The changes that have occurred were, in large part, the result of recommendations by The American Academy of Pediatrics(APP), The European Society for Gastroenterology and Nutrition(ESPGAN) and The World Health Organization(WHO) among several others. The period of time when these recommendations were made was between 1970 and 1982.

Changes in introduction of foods other than breast milk or infant formula-supplementary foods-have responded to recommendations. The AAP and Canadian Pediatric Society(CPS) have presented most direct and clearly defined. Recommendations with the most distinct results.

The recommendations by these groups are summarized in the following slides, hopefully in a logical fashion. Feeding periods for definition of guidelines are important, followed by indicators or signals for introduction of foods.

The goals of infant feeding recommendations are to provide sound scientific facts for realistic consumer communication. Feeding periods are the most understandable for this purpose.

The Infant Feeding Periods Are :

O to 6 Months —Nursing(or milk)

4-6 to 12 Months—Transitional(begin solids)

After 12 Months —Modified Adult(family foods)

Characteristics for each of the periods can be defined in physiological and physical terms. The following describes these findings in further detail :

The nursing period is that time when breast milk, or the appropriate infant formula, is the only source of nutrients.

Physiologic characteristics that support this period are :

Physiologic Characteristics
Nursing Period-Birth to 4 Months

Mouth	• Extrusion reflex present • Can only swallow liquids
Intestines	• Enzymes present to digest breast milk or formula • Other enzyme systems developing
Kidneys	• Immature • Can handle limited renal solute load

Food applications are consistent during the nursing period.

Feeding Implications
Nursing Period-Birth to 4 Months

Nutrient Needs	• High for growth and development
Food	• Milk feedings only —Breast milk —Infant formula —Specialty formulas(if reguired)

The transitional period is critical since nutrient needs remain high and judgement is necessary to ensure introduction of appropriate foods.

Definitions are as follows :

Physiologic Characteristics
Transitional Period-4-6 to 12 Months

Mouth	• Extrusion reflex relaxed
	• Tongue effective to move food to back of mouth
Intestines	• Activity adequate to digest foods
Kidneys	• Approach functional maturity
	• Can accommodate renal solute load

Food applications during the transitional period :

Feeding Implications
Transitional Period-4-6 to 12 Months

Nutrient Needs	• High for growth and development
	• Iron Stores depleted
	• Replacement of foods other than milk
Food	• Milk decreased
	• Iron source(cereal)initiated
	• Single-ingredient foods-variety

During the modified adult period, maturation of physiological and physical systems permits addition of a variety of foods. Description of physiological change follows :

Physiologic Characteristics
Modified Adult Period-Greater than 1 Year

Mouth	• Teeth have erupted
	• Chewing allows range of textures
Intestines	• Functionally mature
Kidneys	• Functionally mature

The developmental periods are helpful in communication with parents, as the measurement criteria can be placed in practical perspective.

The recommendations are also compatible with signals for development. The developmental signals or observations have been identified in detail and are compatible with readily recognized physical and physiological development. Another advantage is that the practical measurements can be identified by parents with their individual infant.

The Individual Points Are :

- Birth weight has doubled
- Weight has reached 6 kg(13 lbs.)
- Breast-fed infant feeds more than 8-10 times in 24 hours
- Formula-fed infant consumes more than 1 guart(or liter) of formula per day
- Baby is often hungry, as observed by the parent

These events usually occur when the infant is 4-6 months old.

The recommendations are compatible with nutrition principles and pediatric practice. The purpose of stating in several ways is to provide an understandable form for parents.

Additionally, to provide communications input, procedural recommendations are important. These may be suggested as follows :

Recommendations for Introduction of New Foods

- Add only one new food at a time
- Offer small portions
- Start cereal feeding with "single variety"
- Introduce single-ingredient foods before combinations of ingredients

The principles involved have been thoroughly reviewed, and can be adapted for individual infants and feeding situations.

As a result of the recommendations, infant nutrition for infants is favorable. Foods have been adapted which fit the recommendations; products

are available to insure quality foods and quality nutrition. Infant nutrition studies have been published, and can be presented which support the nutritional soundness of the recommendations and the understanding of practice by parents who can idnentify with the practical signals.

Another approach has been applied to evaluate the nutrition of infants. Concerns have been expressed. Some represent scientific concerns for pediatricians and nutritionists. Others represent global concerns for the entire population. In most instances, the evaluations provide either confusion or concern for parents-whose major responsibility is the best care and nutrition for infants.

The major issues and very brief resolution of the perceived problems follow:

- Excessive salt/sodium intake-salt has not been added to baby food since 1977.
- Overfeeding-infant obesity/excess calories. Serving sizes and calorie concentrations have been adjusted to serve the best nutritional interest for infants. Infant foods do not have a direct relationship to incidence or severity of obesity.
- Food Sensitivity-single-ingredient foods. The availability of foods and of information has reduced the incidence of food sensitivity.

What lies in the future for infant foods? Many problems remain to be addressed. Some of the changes, some of the projections and some of needs can be addressed.

The consumer is well-informed. The pediatric and nutrition societies have access to excellent information. These facts provide an excellent basis for the future.

The challenge for the infant food industry is to provide infant foods to fulfill the needs for the infant, and to provide sound feeding and nutrition information. One approach to a feeding program which is sound nutritionally and provides a communications method which can be understood by consumers is a feeding plan. An example follows;

First Foods®

Texture	• Pureed-Extremely small particles
Serving	• 71 grams(small)
Ingredients	• Single-ingredient
Label Identification	• Orange

Second Foods™

Texture	• Pureed(less finely)
Serving	• 113 grams(may be multiple)
Ingredients	• Single and combination
Label Identification	• Blue

Third Foods™

Texture	• Ground and chopped
Serving	• 170 grams(may be multiple)
Ingredients	• Single and combination
Label Identification	• Red

This represents a feeding plan-an understandable and logical format. Age has been avoided as a criterion since individual variability cannot be accommodated.

Several concerns remain; all the problems are not solved.

- *Appropriate Foods for Older Infants.* Older tnan one year. Family foods are not always appropriate.
- *Iron Deficiency Anemia.* Iron deficiency can be cured by administration of dietary iron. Infant cereal represents the most universal vehicle for iron administration.
- *Food Sensitivity/Food Allergy.* Many foods are available. Much remains to be done with identification of food sensitizing agents; gluten, lactose, egg protein, milk protein are the

most frequent. Variations occur depending on dietary habits, geographic location and genetic predisposition.

- *Environmental Contaminants.* Pesticides represent a threat. Environmental control has not been adequate, but there is no evidence of risk for infants. Other environmental contaminants that continue to require evaluation include lead, mercury and nitrates.

SUMMARY

This has been a brief overview of where infant nutrition has been, where it is, and my projection of where it's going. The purpose has been to provide an indication that in the U.S., foods are available to provide sound nutrition for infants. More remains to be done-largely in the education of parents in good feeding practice and in continued refinement and expansion of foods.

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