NUTRITION MANAGEMENT OF THE FULL-TERM INFANT

Growth and nutrient needs during the first year of life exceed those at any other stage of the life cycle. However, since the organ systems are not fully developed in infancy, special considerations should be given to when and how foods are introduced. While supplying sufficient nutrients to promote growth and maintenance, it is important for the infant's diet to not exceed the requirements or capabilities of the infant's digestive or excretory systems. The optimal feeding regimen is to exclusively breast-feed for six months and breast-feed with complementary foods for at least twelve months (1,2).

Breast-feeding

Breast-feeding is the optimal way to provide food for the health, growth, and development of the infant. In addition to its unique nutrient composition, it offers immunologic and psychosocial benefits that are not provided by any other feeding substance. Human milk is unique in that it provides docosahexaenoic acid (DHA), a long-chain fatty acid that is essential for infant brain and eye development (3,4). Lactoferrin, an iron-binding protein found in whey of human milk, has been observed to inhibit the growth of certain iron-dependent bacteria in the gastrointestinal tract (5). Infants who are breast-fed usually have fewer gastrointestinal and nongastrointestinal infections, including otitis media, pneumonia, bacteremia, diarrhea, and meningitis. They have fewer food allergies and a reduced risk of certain chronic diseases throughout life (eg, type 1 diabetes, lymphoma, and Crohn's disease) (1,2,6-9).

Infants nursed by a vegan mother may be at risk for vitamin B_{12} deficiency. The dietary vitamin B_{12} intake of the mother should be assessed to determine adequacy. Vegan mothers should be instructed to supplement their diets with foods fortified with vitamin B_{12} (10).

Contraindications for Breast-Feeding

Infants with certain inborn metabolism errors, such as phenyalamine, maple syrup urine disease, or galactosemia should not be breastfed (2).

Breast-feeding is contraindicated for women who:

- use addictive drugs, such as cocaine, marijuana, and phencyclidine (PCP)
- drink more than a minimal amount of alcohol
- receive certain therapeutic or diagnostic agents, such as radiation or chemotherapy (11,12)
- are infected with the human immunodeficiency virus (HIV) (2)

Women should not breast-feed when they are receiving certain therapeutic medications. Not only is toxicity to the infant a concern, but research has indicated that some medications affect the infant's metabolism. In addition, some agents (eg, bromocriptine) decrease milk production. Whereas most medications are considered compatible with breast-feeding, there are substances for which the risk of toxicity to the infant is considered to be greater than the benefit to the mother. The most frequently used of these medications to be aware of include (12):

- amphetamine
- bromocriptine
- cyclophosphamide
- cyclosporine
- doxorubicin
- ergotamine
- lithium
- methotrexate
- nicotine
- phenindione

Formula Feeding

The use of commercially prepared infant formula is an acceptable alternative to breast-feeding. These formulas are designed to approximate the composition of human milk as closely as possible. Most commercial infant formulas are composed of milk proteins or soy protein isolate.

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Milk-based formulas are generally appropriate for use with the healthy full-term infant. Standard formulas have a 60:40 whey-to-casein ratio, which is desirable in a formula; they provide 20 kcal/oz. Breast milk yields an 80:20 whey: casein ratio with about the same number of calories. Soy-based formulas are often used from birth to prevent allergic disease in infants with a strong family history of allergies (13).

As long as the commercially prepared infant formula with iron is delivered in the appropriate volumes for a term infant, it is not necessary to supplement with additional vitamins or iron. The American Academy of Pediatrics recommends that formula-fed infants be given an iron-fortified cereal or supplemented with iron by 6 months of age. When food is introduced during the second 6 months of life, the combination of food and formula will meet the infant's nutrient requirements (14). Fluoride supplementation may be required if powdered or concentrated formula is used and if the community water supply contains less than 0.3 ppm of fluoride. Fluoride should not be supplemented before 6 months of age (2).

Therapeutic or specialized formulas are indicated for use with premature infants, as well as infants with cow's milk allergy or intolerance, intact protein allergy, or generalized malabsorption. Premature-infant formulas are modified in terms of their energy, macronutrient, and micronutrient content in order to meet the specialized physiologic and gastrointestinal needs of these infants. Premature infants should be discharged home on premature-infant formula and remain on it until 12 months of age. Human milk fortifiers (HMFs) are specially designed to be added to expressed breast milk for the premature infant. HMFs provide protein, energy, calcium, phosphorus, and other minerals needed for rapid growth and normal bone mineralization in the premature infant. Hydrolysate formulas are indicated for the nutrition management of infants with allergies to intact protein from either cow's milk or soy. These hydrolyzed formulas, some of which also contain part of the fat as medium chain triglycerides, may also be used for infants with generalized malabsorption of both protein and fat (eg, short gut syndrome and cystic fibrosis). Fat-modified formulas are indicated for nutrition management of infants with steatorrhea due to their limited bile salt pool, such as those with biliary atresia or other forms of malabsorption or intolerance. Medical formulas for various disorders of inborn errors of metabolism are also available from the major formula manufacturers for disorders such as phenylketonuria and maple syrup urine disease.

Water

If the infant consumes an adequate amount of breast milk, formula, or both, the infant will have an adequate intake of water.

Cow's Milk

Cow's milk should not be introduced until a child is 1 year of age. The nutrient composition of cow's milk varies substantially from that of human milk. Feedings with cow's milk causes a markedly high renal solute load due to its protein and sodium content, and infants are not generally able to concentrate urine well. The ingestion of cow's milk increases the risk for gastrointestinal blood loss and allergic reactions. Whole milk can be introduced after the first year and continued through the second year. After the second year, reduced-fat milk can be served (2).

Table E-1: Nutrient Comparison of Breast Milk, Formula, and Cow's Milk

Products per 100 cc	**Energy (kcal)**	**Protein (g)**	**Calcium (mg)**	**Phosphorus (mg)**	**Iron (mg)**	**Sodium (mg)**
Breast milk	70	1.0	32	14	0.3	8
Milk-based formula (20 kcal/oz)	67	1.5	42-51	28-39	1.2	15-20
Soy-based formula (20 kcal/oz)	67	1.8-2.1	60-71	42-51	1.2	20-30
Whole cow's milk (homogenized)	64	4.9	120	95	Trace	51

Introduction of Solid Food

There is no nutritional need to introduce solid food to infants during the first 6 months of age (1,2). The infant's individual growth and development pattern is the best indicator of when to introduce semisolid and solid foods. Generally, an infant will double his birth weight and be able to sit upright without support by the time semisolid foods are introduced. By 4 to 5 months, the infant has the ability to swallow nonliquid foods.

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If solids are introduced before this time, these foods may displace breast milk or formula and the infant may receive inadequate energy and nutrient needs.

No specific schedule of introduction of food other than breast milk or formula must be followed, but certain recommendations exist:

- Iron-fortified infant cereal is commonly suggested as the first food offered. Start with a few spoonfuls of a single-grain, iron-fortified infant cereal such as rice, once or twice a day.
- Introduce single-ingredient foods, one at a time, so that the offending food can be identified if an adverse reaction occurs.
- Vegetables might be accepted more readily if introduced before fruits, since fruits taste sweeter.
- Allow at least 3 days between the introduction of each new food.
- Begin with small amounts of foods, offering seconds as necessary.
- Avoid early introduction of the following common allergens: egg white, cow's milk, citrus, wheat, chocolate, fish, shellfish, tree nuts, and nut butters (eg, no peanut butter until 18 to 24 months of age) because susceptible infants with a family history of allergies may experience allergic reactions.
- Take care to avoid spoilage of home-prepared foods and jars of food once they are opened. Do not feed infants directly from the jar, as saliva added to the jar causes faster spoilage.
- Select appropriate solid foods that require minimal chewing. Foods such as hot dogs, peanuts, grapes, berries, raw carrots and sliced apples, raisins, potato or corn chips, popcorn, seeds, round, hard candies, and gum may cause choking and aspiration in infants and children.

Table E-2: Infant Feeding Guidelines

	Age (months)					
Food	**0-2**	**2-4**	**4-6**	**6-8**	**9-10**	**11-12**
Human milk/ formula (oz)	18-28	25-32	27-45	24-32	24-32	24-32
Iron-fortified cereal (tbsp)			4-8	4-6	4-6	4-6
Zwieback, dry toast				1	1	1-2
Vegetable, plain, strained (tbsp)				3-4	6-8	7-8 (soft, cooked, chopped)
Fruit, plain strained (tbsp)				3-4	6-8	8 (soft, chopped)
Meat, plain, strained (tbsp)				1-2	4-6	4-5 (ground or chopped)
Egg yolk (tbsp)					1	1
Fruit juice (oz)				2-4	4	4
Potato, rice, noodles (tbsp)						8

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INFANT FORMULA COMPARISON CHART

NUTRIENT CONTENT OF INFANT FORMULAS (per 100 cc)

							CARBOHYDRATE		PROTEIN		FAT		MINERALS mg(mEq)						OSM	
FORMULA	INDICATIONS	CAL./ oz.	CHO	PROTEIN	FAT	ADDITIONAL INFORMATION	g	% of Kcal	g	% of Kcal	g	% of Kcal	Na	K	Cl	P	Ca	Fe	mOsm/ KgH_2O	RSL mOsm
COW'S MILK-BASED																				
BREAST MILK	Most preferred for normal infant feeding	20	Lactose	Lactalbumin 65% Casein 35%	High in oleic; low in volatile fatty acids.	Average values for range of 15 days to 15 mos. post partum. Note: compositional variations due to stage of lactation may be a consideration when breast milk is provided to premature or high risk infants with increased nutritional needs.	7.0 (4.9-9.5)	42	1.0 (0.7-2.0)	6	3.9 (1.3-8.3)	52	8 53 (0.8)	42 (1.3)	14 (1.2)	32	0.3	300	7.5	
COW'S MILK, WHOLE	Not recommended for infants <12 month of age	19	Lactose	Casein 81% Lactalbumin 19%	Butterfat	Introduction into infant's diet depends on intake of solids. Avoid skim milk before 2 years of age.	4.8	31	3.4	22	3.5	49	51 (2.2)	159 (4.1)	105 (3.0)	97	126 (6.3)	.05	290	32.2
ENFAMIL A.R. LIPIL (Mead-Johnson)	Infants who frequently spit up or need a thickened formula	20	Lactose Rice starch Maltodextrin	Nonfat milk	Palm olein oil 43.5% Soy oil 19.5% Coconut oil 19.5% Sunflower oil 14.5%	Contains **DHA/ARA** in amounts close to breast milk; pre-thickened with hypoallergenic rice starch.	7.3	44	1.7	10	3.4	46	27	72	50	35	52	1.2	230-240	15.1
ENFAMIL LIPIL WITH IRON (Mead-Johnson)	Normal infant feeding	20	Lactose	Nonfat milk	Palm olein oil 44% Soy oil 19.5% Coconut oil 19.5% Sunflower oil 14.5%	Contains **DHA/ARA** in amounts close to breast milk.	7.3	43.5	1.4	8.5	3.5	48	18	72	42	35	52	1.2	300	13
ENFAMIL WITH IRON (Mead-Johnson)	Normal infant feeding	20	Lactose	Whey Nonfat milk	Palm olein oil Soy oil Coconut oil Sunflower oil	Other uses: sick infants with nutritional problems. Lactalbumin: casein ratio close to breast milk.	7	43.5	1.4	8.5	3.5	48	18	72	42	35	52	1.2	300	13.4
SIMILAC ADVANCE (Ross)	Normal infant feeding	20	Lactose	Nonfat milk Whey protein concentrate	Safflower oil 41% Soy oil 30% Coconut oil 28%	Contains **DHA/ARA** and nucleotides found in breast milk.	7.3	43	1.4	8	3.5	49	16 (0.7)	71 (1.8)	44 (1.2)	28	53 (2.6)	1.2	300	12.7
SIMILAC WITH IRON (Ross)	Normal infant feeding	20	Lactose	Nonfat milk Whey protein concentrate	Safflower oil 41% Soy oil 30% Coconut oil 29%	Other uses: sick infants without nutritional problems.	7.2	43	1.4	8	3.6	49	16 (0.7)	70 (1.8)	43 (1.2)	28	52 (2.6)	1.2	300	12.5
SOY-BASED FORMULAS																				
ISOMIL (Ross)	Allergy to cow's milk; lactose or galactose intolerance	20	Corn syrup Sucrose	Soy protein isolate L-methionine	Safflower oil 41% Soy oil 30% Coconut oil 29%	Other uses: recovery stage after mild/moderate diarrhea.	7.0	41	1.7	10	3.7	49	30 (1.3)	73 (1.9)	42 (1.2)	51	71 (3.5)	1.2	200	15.5
ISOMIL ADVANCE (Ross)	Allergy to cow's milk; lactose or galactose intolerance	20	Corn syrup Sucrose	Soy protein isolate L-methionine	Safflower oil 41% Soy oil 30% Coconut oil 28%	Contains **DHA/ARA.**	7.0	41	1.7	10	3.7	49	30 (1.3)	73 (1.9)	42 (1.2)	51	71 (3.5)	1.2	200	15.5
ISOMIL DF (Ross)	Dietary management of diarrhea in infants and toddlers older than 6 months	20	Corn syrup Sucrose	Soy protein isolate L-methionine	Soy oil 60% Coconut oil 40%	Contains 6g of dietary fiber per liter.	6.8	40	1.8	11	3.7	49	30 (1.3)	73 (1.9)	42 (1.2)	51	71 (3.5)	1.2	240	16.3
PROSOBEE LIPIL (Mead-Johnson)	Allergy to cow's milk; sucrose, lactose or galactose intolerance	20	Corn syrup solids	Soy protein isolate L-methionine	Palm olein oil 44% Coconut oil 19.5% Soy oil 19.5% Sunflower oil 14.5%	Other uses: recovery stage after mild/moderate diarrhea; galactosemia. Contains **DHA/ARA.**	7.1	42	1.7	10	3.5	48	24	80	53	55	70	1.2	200	15.9

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INFANT FORMULA COMPARISON CHART

NUTRIENT CONTENT OF INFANT FORMULAS (per 100 cc)

FORMULA	INDICATIONS	CAL./ oz.	CHO	PROTEIN	FAT	ADDITIONAL INFORMATION	CARBOHYDRATE g	CARBOHYDRATE % of Kcal	PROTEIN g	PROTEIN % of Kcal	FAT g	FAT % of Kcal	MINERALS mg(mEq) Na	K	Cl	P	Ca	Fe	OSM mOsm/ KgH_2O Osm	RSL
LACTOSE-FREE FORMULAS																				
ENFAMIL LACTOFREE LIPIL (Mead-Johnson)	Lactose intolerance	20	Corn syrup solids	Milk protein isolate	Palm olein 44% Soy oil 19.5% Coconut oil 19.5% Sunflower oil 14.5%	Contains **DHA/ARA.**	7.3	43.5	1.4	8.5	3.5	48	20	73	45	37	55	1.2	200	13.2
SIMILAC LACTOSE FREE ADVANCE (Ross)	Lactose intolerance	20	Maltodextrin Sucrose	Milk protein isolate	Safflower oil 40% Soy oil 30% Coconut oil 29%	Contains **DHA/ARA.**	7.2	43	1.4	9	3.7	49	20 (0.9)	72 (1.9)	44 (1.2)	38	57 (2.8)	1.2	200	12.7
PREMATURE FORMULAS																				
ENFAMIL PREMATURE LIPIL (Mead-Johnson)	For the premature and low-birth weight infant less than 2000 gm	24	Corn syrup solids Lactose	Whey protein concentrate Nonfat milk	MCT oil 40% Soy oil 30% High oleic vegetable oil 27%	High protein (whey:casein 60/40), readily digestible fat & CHO, appropriate Ca, P & other minerals for rapid growth; contains **DHA/ARA.**	8.7	44	2.4	12	4.0	44	46	78	71	66	131	1.4	300	21
SIMILAC SPECIAL CARE ADVANCE WITH IRON 24 (Ross)	Low birth weight and premature infants	24	Corn syrup solids Lactose	Nonfat milk Whey protein concentrate	MCT oil 50% Soy oil 30% Coconut oil 18%	Provides levels of calcium and phosphorus for rapid growth; contains **DHA/ARA.**	8.4	41	2.4	12	4.4	47	35 (1.5)	105 (2.7)	66 (1.9)	81	146 (7.3)	1.5	280	22.6
PREMATURE DISCHARGE/TRANSITIONAL FORMULAS																				
ENFACARE LIPIL (Mead-Johnson)	Premature infant discharge formula	22	Lactose Corn syrup solids	Nonfat milk Whey protein concentrate	Vegetable oil 34% Soy oil 29% MCT oil 20% Coconut oil 14%	Higher level of protein and some vitamins and minerals than standard term formulas; contains **DHA/ARA.**	7.7	42	2.1	11	3.9	47	26	78	58	49	89	1.3	250-260	18.1
NEOSURE ADVANCE (Ross)	Premature infant discharge formula	22	Corn syrup solids Lactose	Nonfat milk Whey protein concentrate	Soy oil 45% Coconut oil 29% MCT oil 25%	Higher levels of protein, vitamins, and minerals than standard term formulas; contains **DHA/ARA.**	7.5	40	2.1	11	4.1	49	25 (1.1)	106 (2.7)	56 (1.6)	46	78 (3.9)	1.3	250	18.7
SPECIAL FORTIFIERS OF HUMAN MILK FOR PREEMIES																				
SIMILAC HUMAN MILK FORTIFIER	To fortify breast milk for premature and low birth weight infants	24	Lactose Corn syrup solids	Preterm human milk Nonfat milk Whey protein concentrate	Preterm human milk MCT oil	Mix 1 packet of fortifier with 25ml breast milk to yield 24 kcal/oz. Nutrition information provided is for this recipe.	8.2	42	2.3	12	4.1	47	39 (1.7)	117 (3.0)	91 (2.6)	78	138 (6.9)	0.5	385	23.1
SIMILAC NATURAL CARE* ADVANCE (Ross)	To fortify breast milk for premature and low birth weight infants	24	Corn syrup solids Lactose	Nonfat milk Whey protein concentrate	MCT oil 50% Soy oil 30% Coconut oil 18%	Low in iron; Can be mixed with breast milk or fed alternately to breast milk; should not be a sole source of nutrition. Contains **DHA/ARA.**	8.4	41	2.4	12	4.4	47	35 (1.5)	105 (2.7)	66 (1.9)	94	170 (8.5)	0.3	280	23.0
ENFAMIL HUMAN MILK FORTIFIER (Mead-Johnson)	To fortify breast milk to meet the needs of low birth-weight infants (under 1500 gm)	24	Corn syrup solids Lactose	Preterm human milk Milk protein isolate Whey protein isolate hydrolysate	Preterm human milk MCT oil Soy oil	Mix 1 packet of fortifier with 25 ml breast milk to yield 24 kcal/oz. Nutrition information provided is for one packet of the fortifier (0.71 g).	0.1	5	0.3	32	0.25	63	4	7.3	3.3	13	23	0.4	35	2.4

* Nutrition information provided is for the product only, **NOT** when it is mixed with breast milk.

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INFANT FORMULA COMPARISON CHART

NUTRIENT CONTENT OF INFANT FORMULAS (per 100 cc)

FORMULA	INDICATIONS	CAL./ oz.	CHO	PROTEIN	FAT	ADDITIONAL INFORMATION	CARBOHYDRATE g	CARBOHYDRATE % of Kcal	PROTEIN g	PROTEIN % of Kcal	FAT g	FAT % of Kcal	MINERALS mg(mEq) Na	K	Cl	P	Ca	Fe	OSM mOsm/ KgH_2O	RSL mOsm
SPECIAL FORMULAS																				
NUTRAMIGEN LIPIL (Mead-Johnson)	Intact protein intolerance; galactosemia	20	Corn syrup solids Modified corn starch	Hydrolyzed casein L-cystine L-tyrosine L-tryptophan	Palm olein oil 44% Soy oil 19.5% Coconut oil 19.5% Sunflower oil 14.5%	Other uses: lactose deficiency recovery stage after mild/moderate diarrhea; soy intolerance; contains **DHA/ARA.**	6.9	41	1.9	11	3.5	48	31	73	57	42	63	1.2	270-300	17.1
PORTAGEN (Mead-Johnson)	Fat malabsorption	20	Corn syrup solids Sucrose	Sodium caseinate (Intact protein)	MCT oil 86% Corn oil 11%	Lactose free but not galactose free; Fat malabsorption, incl: decreased pancreatic lipase, decreased bile salt production, defect in fat trans-portation, defect in fat absorption.	7.8	46	2.4	14	3.3	40	38	85	59	47	64	1.3	230	20.0
SIMILAC PM 60/40 (Ross)	Lower Na & K levels; preferred for decreased renal function.	20	Lactose	Whey protein concentrate Sodium caseinate	Corn oil 50% Coconut oil 38% Soy oil 12%	Preferred for renal patients due to lower phosphorus content and 2:1 Ca to P ratio; Low RSL; Lactalbumin: casein ratio close to breast milk.	6.9	41	1.5	9	3.8	50	16 (0.71)	54 (1.4)	40 (1.1)	19	38 (1.9)	0.5	280	12.4
PREGESTIMIL (Mead-Johnson)	Malabsorption, intractable diarrhea	20	Corn syrup solids Dextrose Modified cornstarch	Hydrolyzed casein L-tryptophan L-cysteine L-tyrosine	MCT oil Soy oil Safflower oil Corn oil	Malabsorption due to short gut syndrome, cystic fibrosis, celiac, malnutrition. Other uses: intact protein intolerance, sensitivity to hyperosmolar solutions, recovery stage after prolonged diarrhea. Less palatable than Nutramigen.	6.8	41	1.9	11	3.7	48	31	73	57	50	77	1.3	280-330	17.4
ALIMENTUM ADVANCE (Ross)	Malabsorption, short gut, intractable diarrhea	20	Sucrose Modified tapioca starch	Casein hydrolysate L-cystine L-tyrosine L-tryptophan	Safflower oil 38% MCT oil 33% Soy oil 28%	Available in liquid only; therefore, cannot concentrate product. Contains **DHA/ARA.**	6.9	41	1.9	11	3.7	48	30 (1.3)	80 (2.1)	54 (1.5)	51	71 (3.5)	1.2	370	17.1
ELECARE (Ross)	Intolerance to intact protein; protein maldigestion/malabsorption	20	Corn syrup solids	Free L-amino acids	Safflower oil 39% MCT oil 33% Soy oil 28%	Amino acid-based; Hypoallergenic; free of milk and soy protein; lactose free and galactose free.	7.2	43	2.0	15	3.2	42	30 (1.3)	101 (2.6)	41 (1.2)	55	73 (3.6)	1.2	335	18.5
NEOCATE (SHS)	Intolerance to intact protein	20	Corn syrup solids	Free L-amino acids	Safflower oil Coconut oil Soy oil	Amino acid-based; hypoallergenic; other uses: short bowel syndrome, gastroesophageal reflux.	7.8	47	2.1	12	3.0	41	25	103	51	62	83	1.5	375	
OTHER SOLUTIONS																				
ENFALYTE (Mead-Johnson)	Severe diarrhea	12.6	Rice syrup solids			Natural fruit flavor; also contains citrate.	3	100					(5)	(2.5)	(4.5)	115	98		160	170
REHYDRALYTE	Severe diarrhea	3	Dextrose			Isotonic; also contains citrate.	2.5	100					173 (7.5)	78 (2.0)	221 (6.5)				300	
PEDIALYTE (Ross)	Severe diarrhea	3	Dextrose			Also contains citrate.	2.5	100					103.5 (4.5)	78.2 (2.0)	124.1 (3.5)				250-270	
5% GLUCOSE WATER (Ross)	Initial enteral feeding after NPO if I.V. is source of electrolytes	6	Dextrose																300	
10% GLUCOSE (Ross)	Initial enteral feeding after NPO if I.V. is source of electrolytes	12	Dextrose			Hypertonic.													625	

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NUTRITION MANAGEMENT OF THE TODDLER AND PRESCHOOL CHILD

Description
The Regular Diet for the Toddler (1 to 3 years of age) and the Preschool Child (4 to 5 years of age) includes a wide variety of foods to promote optimal growth and development. The diet consists of foods of different textures, tastes, and colors provided throughout the day. Snacks are required to meet the nutrient needs, since the toddler and preschooler have small stomach capacities.

Indications
The diet is served when specific dietary modifications are not therapeutically required.

Nutritional Adequacy
The diet can be planned to meet the Dietary Reference Intakes (DRIs) for the specific age as outlined in the *Statement on Nutritional Adequacy* in Section IA. Actual nutrient requirements may vary widely among children of the same age, depending on the rate of growth and stage of development. Nutrients that may be of suboptimal intake at this age are protein and iron because children often refuse to eat an adequate quantity of protein sources. Adequate vitamin A intake may also be of concern because children often dislike vegetables. Most healthy children who eat a variety of foods do not need a vitamin and mineral supplement. However, supplementation may need to be discussed with the caregivers if dietary intake appears to be inadequate or sporadic (1,2).

How to Order the Diet
Order as "Pediatric Regular Diet" or "Regular Diet for Age _____." The age of the patient will be taken into consideration in implementing the diet order. Any specific instructions should be indicated.

Planning the Diet
Energy needs vary with the growth rate, body size, and physical activity of the child. The average daily energy requirement for ages 1-3 years is 1046 kcal for males and 992 kcal for females (3). The estimated daily energy needs for ages 4 to 5 years is 1742 kcal for males and 1642 kcal for females (3). The Institute of Medicine's Food and Nutrition Board have established acceptable macronutrient distribution ranges (ADMR) for children and include 45 to 65% of total calories from carbohydrates, 5 to 20% of total calories from protein for young children, and 30% to 40% of total calories from fat for 1 to 3 years and 25% to 35% of total calories from fat for 4 to 18 year olds (3,4)..

The recommended protein (RDA) intake is 13 g/day (or 1.1 g/kg) for 1- to 3-year-olds and 19 g/day (or 0.95 g/kg) for 4- or 5-year-olds (3). Adequate protein intake may be difficult to obtain if chewing skills are limited or milk intake is inadequate. Cheese, peanut butter, and yogurt may be considered to help promote adequate protein intake. Dietary reference intakes that limit added sugars, defined as sugars and syrups that are added to food during processing or preparation, have been established (3,4). The daily intake of added sugars should be limited to 25% of the total energy consumed by a child (3). Twenty-five percent is a maximum limit; the recommended amount of added sugar in a healthy diet is 6% to 10% of total energy (3,4). Fruit juices can provide a substantial amount of sugar and energy in the diet of children. Currently it is recommended that daily fruit juice consumption be limited to 4 to 6 ounces per day for children 1 to 6 years of age (5).

The toddler and preschool child have distinct developmental and nutrition needs. After the first year of life, a time of rapid growth and development, the growth rate slows, but there is a steady increase in body size. Along with the decrease in growth rate, the appetite decreases. However, there is an increased need for protein and many vitamins and minerals (3-4,6).

The toddler and preschool child is striving for independence. Self-feeding is important, although the child may not physically be able to handle feeding utensils or have good hand-eye coordination. At this age, food likes and dislikes become prominent, and food acquires a greater social significance.

Beginning at 2 years of age, recommendations from the *Dietary Guidelines* should be applied for healthy children (6-7). See Table E-3. Current guidelines recommend total fat intake between 30 to 35 percent of calories for children 2 to 3 years of age and between 25 to 35 percent of calories for children 4 years and older (7) . Most fats should come from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils (7) The DRIs have established an adequate intake (AI) of fiber which represents a

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higher than estimated requirements due to the known health benefits of fiber. For children 1 to 3 years 19 g fiber/day is recommended and for ages 4 to 8 years 25 g/day of fiber is recommended (3).

Table E-3: Food Groups and Recommended Portion Sizes for Toddler and Preschool Child

Food Group	Daily Servings	Portion Size 1-3 years	Portion Size 4-5 years
Grains, Breads, Cereals	*>6 servings*		
	Bread	¼ - ½ slice	¾ -1 slice
	Dry cereal	¼ - 1/3 cup	½ cup
	Cooked cereal, noodles, rice	¼ - 1/3 cup	1/3 - ½ cup
	Crackers	2-3	4-6
Fruits	*≥2 servings*		
	Fresh fruit	½ small	½ -1 small
	Cooked, canned, or raw, (chopped)	1/3 cup	½ cup
	Juice	¼- ½ cup	½ cup
Vegetables	*≥3 servings*		
	Cooked, canned, or raw, (chopped)	¼ cup	½ cup
		¼-½ piece	½-1 piece
	Whole	¼ cup	½ cup
	Juice		
Milk	*3-4 servings*		
	Milk	½ cup	¾ cup
	Yogurt	½ oz (2-4 tbsp)	¾ oz (4-6 tbsp)
	Cheese		
Meat	*2 servings*		
	Egg	1	1
	Cooked meat	1-3 tbsp	3-5 tbsp
	Dried beans, peas	1-3 tbsp	2-4 tbsp
Fat	*3-4 servings*		
	Margarine; butter; oil	1 tsp	1 tsp

Children should be supervised during meals and snacks. A child who is choking may not be able to make noise or to attract attention. Foods that may cause choking include hot dogs, chunks of meat, nuts, peanut butter, raw apples, jelly beans, hard candy, gum drops, popcorn, raw carrots, raisins, grapes, berries, and potato or corn chips. By changing the form of some of these items, these foods are less likely to cause choking, such as serving peanut butter with jelly, not by the spoonful, or cutting hot dogs or grapes in small pieces (2).

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NUTRITION MANAGEMENT OF THE SCHOOL-AGED CHILD

Description
The Regular Diet for the School-Aged Child (6 to 11 years old) includes a wide variety of foods to promote optimal growth and development. Nutrition during this stage should supply adequate nutrients to support physical activity, attain a healthy weight, and ensure that the growth demands of adolescence are met (1). In addition, healthy eating habits and regular participation in physical activity should be established to reduce the risk of chronic disease and achieve optimal physical and cognitive development (1). Foods are provided based on the Food Guide Pyramid and the National Cholesterol Education Program. Three meals per day plus one to three planned snacks are recommended.

Indications
This diet is served when specific dietary modifications are not therapeutically required.

Nutritional Adequacy
The Regular Diet for the School-Aged Child meets the Dietary Reference Intakes (DRIs) for specific ages as outlined in the *Statement on Nutritional Adequacy* in Section IA, provided that a variety of foods is consumed. Energy and protein requirements vary with the child's age, growth rate, and physical activity.

How to Order the Diet
Order as "Pediatric Regular Diet" or "Regular Diet for Age _____." The patient's age will be taken into consideration in implementing the diet order. Any specific instructions should be indicated.

Planning the Diet
Energy needs vary with the growth rate, body size, and physical activity of the child. The average energy requirement for children aged 4 to 8 years is 1,742 kcal for boys and 1,642 kcal for girls. For children aged 9 to 11 years, the average daily energy requirement is 2,279 kcal for boys and 2,071 kcal for girls (2). The Institute of Medicine's Food and Nutrition Board has established acceptable macronutrient distribution ranges for school-aged children. These guidelines indicate that carbohydrates should provide 45% to 65% of total energy, proteins should provide 10% to 30% of total energy, and fat should provide 25% to 35% of total energy (2). The recommended dietary allowance (RDA) for protein is 0.95 g/kg for children aged 4 to 13 years. This RDA is met by children aged 4 to 8 years who consume 19 g of protein per day and children aged 9 to 13 years who consume 34 g of protein per day (2). Dietary reference intakes that limit added sugars, defined as sugars and syrups that are added to food during processing or preparation, have been established (1,2). The daily intake of added sugars should be limited to 25% of the total energy consumed by a child (2). Twenty-five percent is a maximum limit; the recommended amount of added sugar in a healthy diet is 6% to 10% of total energy (1,2). Fruit juices can provide a substantial amount of sugar and energy in the diet of school-aged children. Currently it is recommended that daily fruit juice consumption be limited to 4 to 6 oz for children aged 1 to 6 years and 8 to 12 oz for children and adolescents aged 7 to 18 years (3).

The DRI for calcium in children aged 8 years or younger is 500 mg. The DRI increases to 1,300 mg for children aged 9 years or older (4). The requirement for calcium increases with the growth of lean body mass and the skeleton. The higher DRI for calcium was established because evidence indicates that calcium intakes at this level can increase bone mineral density in children, thus decreasing their risk of developing osteoporosis later in life (1).

Older children (9 to 11 years) will have a natural increase in appetite. Between the ages of 8 and 11 years some children (primarily girls), may be at risk for developing eating disorders due to an overemphasis on body image and low intake (5).

Recommendations from the *Dietary Guidelines,* National Cholesterol Education Program, and the American Academy of Pediatrics should be applied to the diet of healthy children. These recommendations include an intake of fat between 25 to 35% of total energy, limiting saturated fat to less than 10% of total energy, limiting dietary cholesterol to less than 300 mg/day, and limiting the intake of *trans* fatty acids (6-8). The recommended daily fiber intake for children aged 6 to 11 years is equal to or greater than the child's age plus 5 g (9). The DRIs have established adequate intakes of fiber that are higher than the estimated requirements due to the health benefits of fiber. The adequate intake of fiber is 25 g/day for children aged 4 to 8 years, 31 g/day for boys aged 9 to 13 years, and 26 g/day for girls aged 9 to 13 years (2).

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Table IE-4: Food Groups and Recommended Portion Sizes for the School-Aged Child (10)

Food Group	Daily Servings	Portion Size
Grains, Breads, Cereals	*More than six servings*	
	Bread	1 slice
	Dry cereal	1 oz or ¾ cup
	Cooked cereal	½ cup
	Noodles	4-6
	Rice	½ cup
	Crackers	4 to 6
Fruits	*Two or more servings*	
	Fresh fruit	1 whole medium
	Cooked, canned, or raw (chopped)	½ cup
	Juice	½ cup
Vegetables	*Three or more servings*	
	Cooked, canned, or raw (chopped)	½ cup
	Juice	¾ cup
Milk	*Three servings*	
	Milk	1 cup
	Yogurt	1 oz
	Cheese	1 oz
Meat	*Two to three servings (a total of 5-6 oz/day)*	
	Egg	1
	Cooked meat	2-3 oz
	Dried beans, peas	½ cup
	Peanut butter	2 tbsp
Fats, Sweets	As needed to provide energy	

See Section III: Clinical Nutrition Management
OBESITY AND WEIGHT MANAGEMENT

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NUTRITION MANAGEMENT OF THE ADOLESCENT

Description
The Regular Diet for the Adolescent (11 to 19 years of age) includes a wide variety of foods to promote normal growth and development during puberty and to maintain a good nutritional status for health and disease prevention after the physiological growth has occurred. Foods are provided based on the *Dietary Guidelines for Americans*, the American Heart Association, the American Cancer Association, and the National Cholesterol Education Program (1-2).

Indications
The diet is served when specific dietary modifications are not therapeutically required.

Nutritional Adequacy
The Diet for the Adolescent is adequate to meet the Dietary Reference Intakes (DRIs) for the specific age as outlined in the *Statement on Nutritional Adequacy* in Section IA, provided that a variety of foods is consumed. Energy and protein requirements vary with the adolescent's age, sex, stage of growth, and physical activity. Special attention may be required to ensure adequate intake of iron, zinc, and calcium.

How to Order the Diet
Order as "Regular Diet" or "Regular Diet for Age ______." The age of the patient will be taken into consideration in implementing the diet order. Any specific instructions should be indicated.

Planning the Diet
Energy needs vary with the sex, stage of growth, and physical activity of the adolescent. See Section IA: Estimated Energy Requirement (EER) for Male and Females Under 30 Years of Age. An initial estimate for energy that relates more closely to physiological age can be obtained by calculating kilocalories divided by height in centimeters (3). This is determined by dividing the DRI for energy for the child's age and sex by the reference height (listed on the Estimated Energy Requirement (EER) for Male and Females Under 30 Years of Age table and then multiplying kilocalories per centimeter by the adolescent's height (4). If the height is unavailable or cannot be measured accurately, the DRI for the kilocalories per day may be used (4). Therefore, periodic adjustments in energy intake may be necessary to maintain an appropriate weight for height.

Protein needs for adolescents also relate more to the physiological age than chronological age. The RDA for protein is 0.95 g/kg weight for ages 11-13 then decreases slightly to 0.85 g/kg/day at the age of 14 to 18. Adequate intake ranges from 34 g/day (9 to 13 years) to 52 g/day (14 to 18 years) (4). See Section IA: Dietary Reference Intake Values for Protein by Life Stage Group.

Girls generally begin puberty around 10 to 12 years of age and boys begin between 11 and 13 years of age. Likewise, girls usually have a peak height velocity around age 12 and boys around age 14. Young men often achieve an adult height greater than young women do because boys grow prepubertally 2 years more than girls do and have a longer period of growth once puberty starts. Girls generally stop growth at 16 years of age and boys at 18 years of age.

During puberty, body composition changes. Boys double their lean body mass between 10 and 17 years of age and maintain about 12% body fat by late puberty. Girls gain more fat during puberty and usually have 23% body fat by late puberty.

Vitamins and mineral needs increase as the adolescent grows. Calcium, iron, and zinc are particularly important for growth, and dietary intake is frequently inadequate. Careful food selection is required to meet the DRIs. Accepting changes that will improve nutrient intake seems to be most successful when the change is related to physical development, appearance, and sports performance.

The DRI for calcium is 1,300 mg for both sexes between the ages of 9 and 18 years (5). The accelerated skeletal and muscular development during adolescence makes this stage of life a critical time for bone growth and deposition of calcium.

The DRI for iron 14- to 18-year-olds is 11 mg/day for males and 15 mg/day for females (4). The need for iron increases during puberty with the increase in muscle mass and blood volume.

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The RDA for zinc for males and females 14 to 18 years is 11 mg/day and 9 mg/day, respectively (4). Zinc is especially important during adolescence because of its role in growth and sexual maturation.

Recommendations from the *Dietary Guidelines,* the American Heart Association, the American Cancer Association, and the National Cholesterol Education Program should be applied for healthy adolescents. Refer to the Regular Diet-Adult in Section IA for recommendations and guidelines.

See Section IA: Regular Diet in Pregnancy and Lactation
See Section III: Clinical Nutrition Management
WEIGHT MANAGEMENT AND OBESITY

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KETOGENIC DIET

Description
The ketogenic diet is designed to establish and maintain ketosis. The diet is very high in fat and severely restricted in carbohydrates. This is done by calculating the diet to provide 3 to 4 grams of fat for each 1 gram of protein and carbohydrate combined, thus converting the fuel burned by the body from carbohydrate to fat. A physician prescribes the ratio of 3:1 or 4:1 as appropriate for each individual patient. The diet is calculated to meet the specific needs of each individual for calories and protein, and provides little to no carbohydrate depending on protein requirements. Even with the high fat content of the diet, weight is usually maintained with very little gain. This is possible because calories are calculated to meet only 75% of the individual's Dietary Reference Intake (DRI) for energy. The foundation of the diet is either heavy whipping cream or MCT oil. The diet using whipping cream is described below.

Indications
The diet serves as an adjunct to anti-convulsant medications in controlling intractable seizures. It is used in cases of resistance to medications or drug toxicity (1,2). Sustained ketosis appears to be important in modifying the convulsive threshold (1,3). The diet seems to be most effective in children 18 months to 10 years of age (4), although it can be used with older children and adults with varying degrees of success. The diet is administered to those who have myoclonic absence (drop) and atonic seizures, which are difficult to control with medications. It may also benefit children with generalized tonic-clonic (grand mal) seizures and seizures of the Lennox-Gestault Syndrome. The ketogenic diet can be used for all types of seizures, especially if medication therapy is not effective (5).

The diet requires a trial period of 2 to 3 months during which effectiveness is assessed and the diet is adjusted to maintain strong ketosis. Once it is determined that the diet is effective on controlling seizure activity, a commitment of 1 to 2 years is required after which weaning is done gradually. Because of the extreme dietary regimens involved in this diet, the Johns Hopkins Pediatric Epilepsy Center recommends use of the ketogenic diet for those individuals who have more than 2 seizures a week despite treatment with at least 2 different anticonvulsant medications (6).

Nutritional Adequacy
The ketogenic diet is inadequate in vitamin B-complex vitamins, folate, iron, calcium, and zinc. The diet must be supplemented with vitamins, iron and calcium in forms that are sugar-free.

How to Order the Diet
Order as "Ketogenic Diet." A nutrition consult by a registered dietitian must accompany the diet order, as the diet has to be precisely calculated. All medications must be carbohydrate free, as well as toothpaste. The diet must be initiated in a hospitalized setting under close supervision.

Planning the Diet
A gram scale and a copy of the Epilepsy Diet Treatment book (6) are paramount in administering this diet effectively.

Calculation (5)

1. Sample patient: age and weight

Age	5
Height	43 inches
Weight in kilograms	18.46 (40.6 lb)
Ideal weight	18.46 (50th percentile)

Ketogenic Ratio (fat calories:nonfat calories ratio)

Up to 2 years	3:1
2 years to 12 years	4:1
Over 12 years	3:1

A 4:1 Ketogenic diet is prescribed for the patient, which at 50th percentile matches the ideal weight for

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his age and size.

2. Calories per kilogram: Calculate the ideal body weight for the child's height using the NCHS growth charts. Determine the number of calories per kilogram based on the child's age and ideal weight from the following chart (7). Additional adjustments for caloric needs will need to be individualized based on patient's activity level.

Up to 1 year	80 kcal/kg
12 - 18 months	75 kcal/kg
18 months - 3 years	70 kcal/kg
4 - 6 years	65 kcal/kg
7 - 8 years	60 kcal/kg
9 - 10 years	55 kcal/kg
11 - 14 years	40 kcal/kg or less

3. Total calories: Determine the total number of kcal in the diet by multiplying the child's ideal weight by the number of calories required per kilogram.

The patient, age 5 and weighing 18.46 kg, needs a total of 65 x 18.46 or 1,200 kcal per day.

4. Dietary unit composition: Dietary units are the building blocks of the ketogenic diet. A 4:1 diet has dietary units made up of 4 gm of fat to each 1 gm of protein plus carbohydrates. Because fat has 9 calories/g (9 x 4 = 36), and protein and carbohydrates each have 4 kcal/g (4 x 1 = 4), a dietary unit at a 4:1 diet ratio has 36 + 4 = 40 kcal. The caloric value and breakdown of dietary units vary with the ketogenic ratio.

Ratio	**Fat Calories**	**Carbohydrates plus Protein Calories**	**Calories per Dietary Unit**
2:1	2 g x 9 kcal/g = 18	1 g x 4 kcal/g = 4	18 + 4 = 22
3:1	3 g x 9 kcal/g = 27	1 g x 4 kcal/g = 4	27 + 4 = 31
4:1	4 g x 9 kcal/g = 36	1 g x 4 kcal/g = 4	36 + 4 = 40
5:1	5 g x 9 kcal/g = 45	1 g x 4 kcal/g = 4	45 + 4 = 49

The patient's dietary units will be made up of 40 calories each because he is on a 4:1 ratio.

5. Dietary unit quantity: Divide the total calories allotted by the number of calories in each dietary unit to determine the number of dietary units to be allowed daily.

   Each of the patient's dietary units on a 4:1 ratio contains 40 calories, is allowed a total of 1200 kcal/day, so he receives 1200/40 = 30 dietary units per day.

6. Fat allowance: Multiply the number of dietary units' times the units of fat in the prescribed ketogenic ratio to determine the number of fat grams permitted daily.

   On his 4:1 diet, with 30 dietary units per day, the patient will have 30 x 4 or 120 g of fat per day.

7. Protein and carbohydrate allowance: Multiply the number of dietary units times the number of protein plus carbohydrate in the prescribed ketogenic ratio, usually one, to determine the combined daily protein plus carbohydrate allotment.

   On his 4:1 diet, the patient will have 30 x 1 or 30 g of protein and carbohydrate per diet.

8. Protein allowance: To maintain health, a 5-year-old child should eat a minimum of 1 g of protein for every kilogram of weight and/or meet the DRI for protein for age.

   At 18.56 kg, the patient should eat 18.5 g of protein per day out of his total protein and carbohydrate allotment of 30 g.

9. Carbohydrate allowance: Determine the grams of carbohydrate allotted by subtracting the protein

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allotment from the total protein plus carbohydrate allotment. Carbohydrates are the diet's filler and are always determined last.

The patient's carbohydrate allotment is 30 - 18.5 = 11.5 gm carbohydrate daily.

10. Meal Order: Divide the daily fat, protein and carbohydrate allotments into 3 equal meals. It is essential that the proper ratio of fat to protein plus carbohydrate be maintained at each meal.

    The patient's diet order reads:

	Daily	**Per Meal**
Protein	18.5 g	6.2 g
Fat	120 g	40 g
Carbohydrate	11.5 g	3.8 g
Kcal	1,200	400

11. Liquids: Multiply the child's ideal weight by 65 to determine the daily cubic centimeter allotment of liquid. As few as 60cc/kg but as many as 70cc may be adequate, depending on the child's activity level and the climate in which they live. Liquid intake should be spaced throughout the day with no more than 120 - 150 cc being given at any one time. Liquids should be non-caloric such as water, herbal or decaffeinated tea or decaffeinated sugar-free diet soda. Sugar free soda should be limited to no more than 1 calorie per day. In hot climates, the cream may be excluded from the fluid allotment. The liquid allotment may also be set equal to the number of calories in the diet.

    The patient, who lives in New York and gets 1200 kcal per day on the diet, is allowed 1200 cc of fluid per day, including his allotted cream.

12. Every child on the ketogenic diet should take a daily dose of a sugar-free vitamin/mineral supplement. For infants or children who have difficulty chewing, 600 to 650 mg of oral calcium, in a sugar-free form, such as calcium gluconate or calcium carbonate or calcium magnesium liquid and a sugarless multi-vitamin with iron, such as Poly-Vi-Sol® liquid or drops can be used. A sugar free multivitamin mineral Chew Tab is a better choice for children over 1 year of age that can chew.

Introducing The Ketogenic Diet

The diet must be introduced in the hospitalized care setting. Initially "ketogenic eggnog" is given after the initial two-day fast or when the ketones have reached the 160 level (4+).

To introduce to children, a ketogenic eggnog is provided a sample full meal recipe follows. The child should receive 1/3 of the child's full meal recipe first meal, 2/3's of the full meal recipe the second meal, and progress to the full recipe by the third meal.

Calculating The Ketogenic Eggnog

Step 1: Calculate the recipe based on 1/3 of the child's total allotted calories. Select an amount of cream that contains close but not equal to the amount of total allotted fat.

	Weight	**Protein**	**Fat**	**Carbohydrate**
Cream	97 g	1.9 g	34.9 g	2.9 g
Egg				
Should be		6.2 g	40.0 g	3.8 g

Step 2: Subtract the carbohydrate in the cream used from the total allotted carbohydrate: 3.8 g - 2.9 g = 0.9 g.

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Step 3: Add the remaining amount of carbohydrate to the total allotted protein: 6.2 g + 0.9 g = 7.1 g.

Step 4: Subtract the protein used in the cream from the sum in Step 3. 7.1 g - 1.9 g = 5.2 g.

Step 5: Using the food values chart (8), give the amount of egg that contains 5.2 g of protein.

Recipe for 1 Full Meal

	Weight	Protein	Fat	Carbohydrate
Cream	97 g	1.9 g	34.9 g	2.9 g
Egg	43 g	5.2 g	5.2 g	-----
Actual total		**7.1 g**	**40.1 g**	**2.9 g**
Should be		6.2 g	40.0 g	3.8 g

In the ketogenic eggnog, the carbohydrate will be lower than the allotment and the protein will be higher than the allotment. The amount of fat should always be within a close proximity to the allotment. On occasion, depending on different ketogenic ratios used, small amounts of oil may be needed.

The 4:1 ketogenic ratio may be double-checked by adding the grams of protein and carbohydrate in the meal and multiplying by four [4]. The sum should be the amount of fat in the meal, in this case, 40.0 g. Since (7.1 g + 2.9 g) x 4 = 40.0 g, the ratio is correct.

When the full quantity is reached, real food may be served or the child may be given eggnog again.

The Ketogenic Eggnog Recipe

Ketogenic eggnog is the only meal that does not need to be eaten all at once. This way the child sipping eggnog will not be under as much pressure as when he/she is faced with a plate of unfamiliar food. At home, the parents can prepare more appetizing, familiar meals. However, it is important that parents be given enough training in preparing solid food meals so they will be able to do it comfortably at home. Ingredients required for the ketogenic eggnog are:

Heavy Cream
Egg
Vanilla Extract
Saccharin (optional)

The patient's first meal of eggnog will be 1/3 of the full meal recipe:

32 g	Heavy Cream
14 g	Egg
up to 5 drops	Vanilla
up to ¼ grain	Saccharin
46 cc	Total

The patient's second meal of eggnog will be 2/3 of the full meal recipe:

64 g	Heavy Cream
28 g	Egg
up to 5 drops	Vanilla
up to ¼ grain	Saccharin
92 cc	Total

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The patient's third meal of eggnog will be the full meal recipe.

92 g	Heavy Cream
14 g	Egg
up to 5 drops	Vanilla
up to ¼ grain	Saccharin
140 cc	Total

Regular meals are provided to the patient usually by the third meal and/or prior to discharge.

Calculating Meal Plans

When calculating the meal plan, divide the total protein, fat and carbohydrate allotted for the day by three and provide 1/3 of the allotment per meal. For example:

	Weight	Protein	Fat	Carbohydrate
Cream	65 g	1.3 g	23.4 g	1.9 g
Fruit	19 g	0.2 g	--	1.9 g
Meat	20 g	4.7 g	3.3 g	--
Fat	18 g	--	13.3 g	--
Actual Total		**6.2 g**	**40.0 g**	**3.8 g**
Should be		6.2 g	40.0 g	3.8 g

Calculate the whipping cream first. Heavy whipping cream (36%) should take up no more than half of the carbohydrate allotment in the meal.

The patient is allowed a total of 3.8 g carbohydrates per meal. Referring to the food value charts (9), to use half of this allotment of cream, he should eat 65 g of 36% cream, which contains 1.9 g carbohydrates.

Calculate the rest of the carbohydrate (fruits or vegetables) by subtracting the carbohydrate contained in the cream from the total carbohydrate allotment.

Referring to the food value charts, the patient can eat the remaining 1.9 g carbohydrates as 19 g of 10% fruits. The percent equals the percent of carbohydrate in the fruit (7).

10% Carbohydrate Fruits	15% Carbohydrate Fruits
Applesauce	Apple
Cantaloupe	Apricot
Grapefruit	Blackberries
Tangerine	Blueberries
Honeydew	Figs
Orange	Nectarine
Papaya	Pear
Peach	Pineapple
Strawberries	Plums (Damson)
Watermelon	Raspberries (black)
	Raspberries (red)
	Grapes
	Mango

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Calculate the remaining protein (meat/fish/poultry, cheese or egg) by subtracting the protein in the cream and vegetable from the total protein allotment. The 65 g of 36% cream and the 19 g of 10% fruits contain a total of 1.5 g of protein.

The patient is allowed 6.2 gm of protein per meal, so he can eat 4.7 g of protein from meat, fish or poultry. Referring to the food value charts (9), this calculates to be 20 g of meat, fish or poultry.

Calculate the amount of fat to be allowed in the meal by subtracting the fat in the cream and protein from the total fat allotment.

The patient has to eat 40 g of fat with each meal. The cream and meat contain 26.7 g of fat, leaving 13.3 g of fat to be mixed with his meal.

Butter, margarine or mayonnaise are more frequently used because of their palatability. However, they contain only 74% fat. Therefore, the remaining grams of fat are divided by 0.74. 13.3/.74 = 17.9 or 18 g of butter, margarine or mayonnaise

Oil is not included but can be used. Oil would raise the average up higher but is not used as often as butter, margarine or mayonnaise.

Other Considerations

Because the diet may induce hypoglycemia, blood glucose levels need to be monitored during the fasting period (3). All IV's must be glucose free. If the blood sugar drops at or below 25-mg % with symptoms of hypoglycemia, administer 15 to 30 cc (1.8 to 3.75 g carbohydrate) of orange juice. Monitor closely and administer more juice if necessary, but be aware that too much carbohydrate will delay ketosis. (See reference 5 for complete hypoglycemia plan.) Another alternative is to administer 1 oz. Pulmocare® plus 5-cc corn/safflower oil. This provides a 4.3:1 ratio and 1.25 g carbohydrate in 30 cc, therefore, treating the hypoglycemia but not interrupting ketosis (7).

Food Guide

All foods must be weighed precisely on a gram scale. *Bowes & Church's Food Values of Portions Commonly Used* (9) is a useful reference for meal planning.

The following foods and products are eliminated from the diet because they contain an appreciable amount of carbohydrates.

Foods to Avoid

Bread
Cake
Candy
Carbonated beverages,
Cereals, sugar coated
Chewing gum
Cookies
Cough drops or cough syrups that contain sugar
Crackers
Honey
Ice cream, commercial
Jam
Sugar sweetened Ketchup
Marmalade
Medicines containing sugar
Molasses
Muffins
Pancakes
Pastries
Peas
Pies
Jelly Preserves
Potatoes
Puddings
Rice
Rolls
Sherbet
Sugar
Syrup
Toothpaste
Waffles

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