FORMULA ROTATION
FOR
CHILDREN WHO RECEIVE TUBE FEEDINGS

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Formula rotation is recommended for infants and children who receive their primary nutrition from a formula and a feeding tube. There are two primary advantages:

- **Dietary Diversity**

The human body was designed to receive a diversified diet. The breast fed infant is exposed to dietary diversity at each meal. The taste of food eaten by the mother passes into the breast milk, giving the baby a great deal of variety. The fat content of the milk varies from the beginning to the end of the meal – again, offering change and variety during the meal. By 6 months, the diet of the typical infant is expanded to include cereals, fruits, and vegetables. Anecdotal reports of bottle-fed infants suggests that there is both a greater eagerness to transition to supplemental foods and a greater difficulty in making the transition to new tastes. Perhaps this occurs because of an inner drive and need for dietary diversity, and also a lack of preparation for the shift to greater diversity because of the infant formula. Continued diversity in infant feeding is encouraged during the first year to provide a strong foundation for the variety that will support a nutritious diet for the child and adult.

The infant and young child who is unable to take nutrients by mouth is quite limited in receiving nutritional diversity. Like the bottle-fed infant, the baby who receives tube feedings is generally given a single formula during the first 6 months. However, this singular dietary formula is continued; and the body receives none of the normal variation associated with typical growth and development. The formula will be changed as the child grows and requires a higher level of nutrients and calories; however, a formula similar to the infant formula is generally recommended. For example, if babies have been on a soy formula, a standard soy formula is often introduced when they are ready for a higher calorie formula.

Because of swallowing and gastrointestinal problems, many of these infants are not introduced to oral feeding until their second year. There is often a strong resistance to accepting pureed foods by mouth. How much of this resistance is a lack of familiarity with dietary diversity in the gastrointestinal tract? Theoretically there would be a strong advantage to creating dietary diversity during the first year through the rotation of formulas, giving the

body the opportunity to adjust to dietary change on a daily basis.

In addition to gastrointestinal diversity, small changes in smell and taste would be present as the infant experienced the odor of different formulas during burps. Personal clinical experience supports this theoretical view.

- ## Food Sensitivities and Allergies

The incidence of food allergy in infants and children is controversial. Traditional allergists suggest that it is quite low (i.e. 3% or less). Physicians interested in environmental medicine suggest a much higher figure, especially in children who have neurological problems or have received antibiotics. Food allergies and intolerances can provoke symptoms in all areas of the body, including gastrointestinal, neurological, and emotional behaviors. Gastrointestinal symptoms such as bloating, excessive gas, abdominal pain or cramps, diarrhea, constipation, nausea, vomiting, and gastroesophageal reflux can all be symptoms of a food allergy or sensitivity. Increased mucous production frequently accompanies allergies. This makes breathing and swallowing more difficult and often contributes to the need for long term tube feeding.

Children may have an allergic sensitivity to a food or environmental substance, and show symptoms at one time and no symptoms at another time. This is because allergies can be cumulative. If a person is allergic to milk and tree pollens, an adverse response to milk may occur only during the "hay fever" season. When the body does not have to deal with pollen, the reaction to milk may be in the normal range. With improved nutrition, reduced stress, and avoidance of environmental chemicals and pollutants, the child may have fewer signs of allergy. Eating larger or more frequent amounts of an allergic food can provoke symptoms. The child may be able to tolerate smaller amounts of the food or eating it less frequently.

Because our bodies try to adapt to the environment and to potential allergens, an allergic reaction may not be obvious. An adaptation response occurs that results in an addiction to the food. Eating a food every day provides a constant exposure, and may actually make the person "feel better" just after eating. Some allergists have noted that a sensitive or vulnerable individual may become allergic to foods that are eaten frequently. Continued exposure to foods eaten daily may culminate in periods of active symptoms in which the body becomes exhausted. Children who eat the same foods daily, weekly, monthly, and yearly via a single tube-feeding formula appear to be particularly vulnerable to addictive allergies. It generally takes 4 days for a food to completely pass through the body. This is the basis for the 4-day rotational diet that may be recommended by an allergist.

If the child is also taking food by mouth, other foods containing the same protein, carbohydrate, and fat sources should be rotated. For example yogurt would be given on the same day as a milk-based formula, but not on the days when a soy or elemental formula was given. Milk in all forms should be eliminated on non-milk days.

Rotating Formulas

The rotation of formulas should be introduced gradually. One formula at a time can be added in order to identify formulas that may not agree with the child. The new formula initially should be diluted and gradually increased to full-strength. When two formulas are accepted well, a third one can be added. Children with food sensitivities may show a withdrawal reaction when the food is eliminated from the diet. If this is not recognized, a caregiver may assume that the negative response is to the new formula, rather than to the elimination of an addictive formula.

The following list of formulas can be used to select a rotary diversified diet of formulas for infants and young children who are tube-fed. Select 3-4 formulas with different nutritional proteins and carbohydrates, and rotate these, giving a different formula every day in the rotation. Remember, formula rotation is done on a daily basis, not on a meal basis. Thus, Formula A would be given on day #1, and Formula B would be given on day #2. This is different from giving Formula A for lunch and Formula B for dinner.

For example:

Day 1 =	Similac (milk + corn)
Day 2 =	Nursoy Liquid (soy–no corn)
Day 3 =	Compleat Modified (beef + fruits and vegetables)
Day 4 =	Peptamen Junior (pre-digested-hydrolyzed casein)

There are other formulas in the most common milk-and-corn, and soy-and-corn categories. Read labels to identify additional formulas. Milk, soy, and corn are frequent allergens for infants and young children.

Milk: Lactose, whey, and casein are all milk products and may be poorly tolerated if the child has a milk allergy. Some children are specifically sensitive to casein even though it is considered easily digested or hypoallergenic.

Corn: Dextrose is a sugar which is made from corn. The majority of formulas have corn syrup or corn oil in them as primary sources of carbohydrates and fats.

MILK-BASED INFANT FORMULAS

(20 calories per ounce)

Contain Corn

Enfamil (Mead Johnson)
Similac (Ross)
Good Start (Carnation)
Lactofree (Mead Johnson)

Does Not Contain Corn but Contains Some Soy Oil

Gerber Baby Formula (Gerber)
Bonamil (Wyeth-Ayerst)
SMA (Wyeth-Ayerst)

HYDROLIZED CASEIN-BASED INFANT FORMULAS

Pre-Digested Milk – Hypoallergenic
(20 calories per ounce; 0.67 calories per milliliter)

Contain Corn

Nutramigen (Mead Johnson)
Pregestimil (Mead Johnson)

Does Not Contain Corn but Contains Some Soy Oil

Alimentum (Ross)

AMINO ACID-BASED INFANT FORMULAS

Hypoallergenic – No milk derivatives
(20 calories per ounce)

Contain Corn

Neocate (SHS)

SOY-BASED INFANT FORMULAS

(20 calories per ounce)

Contain Corn

Isomil (Ross)
Prosobee (Mead Johnson)
Nursoy Powder (Wyeth-Ayerst)
Gerber Soy (Gerber)

Do Not Contain Corn

Nursoy – liquid only (Wyeth-Ayerst)
Carnation Alsoy (Carnation)

MILK-BASED TODDLER FORMULAS

(20 calories per ounce)

Contain Corn

Carnation Follow-Up Formula (Carnation)
Enfamil Next Step (Mead Johnson)

Do Not Contain Corn

Similac Toddlers Best (Ross)

SOY-BASED TODDLER FORMULAS

(20 calories per ounce)

Contain Corn

Enfamil Next Step Soy (Mead Johnson)
Carnation Follow-Up Soy(Carnation)

MILK-BASED STANDARD FORMULAS

(30 calories per ounce)

Contain Corn

Kindercal (Mead Johnson)
Enfamil Next Step (Mead Johnson)

SOY-BASED STANDARD FORMULAS

(30 calories per ounce)

Contain Corn

Enfamil Next Step (Mead Johnson)
Carnation Follow-Up Soy (Carnation)

CASEIN-BASED STANDARD *FORMULAS (No Soy)*

Pre-Digested Milk. Lactose Free. Elemental Diet Formula (30 calories per ounce)

Contain Corn

PediaSure (Ross)

CASEIN-BASED STANDARD FORMULAS

(Contain Soy) Pre-Digested Milk. Lactose Free. Elemental Diet Formula (30 calories per ounce)

Contain Corn

Sustacal (Mead Johnson)
Jevity (Ross)
Osmolite (Ross)
Nutren Junior (Clinitec)
AccuPep (Sherwood Medical)

AMINO ACID-BASED STANDARD FORMULAS

Hypoallergenic – No milk derivatives
(30calories per ounce)

Contain Corn

Neocate One + (SHS)
Vivonex Pediatric (Sandoz)

PEPTIDE-BASED STANDARD FORMULAS

Hydrolized Whey Protein
(30 calories per ounce)

Contain Corn

Peptamen Jr. (Clintec)

BLENDED TUBE FEEDING FORMULAS

(30 calories per ounce)

Contains Corn and Non-Fat Milk. No Soy

Compleat – Regular (Sandoz)
[beef, cereals, fruit and vegetables, non-fat milk]

Contains Corn and Lactose. No Soy

Compleat – Modified (Sandoz)
[beef, cereals, fruit and vegetables, non-fat milk]

Contain Corn and Casein and Soy
Pre-Digested Milk

Vitaneed (Sherwood Medical)
[fruit puree and vegetables; beef puree]

"MILKS" THAT CAN BE USED AS A LIQUID BASE WHEN BLENDERIZED FOODS ARE ADDED TO CREATE A FORMULA, OR ARE TAKEN BY MOUTH

Do Not Contain Milk, Soy, or Corn

Fortified Goat's Milk (Meyenberg)
Fortified Rice Milk (Rice Dream – Imagine Foods)

These milks do not contain complete nutrition for an infant. They should never be used as a total formula.

CARBOHYDRATE SOURCE FOR ADDED CALORIES

Contain Corn

Polycose (Ross) [glucose polymer of corn]
Moducal (Mead Johnson) [glucose polymer of corn]
Dextrose [corn sugar]

Do Not Contain Corn

Dry Infant Rice Cereal [rice]
Fructose [fruit sugar]
Sucrose [cane or beet sugar]

FAT SOURCE FOR ADDED CALORIES

Contain Corn

Corn Oil [corn]

Do Not Contain Corn

MCT Oil (Mead Johnson)
[medium chain fractionation of coconut oil]

Microlipid (Sherwood Medical)
[Safflower oil]

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Guidance in selecting formulas for rotation should be provided by a registered dietitian. Children with special needs also have nutritional needs that may be met by one formula but not another. Short-term exploration of formulas may be done by parents and therapists if the guidance of a dietitian is not available to identify possible formulas that are tolerated by the child. However, long-term use of any formula or formula rotation series should be guided by a registered dietitian and/or a physician.