
Family Practice Grand Rounds

Infant Nutrition

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DR. DEAN R. BORDEAUX (*Director, Residency in Family Practice*): Grand Rounds today is on infant nutrition. Family physicians and their patients are bombarded with nutritional information. Some of the information is sound, but other information, particularly in the lay press, is not. Because infant nutrition is such a common topic, we have no specific case to present. Instead, we will discuss common nutritional questions that might occur while caring for any infant. The general topics covered will be first feeding, breast feeding, milk allergy, and the introduction of solid foods. We will attempt to discuss what is known and what is not known so that we can help our patients make rational decisions about feeding their infants.

What should be ordered for a formula-fed infant's first feeding?

DR. JAMES G. HEIDENREICH (*Residency faculty*): We have all heard differing opinions about what an infant should have at first feeding. It is difficult to determine what is correct. A study was done in the late 1960s in which sterile water, 5 percent glucose, and milk were instilled into rabbits' tracheas.¹ Sterile water caused the least irritation to the trachea. As a result of this study it was suggested that the first feeding be sterile water, with milk introduced at the second feeding.² Aspiration, however, is not the only factor that should be considered when starting an infant's feedings. Caloric needs, the prevention of dehydration, and the prevention of hypoglycemia are also important. These factors have been emphasized more recently. For example, Avery stated in 1975 that feeding is both unnecessary and undesirable in the first few hours after delivery.³ By 1979, it was stated by Krause and Mahan that feeding should be attempted within the first few hours of life in order to provide for the infant's fluid

and caloric needs and to avoid hypoglycemia.⁴

In the absence of specific problems there appears to be no study that shows the advantage of one type of feeding over another. I therefore suggest that feedings start by three hours of age and that 10 percent glucose be used for the first feeding. This is not enough to meet caloric needs but will help prevent dehydration and hypoglycemia.

The method may vary for smaller infants unable to feed orally or who have a problem that interferes with regular feeding. For example, if a tracheoesophageal fistula is suspected, sterile water should be used, as this is probably less irritating if aspirated. For infants of diabetic mothers it is suggested that milk be used to safeguard against hypoglycemia.

DR. BORDEAUX: We have all been taught that breast-feeding is best. How do you do about persuading the mother to breast-feed?

DR. DAVID J. SCHLAGHECK (*Third year family practice resident*): A baby who is successfully breast-fed is a well-nourished baby. It has been shown that the most important factor in breast-feeding is to have an educated, well-supported, and motivated mother. This kind of mother is able to establish a successful nursing dyad with her new infant. Family physicians are in an ideal position to help establish this bond between mother and child.

One of the ways that a successful nursing relationship can be encouraged is by education during the prenatal period, at the time of delivery, and at postpartum follow-up. Every pregnant woman should be assured that she can breast-feed successfully if she desires regardless of general health, age, weight, breast size, and the number of children she has at home.

DR. BORDEAUX: What are the benefits of breast-feeding?

DR. SCHLAGHECK: Mother's milk and nursing have several positive benefits for both mother and child. The infant benefits by the antibodies, lymphocytes, and macrophages that are passively transferred in the mother's milk and help comple-

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ment the immature immune system.⁵ Mother's milk is the most available form of infant nutrition in the world and is always at the right temperature. Nursing also provides valuable contact between mother and infant.

DR. BORDEAUX: What should the mother eat while she is breast feeding?

DR. SCHLAGHECK: Human milk averages 70 kcal/100 ml. The average mother produces 850 ml of milk per day. To produce this amount of milk, the mother needs an extra 750 kcal a day. The fat depot that the mother lays down during pregnancy can supply 230 kcal. This leaves an additional caloric requirement of approximately 500 kcal a day.

The nursing mother also needs a total of at least 70 gm of protein a day, an extra 400 mg of calcium, and supplemental vitamins.⁶

The need for milk is controversial. Milk is certainly a good food but is not essential to breast feeding. Others have pointed out that "cows don't drink milk, but they seem to produce plenty of it."

DR. BORDEAUX: Can breast feeding be used for contraception?

DR. SCHLAGHECK: This was studied by Perez in 1972.⁷ In 170 nursing mothers, the date of first ovulation was approximately 112 days after delivery compared with 49 days in mothers who were not nursing. The chance of ovulation at nine weeks was only 9.8 percent. By 18 weeks however, 40 percent of the nursing women had a menstrual period. Eighty percent of the menstrual periods were ovulatory, and the group had 12 pregnancies in the first four months. Therefore, breast feeding might be a way to increase the natural spacing or time interval between having children, but for the modern American mother, it is an unreliable form of birth control.

DR. BORDEAUX: When should breast feeding be started?

DR. SCHLAGHECK: At the time of delivery. Early ad lib nursing should be stressed. This improves bonding and assures an early and adequate induction of milk supply. It also increases the amount of oxytocin released, ensuring firm uterine contractions and decreased amounts of postpartum bleeding.⁸

It is important not to separate mother and child at the time of birth. Nursing should take place in an area that is quiet, in which the mother can relax and have adequate time to suckle her infant. Those

in contact with the mother should promote her feelings of adequacy to ensure successful breast feeding.⁹

DR. BORDEAUX: Should breast feeding be stopped if the mother develops a fever?

DR. SCHLAGHECK: A postpartum fever is not a contraindication to breast feeding. About the only absolute contraindications are active hepatitis, tuberculosis, and herpes simplex infections.

DR. BORDEAUX: What feeding schedule should be used for the newborn?

DR. SCHLAGHECK: Newborn feeding schedules should initially be determined by the infant, not by the mother, and certainly not by the charge nurse in the nursery. The concept of feeding a baby or putting a baby to the breast every four hours is a modern practice that is not based on the physiology of our species. In 1977, Lozoff¹⁰ studied anthropologic data and came to the conclusion that for over 99 percent of our species' existence, infants were carried continuously and nursed very frequently.

DR. BORDEAUX: When should the breast fed infant be seen for follow-up?

DR. SCHLAGHECK: The infant who is breast feeding should be seen within two weeks of going home. The baby should be checked for any evidence of jaundice. The weight, voiding pattern, and the number of feedings should also be determined.

DR. BORDEAUX: What about medications for the nursing mother?

DR. SCHLAGHECK: The nursing mother should be kept off all drugs if possible. Certain drugs, such as lithium, isoniazid, propylthiouracil, chloramphenicol, and all antimetabolites and radionuclides, are absolutely contraindicated in the nursing mother.¹¹ She should also be warned to limit her intake of coffee and cigarettes.

DR. BORDEAUX: How should we deal with the breast-fed infant who is not gaining weight?

DR. SCHLAGHECK: The usual approach to failure to thrive in a breast-fed infant in American medicine has been this: The mother comes in and says, "I am a failure. I cannot breast feed my baby because he is not gaining any weight." The physician says, "Yes, that's true. Here's a bottle."

Any breast-fed baby that is failing to gain weight needs to be evaluated just as intensively as a formula-fed baby. There are many causes for failure to thrive among infants, including poor suckling, gastrointestinal disturbances, infections,

congenital heart disease, and increased nutritional requirements as seen in small for gestational age babies.

Maternal causes include decreased milk production from poor diet or fatigue. The most common cause of poor nursing is a decreased letdown reflex. This is usually related to distress, a lack of support, and environmental or other psychological factors.^{12,13}

DR. BORDEAUX: Do you recommend supplemental bottles?

DR. SCHLAGHECK: Supplemental bottles should be avoided, although I would not be dogmatic about that at four in the morning.

DR. BORDEAUX: Many mothers come to the office worried that their baby might be allergic to infant formula. How common is cow's milk allergy?

DR. JAMES T. CRABTREE (*Second year family practice resident*): The incidence of cow's milk allergy is reported to be between 0.1 percent to 8.0 percent. The actual incidence is probably less than 3 percent.¹⁴

DR. BORDEAUX: What is the etiology of cow's milk allergy?

DR. CRABTREE: The etiology is felt to be related to the presence of foreign proteins in cow's milk. The simple induction of an immune state is not enough to cause an allergy. Ninety-eight percent of infants have been shown to have antibodies to milk proteins by two years of age.¹⁵ The mere presence of antibodies to milk proteins, therefore, does not indicate that the infant is allergic. Sensitization to cow's milk can also occur indirectly. For example, cow's milk allergy has been found in breast-fed infants whose mothers were ingesting cow's milk.¹⁶ Also, there are suspected cases of cow's milk allergy being induced in utero.¹⁷

DR. BORDEAUX: When do infants first become allergic to cow's milk?

DR. CRABTREE: After cow's milk is started, 40 percent of sensitive infants will manifest symptoms during the first week and 75 percent, within the first two months.¹⁸ If a child does not become allergic or manifest symptoms when cow's milk is started, it does not necessarily mean that he will not later become allergic. Some children will not become allergic until they have an episode of gastroenteritis. If a child has an episode of gastroenteritis and later shows continuing symptoms, one should suspect cow's milk allergy as well as a persistent lactase deficiency.

DR. BORDEAUX: What is the clinical presentation of an infant with cow's milk allergy?

DR. CRABTREE: There are three common presentations:

1. *Colicky abdominal pain*: These infants often have blood and mucus in the stools. This is not felt to be an actual allergic response, but it can be viewed as that because the treatment is the same as for a true milk allergy.

2. *Malabsorption syndrome*: These patients have steatorrhea and frequently have gross blood in their stools. The xylose absorption test is usually abnormal.

3. *Allergic gastroenteropathy*: Gastrointestinal symptoms are either mild or absent; these patients usually present with other allergic symptoms such as rhinitis, eczema, and asthma.

Milk allergy may also present as failure to thrive because of protein loss in the gastrointestinal tract. Other less common manifestations in an infant are a tension fatigue syndrome and anaphylaxis. Many milk allergy patients will have iron deficiency anemia from gastrointestinal blood loss. This anemia responds poorly to iron unless the basic problem is corrected.

DR. BORDEAUX: How do the symptoms in infants compare with the symptoms in older children?

DR. CRABTREE: In the infant population there is a predominance of gastrointestinal symptoms in comparison with older children. With the passage of time the gastrointestinal symptoms will often subside. The idea that children outgrow their allergies, however, is now being questioned. It is now felt that in many cases only the manifestations change. For example, an infant who initially presented with diarrhea and vomiting as a result of exposure to cow's milk may later have eczema or asthma.

DR. BORDEAUX: How common is cow's milk allergy in other family members?

DR. CRABTREE: If a child in a family is found to be allergic to cow's milk, there is a one in three chance that other siblings will have cow's milk allergy.¹⁹ This is an important question to ask about a child with suspected cow's milk allergy.

DR. BORDEAUX: How can the diagnosis of cow's milk allergy be made?

DR. CRABTREE: The main method of diagnosis is a food elimination test followed by a challenge. For the elimination test all cow's milk and all milk products (ice cream, sherbets, chocolate,

cream soups, and cream vegetables) should be eliminated for about three weeks. Most authors do not recommend eliminating bakery goods and butter because the amount of milk protein in them is not great enough. The elimination period may need to exceed three weeks if the symptoms began more than three weeks after the child was started on milk.

If there is no improvement, a different allergy or another diagnosis should be considered. If there is equivocal improvement, the elimination period should be extended for an additional three weeks.

If the symptoms abate, a challenge test should be done to confirm the diagnosis. If there is a history of severe allergic reactions, the challenge should be conducted in the hospital so the child can be carefully observed for anaphylaxis. A challenge test is not negative until the allergen has been given daily for up to a week. If the history suggests large amounts of the allergen are necessary to induce an allergic response, this should be kept in mind during the challenge test. The challenge should be followed with another three-week period of elimination to observe for subsidence of symptoms.

If there is unequivocal improvement, the patient may not need a challenge. In fact, many parents will refuse to have the challenge done if the child responds promptly to the elimination diet.

DR. BORDEAUX: How useful are laboratory tests?

DR. CRABTREE: The main method of diagnosis is still food elimination and challenge. However, there are also several laboratory tests that are sometimes helpful. The first of these is the radioallergosorbent test (RAST). It has the advantage of being very specific. Of those who are shown by food elimination tests to have an allergy, about 80 percent will have a positive RAST. However, it is not a useful screening tool, since there are many false negatives. It is also expensive and looks only at IgE mediated reactions. Serum IgE levels greater than 300 IU/ml are a useful indicator; however, they are not specific.²⁰

The peripheral blood and stool eosinophils may also be examined to screen for an allergic process. Skin testing has a limited place in the detection of cow's milk allergy because of problems with both false positives and false negatives.¹⁴

DR. BORDEAUX: What about treatment?

DR. CRABTREE: The primary treatment is the

avoidance of cow's milk. If the history indicates the child gets along well with small amounts of milk, then the child may ingest a little. Usually allergens have an additive effect. Although most patients can get by safely with a little each day, they should be cautioned that it is not permissible for them to take as much as they want.

After the child is started on the milk elimination diet, new foods should be added every three to seven days. The child will probably have other food allergies, and these will be easier to detect this way. A challenge test should be repeated with the allergen every 6 to 12 months, keeping in mind that the manifestations may be different at a later date.

Usually when children are found to be allergic to cow's milk, a soybean formula is substituted. Unfortunately, 20 percent of children placed on a soybean formula will later become allergic to the substitute.¹⁴

Cromolyn has also been used to treat food allergies. It is indicated if the elimination diet proves to be too prohibitive or is impractical. The dosages range from 25 to 200 mg given by mouth one-half hour prior to eating.^{21,22}

DR. BORDEAUX: Can breast feeding prevent later food allergies?

DR. CRABTREE: A paper in *Lancet* supports this concept.²³ There was a significant difference in the prevalence of allergy at three years of age between a group of infants fed breast milk for fewer than two months and a group breast fed longer than six months. The authors of this study recommended breast feeding for at least six months in a child in whom there is a family history of allergy. A later study by the same authors, however, indicates that early elimination of potential allergens may only delay the onset of allergic symptoms.²⁴

DR. BORDEAUX: Is there a relationship between solid foods and obesity?

DR. DAVID E. TRACHTENBARG (*Associate Director, Family Practice Residency*): The data on this are contradictory. The infant regulates its food intake to a large extent according to volume in the first six weeks of life. In other words, a neonate given concentrated milk formula will take more calories than one given a diluted milk formula. Many of the strained baby foods such as vegetables and soups have less caloric density than milk does. Therefore, if the mother gives vegetables,

the infant would probably take in fewer calories than if milk were given. Cereals and juices have approximately the same caloric density as milk; fruits, meats, and desserts have more. The food reported to have the highest caloric density is egg yolk; this also has a high cholesterol content. This means that the early introduction of solid food could contribute to weight gain by increased caloric density, but only if the mother is giving meats, fruits, desserts, and other foods with high caloric density.²⁵

DR. BORDEAUX: Can infants properly swallow solid food?

DR. TRACHTENBARG: The swallowing mechanism has been studied. Infants develop the normal adult swallowing mechanism somewhere between the age of 2.5 and 3.5 months. Prior to this time they cannot transfer food from the front of their mouth to the back of their throat to swallow.²⁶

DR. BORDEAUX: Will infants sleep better at night if given cereal?

DR. TRACHTENBARG: Termination of night feeding was studied by Beal.²⁷ She found that the median age at which infants slept through the night was six weeks for boys and five weeks for girls. There was no relationship between breast feeding, bottle feeding, or the introduction of solid food and sleeping through the night. Some infants with lucky parents slept as early as one week of age, other infants book as long as 15 months!

DR. BORDEAUX: Will the early introduction of solid food prevent disease?

DR. TRACHTENBARG: There are several studies showing that breast-feeding will prevent disease.²⁸⁻³⁰ For the breast-fed infant I was not able to find any study showing that the early introduction of solid foods provides any additional benefits.³¹

In one study infants fed only formula had a higher mortality than infants given formula and supplemental solid foods in the first six months.³⁰ The study was done in Chile, however, and the composition of the infant formulas was not specified. Therefore, one should be cautious about extrapolating this finding to more developed countries.

DR. BORDEAUX: Should solid foods be introduced in a particular order?

DR. TRACHTENBARG: Traditionally solid foods have been introduced in the order of cereals, vegetables, fruits, and meats. Part of the rationale for this is to avoid food allergies. Although there is

no good evidence that you can avoid food allergies by doing this, I would recommend continuing this pattern, since it does progress from low caloric density food to high caloric density food and may help prevent obesity.

DR. BORDEAUX: Is there a problem with solid foods and excessive salt intake?

DR. TRACHTENBARG: There was concern about this several years ago. Since that time the baby food companies have removed most of the salt from baby food. Related to this is a study by Fomon et al in which they found that infants at four and seven months of age had no preference either for or against food that was salted.³² This was done by feeding infants salted foods one time and unsalted foods another time. There was no difference in food intake between the two kinds of food. Parents should be told not to add additional salt to the food themselves because they do not like the taste of low-salt food.

DR. BORDEAUX: What about parents making their own baby food?

DR. TRACHTENBARG: Parents should be taught how to make their own baby food. This is much cheaper than buying it in jars. A survey in Sweden found that mothers who use the commercial products are often insecure about themselves and their abilities.³³ I believe that family physicians should try to help relieve this insecurity with good patient education.

DR. BORDEAUX: How compliant are patients with our nutritional instructions?

DR. TRACHTENBARG: About 70 percent of patients will follow their physician's nutritional advice and 30 percent will not. Breast-feeding mothers are about 85 percent compliant, whereas bottle-feeding mothers are about 55 percent compliant.

Contrary to what might be expected, patients who have been seeing the same physician for a number of years are less compliant than new patients. It is hypothesized that people who have long-term relationships with their physicians are usually established in the community and have many friends and relatives to give them advice. Nutritional knowledge also is negatively correlated with compliance. In other words, people who know more about nutrition are less likely to follow their physician's advice and are more likely to do what they think is appropriate.³⁴

DR. BORDEAUX: Can solid foods cause electrolyte problems?

DR. TRACHTENBARG: There have been reports of hypernatremia in infants fed improperly diluted formula. Solid foods also present an increased solute load, but this is probably not clinically significant for most infants.

DR. BORDEAUX: What recommendations would you make concerning solid food?

DR. TRACHTENBARG: In Sweden there is a standard recommendation that solid foods be started between three and four months of age.³³ In America it seems that every physician gives different advice. Physicians have recommended starting solid foods from shortly after birth to one year of age.³⁵

I recommend that solid foods be started no sooner than three months of age. In the study from Chile previously mentioned,³⁰ it was found that after six months of age infants who were fed only breast milk had a greater mortality. Based on this, solid foods should be started no later than six months of age.

I tell mothers that if they want to feed their babies baby foods earlier, it will probably not hurt them, but the swallowing mechanism has not developed enough for them to handle solid foods well. It is also recommended that small quantities of new food be given initially and that several days should elapse before starting other new foods in case the infant does have a reaction. Truly solid foods such as graham crackers should be avoided until about six months of age. Foods that are potentially dangerous, such as nuts or fish with bones in it, should be avoided until at least two years of age, at which time most children can tolerate a normal adult diet.³⁶

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