Standard Infant Formula and Formula Feeding–Cow Milk Protein Formulas

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The number and variety of infant formulas have increased tremendously during the past decade. Although standard infant formulas make up approximately 75% of the infant formulas currently sold, the remaining include a variety of specialized formulas that are designed for specific medical indications or symptoms. This *In Brief* presents information on standard infant formulas, and a separate *In Brief* focuses on specialized formulas.

Despite the preponderance of evidence that human milk has a large variety of nutritional and nonnutritional advantages, the most recent data from the Centers for Disease Control and Prevention (CDC) (2015) indicate that only 79% of women will start breastfeeding their babies at birth, and by 6 months of age that proportion drops to approximately 19%. Based on the birth of approximately 4,000,000 infants during the time of data collection, nearly 1,000,000 infants were fed formula from birth and more than 3,000,000 received at least some formula by 6 months of age. The large number of formula choices available to families can be confusing. Thus, pediatricians should have a good working knowledge of the infant formula products available on the market, any benefits and/or ramifications from specific formula choices, as well as the knowledge to identify the small percentage of infants who might require a specialized infant formula.

The use of alternatives to human milk dates back to 4,000 years ago. Over time, the most commonly used substitute was cow milk, but a variety of different animal milks have been used, including sheep, goat, and camel, based on availability. In the late 18th century, scientific interest led to the comparison of the composition of human milk with that of a variety of different animal milks. In the mid-1860s, chemist Justus von Liebig developed and patented the first infant formula based on cow milk, a powdered formula made from wheat flour, cow milk, malt flour, and potassium bicarbonate. Soon after this, and continuing for more than a century, many other infant formulas were introduced to the market.

The Infant Formula Act of 1980 authorized the Food and Drug Administration (FDA) to ensure quality control of infant formulas. Based on American Academy of Pediatrics (AAP) recommendations, a standard list of 29 nutrients was to be present in all infant formulas. In 2014, the FDA finalized a rule that set standards for manufacturers of infant formulas. These standards required manufacturers to prove that the infant formulas they produce support normal physical growth, to test for nutrient content in the final product stage and at the end of the product shelf life, and to undergo yearly FDA inspections at all facilities. Because both brand name and store brand infant formulas are subjected to the same standards, brand name infant formulas should not be considered superior to store brand formulas. Thus, parents may choose the significant cost savings of a store brand formula without hesitation.

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In standard infant formulas, the protein source is cow milk, lactose is the main carbohydrate source, and the fats are from a blend of vegetable oils. Standard infant formulas are available in powder or liquid concentrates to be mixed with a predetermined amount of water and as ready-to-use liquids, with caloric densities of 19 to 20 kcal/oz. Both the powder and concentrate preparations allow for the formula to be mixed with less water to provide a higher caloric density when needed. Iron is an essential mineral, and the AAP currently recommends that from birth to 1 year of age a standard, iron-fortified formula be used for all infants who are not breastfed. Although low-iron formulas are available, they should be considered nutritionally inadequate and are not recommended.

Because levels of long-chain polyunsaturated fatty acids (LCPUFAs), specifically, docosahexaenoic acid (DHA) and arachidonic acid (ARA), had been found to be higher in the brains of breastfed infants compared with those formerly fed formula, LCPUFAs have been included in most marketed standard infant formulas since 2002. The addition of LCPUFAs is marketed as improving the visual development and neurodevelopment of infants. Although early meta-analyses did not support this claim, more recent studies examining infants fed with higher doses of DHA and ARA have reported benefits. However, because most randomized control trials do not support these claims, there is no recommendation for the routine supplementation of infant formula with LCPUFAs.

Because of parental perceptions of changes in bowel movements being a potential reason for formula changes, physicians need to be familiar with the difference in the feeding and stooling patterns of breastfed versus formula-fed infants. Infants who are formula fed generally take larger, less frequent feeds than breastfed infants. The stools of formula-fed infants tend to be thicker in consistency, darker in color, and less frequent than those of breastfed infants during the first few weeks after birth. Overall, the volume of stool tends to be the same for breastfed and formula-fed infants. However, there is some variation based on the type of infant formula used. Specifically, infants fed hydrolyzed protein formulas have stooling patterns and stool appearance more like those of breastfed infants.

A variety of specialized infant formulas are also available on the market, with a significant number of new products available in the past decade. These will be discussed in an upcoming *In Brief* on specialized infant formulas.

COMMENT: Guiding parents through formula options is an important component of anticipatory guidance by primary care providers Although it can be challenging to reassure parents that gassiness, minimal grunting with defecation, spitting up, and crying in the first few weeks after birth may be normal behaviors or symptoms in young infants, assisting families in these decisions is an important part of our job. However, families may not seek advice but instead make the changes on their own based on symptoms they have observed or advice from family members. I am reminded of 2 interesting studies that Dr Brian Forsythe and colleagues published. In the first study, published in 1985, his team interviewed a group of mothers when their infants were 4 months of age. They found that the mothers of infants who underwent formula changes were more likely to think that their infant had an intrinsic problem, such as an illness. When these mothers were again interviewed 3½ years later, those whose children were managed with formula changes for perceived feeding problems or crying were more likely to perceive their children as vulnerable (relative risk, 2.18; 95% confidence interval, 1.05–4.53). These studies raise concerns that benign formula changes may not always be innocuous and pediatricians need to seriously consider and identify infants who truly meet the criteria for a change in formula.

– Janet R. Serwint, MD
Associate Editor, *In Brief*

Correction

A sharp-eyed reader identified an error in the February review "A Clinical Approach to Tonsillitis, Tonsillar Hypertrophy, and Peritonsillar and Retropharyngeal Abscesses" *(Pediatrics in Review.* 2017;38(2):81–92, doi: 10.1542/pir.2016-0072). In the section "Tonsillitis, Pharyngitis," under the heading "Diagnosis," the correct culture medium to use when a pharyngeal infection with *Neisseria gonorrhea* is suspected is Thayer-Martin or Martin-Lewis medium. The online version of the article and the accompanying teaching slides have been corrected. The journal regrets the error.

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