Human milk as the Gold Standard for Infant feeding

Ruth A. Lawrence
Dept. of Pediatrics, Strong Memorial Hospital, School of Medicine and Dentistry, University of Rochester Medical Centre, 601, Elmwood Avenue, Rochester, NewYork 14642, U.S.A.

Ruth A. Lawrence

Summary

Human milk is specifically designed to meet the growth needs of the human infant. Of most importance and significance is the growth of the brain in the first year of life (Raisler, et al., 1999). Clinicians should focus on the optimal growth of the central nervous system by encouraging exclusive breastfeeding for at least six months, followed by the addition of weaning foods and the continuation of breastfeeding for at least a year and then for as long thereafter as mother and infant choose (Work group on Breastfeeding, 1997).

Introduction

Human milk is for the human infant. Early in the pregnancy, the breasts respond to the hormonal milieu that begins the development of the ductal system and the alveoli which will eventually produce the milk (Lawrence, 1999). It has been long accepted that mother's milk is the best option for infants. The advent of readily available formulas made from cow milk has left the impression that these preparations are an adequate substitute. Not only are the constitutents less adequate but formula introduces the risk of use of contaminated water and increased exposure to infectious diseases. Human milk contains all of the nutrients that an infant needs for appropriate growth and development. Research in the last decade has identified additional information regarding the tremendous value of human milk to the human infant (Cunningham, et al, 1991). Pediatricians around the world have focused on weight gain as part of the management and assessment of the young infant. Monitoring weight gain ignores the value of human milk in optimal brain growth (Zetterstrom, 1998) and the special protection of human milk against infectious disease (Victoria, et al., 1987). This discussion will highlight some of the newer information about the value of human milk.

Species Specificity

Everyone of the four thousand mammalian species produces a milk specifically engineered to meet the growth and development needs of the offspring of that species (Lawrence, 1999). Aquatic mammals such as the whale require large amounts of fat to live in the ocean and stay afloat and keep warm. Thus, whale milk is over 50% fat. Other species such as the rabbit will double its birth weight in a week and leave the hatch shortly thereafter. Thus, rabbit milk is high in protein and moderately high in fat. Human milk is equally unique and specifically designed for the growth needs of the human infant.

Development of the Brain and Central Nervous System.

The brain of a human infant will double in size in the first year of life, and, thus, the first year of life is a critical growth period for the central nervous system in the human infant. Nutritional management of the human infant in the first year of life should focus on optimal brain growth not on the accumulation of adipose tissue. Although this measurement is much more difficult than placing a child on a scale, studies have measured the brain growth

indirectly by intelligence testing and other sensory development. Over 30 years ago, Newton (1971) studied a group of 3 year olds, examining the hypothesis that extended breastfeeding beyond a year would make the infant very dependent upon his mother. A group of 3 year olds who were breast fed over a year were compared with a group of 3 year olds who had been exclusively bottle fed. In a blinded study, the results of the psychologic testing revealed that those children who had prolonged breastfeeding were indeed more outgoing, assertive, comfortable in social situations and scored higher on the developmental tests than those children who were bottle fed. In the early 1980's, Lucas and colleagues (Lucas, et al., 1992) studied a group of premature infants prospectively. The hypothesis was that providing prematures with their mother's milk by feeding tube was more efficacious than providing a premature with formula by feeding tube. The investigators reported their results at 18 months and then again at 8 years of age, documenting that the infants who receive their mothers' milk scored better on the Bayley Scales at 18 months and on the Wechsler Intelligence Tests at 8 years. The difference of 8 points or more persisted even when adjustments were made for maternal education and socioeconomic status. More recently, an 18 year study of over a thousand children in New Zealand was reported by Horwood and Fergusson (1998). Not only did the children in these studies score higher on the intelligence tests but had better grades, better deportment, and better social skills throughout their schooling for the first 18 years of life. Other similar studies continue to appear in the literature(Johnson and Swank 1996, Lanting, et al., 1998, Lucas, et al., 1998).

The question remains," Is it possible that there are constituents in human milk that facilitate the growth of the human brain?" Three constituents are most important. First is cholesterol which is in high concentration in nerve and brain tissue. Human milk contains cholesterol, and the amount of it is consistent from the beginning of lactation until the time of weaning whenever that might take place. The amount of cholesterol in the milk is relatively stable regardless of mother's diet which might range from high fat and high cholesterol to low fat and low cholesterol (Rebuffe-Scrive, et al., 1985). This suggests that Mother Nature is protecting the presence of cholesterol in human milk. In contrast, there is no cholesterol in infant formula today. The second constituent is taurine, an amino acid which is consistently in human milk and absent in cow milk and until recently absent in formula. In recent years, formula manufacturers have been adding synthetic taurine to their products. Taurine is not an essential amino acid for adults but is for the infant who cannot manufacture it. Taurine is also an important constituent of brain and nerve tissue. The third nutrient is docosahexaenoic acid or DHA, an Omega 3 fatty acid, that is in high concentration in brain and nerve tissue (Jorgensen, et al., 1996). The importance of DHA in the feeding of prematures has been evaluated by a number of investigators (Neuringer, et al, 1994). Studies of visual acuity are a simple way of evaluating the effect on the retina of the eye and indirectly on the maturation of the brain. Technology is available to assess the visual acuity of premature infants. Premature infants fed their mothers' milk have been demonstrated to have greater visual acuity than infants fed formula. When this formula is supplemented with DHA, the visual acuity of the infant improves over that of an infant fed formula but does not meet the visual acuity capacity of infants fed their mothers' milk. An additional parameter that can be used as a measurement of nerve tissue development is the assessment of auditory acuity (Amin, et al. 1998). Studies have been done measuring auditory evoked response in infants with different diets. These show a similar outcome with infants fed their mothers' milk having the best auditory acuity and those fed formula have the least and those fed formula supplemented with DHA being improved over those fed formula alone.

It is clear that infants fed their mothers' milk appear to have better neurologic development than those fed formula or those fed formula with supplementation as documented by long term intelligence testing, as well as the measurement of visual and auditory acuity (Lucas, et al., 1998).

Protection Against Infection.

Protection against infection by breastfeeding has been documented for many generations as morbidity and mortality has been recorded to be less in infants who are breastfed (Beaudry, et al., 1995, Pisacane et al., 1994). Protection against diarrheal diseases has been the major benefit evaluated (Hanson, et al., 1989). It is well-documented that breastfeeding and human milk protect against rotavirus, for an example, for which there is now a vaccine. The dramatic difference in the incidence of otitis media, especially in the United States and Canada as correlated with feeding method has revealed that infants who are breastfed suffer considerably less from the disease. It is not only because of the protective effects of the milk itself but because of the manner of suckling at the breast which protects the Eustachian tube against regurgitation (Aniansson, et al., 1994).

Of particular interest has been the identification of nucleotides and cytokines in human milk. Isolation of cytokines as shown that evaluation of their presence in the diet has a curcial effect on curtailing the development of infection. A strong testimony in support of the value of both nucleotides and cytokines is the fact that manufacturers of formula are currently trying to incorporate synthetic replicas of human cytokines and nucleotides into infant formulas.

Epidemiologic studies have reported that exclusive breastfeeding for at least four months appears to be protective against the development of allergy (Burr, et al., 1993, Isolauri, et al., 1999) celiac disease, Crohn's Disease (Koletzko, et al., 1989), childhood onset of diabetes (Virtanen, et al., 1991) and childhood cancers (Davis, et al., 1988). Additional studies of development of latent diseases in childhood have suggested a similar protective effect of exclusive breastfeeding for at least 4 months. Any time the value of breastfeeding is compared with the effects of formula feeding, it is important to define breastfeeding and to document its duration. Exclusive breastfeeding is the feeding of an infant with only mother's milk. Fullbreastfeeding is giving all nutrition by breast but the occasional use of water or vitamins. Partial breastfeeding is the introduction of formula while breastfeeding. These definitions were agreed upon by an international group in order to develop a more uniform assessment of breastfeeding (Labbok, et al., 1997).

The Advantage of Breastfeeding to the Mother.

While one usually speaks of the tremendous advantages of mother's milk for the human infant, little attention has been focused on the advantages of the mother to breastfeed her infant. It has been shown that women who breastfeed their infants return to the normal prepartum state more quickly including the involution of the uterus and the loss of intrapartum weight gain. Of particular importance is the fact that women who breastfeed have a lower risk of long term osteoporosis than women who do not breastfeed. Although there is some decrease in mineral density of the bones following pregnancy and lactation, there is a rebound increase in bone density following weaning (Cross, et al., 1995). There is also a documented decrease risk of premenopausal breast cancer (Newcomb, 1994) and ovarian cancer (Rosenblatt, and Thomas 1993) in women who breastfeed their infants as compared to women of similar age and risk who do not breastfeed. Many studies on postpartum fertility and child spacing have documented clearly that women who breastfeed postpone the return of ovulation and fertility for longer periods of time than those women who do not breastfeed (Subcommittee on Nutrition During Lactation, 1991).

Possible Contraindications ?

With all of the tremendous benefits of human milk, could there possibly be any contraindications ? In the area of infectious disease because of our present lack of knowledge and limited medical treatments in human immunodeficiency viral (HIV) disease, it is recommended by the World Health Organization that a mother should

not breastfeed her infant if she is HIV positive. This recommendation pertains to developed countries. In underdeveloped countries, however, where the risk of death in the first year of life approaches 50% in the non-breastfed infant, it may be prudent to breastfeed in the presence of maternal HIV because of the high risk of bottle feeding. Human T-cell Leukemia Virus Type I (HTLV-I) is also considered a possible contraindication to breastfeeding. With other infectious diseases, including tuberculosis, once treatment has been initiated there are not contraindications to breastfeeding (Lawrence, 1997).

Another concern regarding breastfeeding is the use of maternal medications (Committee on Drugs, 1994, Lawrence, 1999) There are very few circumstances in which breastfeeding is contraindicated in the face of maternal medications. The categories of drugs which may contraindicate breastfeeding are the use of antimetabolites (immunosuppressive drugs and anticancer drugs), street drugs or drugs of abuse such as heroin and cocaine, and thirdly the therapeutic use of radioactive drugs). Should a mother be given a single dose of radioactive compound for diagnostic purposes, the mother should pump and discard her milk until the radioactivity has cleared from the system. There are good data of the clearance times of the common radioactive therapeutic compounds. Should there be a question regarding a given medication, information regarding that medication can be sought from one of the drug databases or the Lactation Study Center in Rochester, New York, USA. In general, the tremendous benefit of being breastfed far outweighs the risk of any possible hazardous drug or infectious disease (Wilson, et al., 1998).

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