

Breast Milk –Production and Benefits

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Abstract:

Human milk is uniquely superior for infant feeding and represents the perfect example of individualization in Pediatrics. Human milk is not a uniform body fluid but a secretion of the mammary gland of changing composition. Breastfeeding is widely acknowledged as the normal and unequalled method for feeding infants due to its associated health benefits, both for the infant and the mother. The World Health Organization recommends that infants are exclusively breastfed up to the completion of six months of age, with breastfeeding continuing to be an important part of the diet until the infant is at least two years old. The several health benefits associated with breastfeeding are driven by the combined action of the nutritional and bioactive components in human milk and the magnitude of the majority of the ascertained biological effects is directly dependent on breastfeeding duration. This review briefly summarizes the current knowledge on the composition of human milk and provides an overview on its functional effects on health outcomes, focusing on the latest research results. Extensive research has demonstrated health, nutritional, immunologic, developmental, psychological, social, economic and environmental benefits of human milk. Breastfeeding results in improved infant and maternal health outcomes in both the industrialized and developing world.

Keywords: Human milk, Breastfeeding, Infants, Lactation

Breast Milk Concept:

Breast milk or mother milk is the milk produced by the breasts or mammary glands of a human female to feed a child. Milk is the primary source of nutrition for newborns before they are able to eat and digest other foods; older infants and toddlers may continue to be breastfed, in combination with other foods from six months of age when solid foods should be introduced.

Benefits of Breast Milk :

Breastfeeding offers health benefits to mother and child even after infancy. These benefits include proper heat production and adipose tissue development, a 73% decreased risk of sudden infant death syndrome, increased intelligence, decreased likelihood of contracting middle ear infections, cold and flu resistance, a tiny decrease in the risk of childhood leukemia, lower risk of childhood onset diabetes, decreased risk of asthma and eczema, decreased dental problems, decreased risk of obesity later in life, and a decreased risk of developing psychological disorders, including in adopted children. In addition, feeding an infant breast milk is associated with lower insulin levels

and higher leptin levels compared feeding an infant via powdered-formula.

Breastfeeding also provides health benefits for the mother. It assists the uterus in returning to its pre-pregnancy size and reduces post-partum bleeding, as well as assisting the mother in returning to her pre-pregnancy weight. Breastfeeding also reduces the risk of breast cancer later in life. Lactation protects both mother and infant from both types of diabetes. Lactation may protect the infant from specifically developing Type 2 diabetes because studies have shown that bioactive ingredients in human breast milk could prevent excess weight gain during childhood via contributing to a feeling of energy and satiety. A lower risk of child-onset diabetes may more applicable to infants who were born from diabetic mothers. The reason is because while breastfeeding for at least the first 6 months of life minimizes the risk of Type 1 diabetes from occurring in the infant, inadequate breastfeeding in an infant prenatally exposed to diabetes was associated with a higher risk of the child developing diabetes later on. However, it can be argued that human breastfeeding may contribute to protective effects against the development of Type 1 diabetes due to the fact that the alternative of

bottle-feeding may expose infants to unhygienic feeding conditions.

Though it now is almost universally prescribed, in some countries in the 1950s the practice of breastfeeding went through a period where it was out of vogue and the use of infant formula was considered superior to breast milk. However, it is now universally recognized that there is no commercial formula that can equal breast milk. In addition to the appropriate amounts of carbohydrate, protein, and fat, breast milk provides vitamins, minerals, digestive enzymes, and hormones. Breast milk also contains antibodies and lymphocytes from the mother that help the baby resist infections. The immune function of breast milk is individualized, as the mother, through her touching and taking care of the baby, comes into contact with pathogens that colonize the baby, and, as a consequence, her body makes the appropriate antibodies and immune cells.

At around four months of age, the internal iron supplies of the infant, held in the hepatic cells of the liver, are exhausted. The American Academy of Pediatrics recommends that at this time that an iron supplement should be introduced, however, other health organisations such as the NHS in the UK have no such recommendation. Breast milk contains less iron than formula, because it is more bioavailable as lactoferrin, which carries more safety for mothers and children than ferrous sulphate. Both the AAP and the NHS recommend vitamin D supplementation for breastfed infants. Vitamin D can be synthesised by the infant via exposure to sunlight, however, many infants are deficient due being kept indoors or living in areas with insufficient sunlight. Formula is supplemented with vitamin D for this reason

Lactation :

Lactation is the process by which milk is synthesized and secreted from the mammary glands of the postpartum female breast in response to an infant sucking at the nipple. Breast milk provides ideal nutrition and passive immunity for the infant, encourages mild uterine contractions to return the uterus to its pre-pregnancy size (i.e., involution), and induces a substantial metabolic increase in the

mother, consuming the fat reserves stored during pregnancy.

Structure of the Lactating Breast:

Mammary glands are modified sweat glands. The non-pregnant and non-lactating female breast is composed primarily of adipose and collagenous tissue, with mammary glands making up a very minor proportion of breast volume. The mammary gland is composed of milk-transporting lactiferous ducts, which expand and branch extensively during pregnancy in response to estrogen, growth hormone, cortisol, and prolactin. Moreover, in response to progesterone, clusters of breast alveoli bud from the ducts and expand outward toward the chest wall. Breast alveoli are balloon-like structures lined with milk-secreting cuboidal cells, or lactocytes, that are surrounded by a net of contractile myoepithelial cells. Milk is secreted from the lactocytes, fills the alveoli, and is squeezed into the ducts. Clusters of alveoli that drain to a common duct are called lobules; the lactating female has 12–20 lobules organized radially around the nipple. Milk drains from lactiferous ducts into lactiferous sinuses that meet at 4 to 18 perforations in the nipple, called nipple pores. The small bumps of the areola (the darkened skin around the nipple) are called Montgomery glands. They secrete oil to cleanse the nipple opening and prevent chapping and cracking of the nipple during breastfeeding.

The Process of Lactation :

The pituitary hormone prolactin is instrumental in the establishment and maintenance of breast milk supply. It also is important for the mobilization of maternal micronutrients for breast milk.

Near the fifth week of pregnancy, the level of circulating prolactin begins to increase, eventually rising to approximately 10–20 times the pre-pregnancy concentration. We noted earlier that, during pregnancy, prolactin and other hormones prepare the breasts anatomically for the secretion of milk. The level of prolactin plateaus in late pregnancy, at a level high enough to initiate milk production. However, estrogen, progesterone, and other placental hormones inhibit prolactin-mediated milk synthesis during pregnancy. It is not until the

placenta is expelled that this inhibition is lifted and milk production commences.

After childbirth, the baseline prolactin level drops sharply, but it is restored for a 1-hour spike during each feeding to stimulate the production of milk for the next feeding. With each prolactin spike, estrogen and progesterone also increase slightly.

When the infant suckles, sensory nerve fibers in the areola trigger a neuroendocrine reflex that results in milk secretion from lactocytes into the alveoli. The posterior pituitary releases oxytocin, which stimulates myoepithelial cells to squeeze milk from the alveoli so it can drain into the lactiferous ducts, collect in the lactiferous sinuses, and discharge through the nipple pores. It takes less than 1 minute from the time when an infant begins suckling (the latent period) until milk is secreted.

The prolactin-mediated synthesis of milk changes with time. Frequent milk removal by breastfeeding (or pumping) will maintain high circulating prolactin levels for several months. However, even with continued breastfeeding, baseline prolactin will decrease over time to its pre-pregnancy level. In addition to prolactin and oxytocin, growth hormone, cortisol, parathyroid hormone, and insulin contribute to lactation, in part by facilitating the transport of maternal amino acids, fatty acids, glucose, and calcium to breast milk.

Colostrum is secreted during the first 48–72 hours postpartum. Only a small volume of colostrum is produced—approximately 3 ounces in a 24-hour period—but it is sufficient for the newborn in the first few days of life. Colostrum is rich with immunoglobulins, which confer gastrointestinal, and also likely systemic, immunity as the newborn adjusts to a nonsterile environment.

After about the third postpartum day, the mother secretes transitional milk that represents an intermediate between mature milk and colostrum. This is followed by mature milk from approximately postpartum day 10. Cow's milk is not a substitute for breast milk. It contains less lactose, less fat, and more protein and minerals. Moreover, the proteins in cow's milk are difficult for an infant's immature digestive system to metabolize and absorb.

The first few weeks of breastfeeding may involve leakage, soreness, and periods of milk

engorgement as the relationship between milk supply and infant demand becomes established. Once this period is complete, the mother will produce approximately 1.5 liters of milk per day for a single infant, and more if she has twins or triplets. As the infant goes through growth spurts, the milk supply constantly adjusts to accommodate changes in demand. A woman can continue to lactate for years, but once breastfeeding is stopped for approximately 1 week, any remaining milk will be reabsorbed; in most cases, no more will be produced, even if suckling or pumping is resumed.

Mature milk changes from the beginning to the end of a feeding. The early milk, called foremilk, is watery, translucent, and rich in lactose and protein. Its purpose is to quench the infant's thirst. Hindmilk is delivered toward the end of a feeding. It is opaque, creamy, and rich in fat, and serves to satisfy the infant's appetite.

During the first days of a newborn's life, it is important for meconium to be cleared from the intestines and for bilirubin to be kept low in the circulation. Recall that bilirubin, a product of erythrocyte breakdown, is processed by the liver and secreted in bile. It enters the gastrointestinal tract and exits the body in the stool. Breast milk has laxative properties that help expel meconium from the intestines and clear bilirubin through the excretion of bile.

Conclusion :

Research and practice have shown that breastfeeding and human milk can offer significant nutritional and nonnutritional benefits to the infant and the mother and lay the foundations for optimal infant, child and adult health as well as child development. Therefore, the support of breastfeeding should be seriously viewed as a major public health issue. Interventions to reinforce breastfeeding are relatively simple and inexpensive. The enthusiastic support and involvement of pediatricians and system wide-support such as the Baby Friendly Hospital can be effective in promoting breastfeeding.

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