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**Bch308 assignment**

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**Question : Explain the suitability of human breast milk over cow milk**

The sole source of nutrition for infants in the first 6 mo of life, breast milk plays a critical role in development. Infants of mothers with adequate nutritional status have reserves of some nutrients at birth, but they depend entirely on breast milk for other nutrients. Even in mothers who are well nourished, other physiologic or environmental factors may compromise status and capacity to transfer nutrients via breast milk. This review summarizes the current knowledge on how nutrient concentrations change through the initiation and progression of lactation, and how modifiable and nonmodifiable factors, including interventions, influence breast milk nutrient concentrations

Milk is a product of evolution designed specifically for the nutrition of infant mammals. It bridges the nutritional gap between intrauterine dependence and extrauterine independence. The same nutrients are present in the milk of all species, although in different proportions.

**Human breast milk contains some essential nutrients needed for the child’s growth and development which includes :**

**Thiamin**

Thiamin acts as a coenzyme in the metabolism of carbohydrates and BCAAs. Deficiency, a public health problem most common in pregnant women and young children, may cause infantile beriberi and is a leading cause of infant morbidity and mortality in affected populations. In breast milk, thiamin is present primarily as thiamin monophosphate (∼60%) and free thiamin (∼30%) . Thiamin concentrations in breast milk increase over the first several months of lactation

**Riboflavin**

Riboflavin functions as part of the coenzymes FMN and FAD in redox reactions involved in energy production and activity of glutathione, a free radical scavenger. Deficiency of riboflavin affects multiple metabolic pathways and can cause dermatologic abnormalities, peripheral neuropathy, poor growth, and impaired iron absorption . In breast milk, FAD and free riboflavin are the predominant forms of riboflavin ). One investigator found a peak inRiboflavin in breast milk is positively correlated with maternal dietary intake ). There is conflicting evidence on the correlation between maternal riboflavin status and breast milk riboflavin. In well-nourished mothers, investigators found a positive correlation between status and milk riboflavin. Although studies in The Gambia, India, and Malawi reported lower breast milk concentrations than the Institute of Medicine and WHO means of 0.35–0.39 mg/L , another study in India showed comparable breast milk riboflavin concentrations between Indian women with marked deficiency and well-nourished Western women.

**Vitamin B-6**

Vitamin B-6 acts as a cofactor for >100 enzymes involved in amino acid metabolism, glycolysis, and gluconeogenesis ). In infants, vitamin B-6 deficiency is associated with neurological and behavior abnormalities, including irritability, increased startle response, and seizures .Pyridoxal is the predominant form of vitamin B-6 in breast milk, which also contains smaller amounts of pyridoxal phosphate, pyridoxamine, and pyridoxine ). Vitamin B-6 concentrations in breast milk increase 3- to 4-fold in the first few weeks postpartum, followed by a gradual decline in late lactation ). After 6 mo, breast milk alone may be insufficient to meet an infant's vitamin B-6 requirements (1).

Plasma pyridoxal 5΄-phosphate, the primary biomarker of vitamin B-6 status, is positively correlated with breast milk vitamin B-6 concentrations .Maternal vitamin B-6 intake is a strong determinant of breast milk concentrations ), with rapid changes in breast milk

**Folate**

Folate and its coenzymatic forms are necessary for protein, DNA, and RNA biosynthesis, and as such are in greatest need during periods of growth, development, and reproduction .The predominant form of folate in human milk is 5-methyltetrahydrofolate ). Breast milk folate concentrations are low in colostrum and increase in the weeks after delivery (14), peaking at 2–3 mo ), decreasing slightly from 3 to 6 mo , and remaining stable into late lactation . Folate is preferentially taken up by secretory mammary glands, maintaining milk folate concentrations at the expense of maternal stores except in cases of frank maternal deficiency

**Choline**

Choline is a vital amine involved in numerous physiological processes, including structural integrity of cell membranes, transmembrane signaling, lipid-cholesterol transport and metabolism, methyl group metabolism, and brain development ). Choline adequacy is particularly important during the rapid growth associated with perinatal development ). Because betaine, the irreversible oxidation product of choline, is excreted by human infants in large amounts during the first year of life, it is assumed that the supply of dietary choline via breast milk is critical to normal development ). In young children, choline inadequacy has been correlated with stunting , which suggests that adequate breast milk choline may be necessary for proper growth in infancy. In breast milk, choline is found primarily as phosphocholine and glycerophosphocholine, with lower concentrations of free choline, phosphatidylcholine, and sphingomyelin .Total breast milk choline concentrations increase rapidly between 7 and 22 d postpartum and remains relatively stable in mature milk, although free choline concentrations decline from 12 to 180 d postpartum . Etc

**Benefits of human breast milk**

Human breast milk provides the ideal nutrition for infants. It has a nearly perfect mix of vitamins, protein, and fat -- everything your baby needs to grow. And it's all provided in a form more easily digested than infant formula. Breast milk contains antibodies that help your baby fight off viruses and bacteria. Breastfeeding lowers your baby's risk of having asthma or allergies. Plus, babies who are breastfed exclusively for the first 6 months, without any formula, have fewer ear infections, respiratory illnesses, and bouts of diarrhea. They also have fewer hospitalizations and trips to the doctor.

Breastfeeding has been linked to higher IQ scores in later childhood in some studies. What's more, the physical closeness, skin-to-skin touching, and eye contact all help your baby bond with you and feel secure. Breastfed infants are more likely to gain the right amount of weight as they grow rather than become overweight children. The AAP says breastfeeding also plays a role in the prevention of SIDS (sudden infant death syndrome). It's been thought to lower the risk of diabetes, obesity, and certain cancers as well, but more research is needed.