

BIOCHEMICAL CHARACTERISTICS OF HUMAN MILK AND ITS CLINICAL SIGNIFICANCE TO HEALTH AND DISEASE OF NEWBORNS

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There is no doubt that the superiority of human milk over artificial feeding still remains, and as yet there is no artificial formula which fully mimics human milk.

The purpose of this presentation is to reveal some biochemical characteristics of human milk and link its significance to the well being of the newborn infants. It is important to remember that breast milk varies slightly in its composition throughout the different stages of lactation and also varies every day with different feedings.

WATER CONTENT:

Relative amount of water and solids - both human and cows milk are about the same - the water content is approximately 87%. Sp. Gr. 1030 - 1032

CALORIES:

The calories are about the same - 20 cal./ounce

PH:

<u>BREAST MILK</u>	<u>COWS MILK</u>
Alkaline	Acid

LATE METABOLIC ACIDOSIS:

Usually seen in prematures after feeding for three days. Condition is due to acid loading properly of the diet itself (milk). The characteristics of this disease are acidosis, inadequate weight gain, watery stools and lethargy. The condition can be corrected by adding alkali (Na Bicarb to milk). It is also known that replacing formula with human breast milk abruptly corrects this condition.

PROTEIN:

<u>HUMAN</u>	<u>COW</u>
1.1%	3.3%

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Cows milk has approximately three times the amount of protein present in human milk. In addition, the quality of protein present in both milks are different - cows milk has six times higher content of casein than human milk.

CLINICAL SIGNIFICANCE OF PROTEIN CONTENT:

1. Cows milk is more difficult to digest causing a hard large curd while breast milk curd is small and flocculent.

2. Prematures and Daily Protein Requirements:

Prematures weighing less than 2000 gms. have more rapid rate of growth and require protein than that present in human milk alone.

3. Milk Allergy and Infantile Eczema

Both occur with much higher incidence in artificially fed formula than in breast fed neonates. This is contributed basically to the quality of protein present in the two milks.

4. Cows Milk Colitis:

Ingestion of cows milk occasionally associated with marked intolerance to protein during first few weeks of life. This condition presents as vomiting, rectal bleeding and diarrhea. It simulates ulcerative colitis. Withdrawal of cows milk clears this condition completely.

5. Chronic Pulmonary Hemosiderosis:

With the presence of precipitins to milk proteins in the serum of infants, this condition improves with use of human breast milk.

CARBOHYDRATE:

The quality is same - lactose

Quantity:

<u>HUMAN</u>	<u>COW</u>
7%	4%

FAT QUANTITY: Same - 3.5%

QUALITY: Olein: 2 times higher in human milk it is easily absorbable.

Volatile Fatty Acids: Much higher in cows milk

a) Although full term infant has no difficulty digesting cows milk fat, in premature and debilitated infants cows milk fat may cause steatorrhea.

b) Stomach empty time is more rapid for the human milk than for the cows milk.

VITAMINS:

milk from mothers whose diet is quantitatively and qualitatively balanced will supply the necessary vitamins except for:

Vit D) Inadequate amounts for the nutritional needs
Vit C) of infants in the first month of life.

MINERALS:

Milk from mothers who ingested adequate diet will supply the essential mineral, except:

1. Fluoride
2. Iron
3. Copper

HUMAN MILK
0.2%

COWS MILK
0.7%

Fe & Copper

More is present in human milk versus cows milk. The other mineral are higher in cows milk.

HYPOCALCEMIC TETANY:

Excessive load of ash, especially phosphate, on immature kidneys of newborns will induce hypocalcemia which is basically present in newborns as tremors, tetany or convulsions. Breast milk contains much less phosphate than cows milk. This produces a protective effect against development of neonatal tetany.

PREMATURE AND DAILY REQUIREMENT OF PHOSPHATE:

Neonates weighing less than 2000 gms. have a more rapid rate of growth and will require more phosphate than that present in human milk.

BACTERIAL CONTENT:

Breast milk is essentially free from bacteria contamination, however, pathogenic organisms may

gain access to breast milk by:

1. Mastitis
2. T.B. Bacilli
3. Typhoid Bacilli

COWS MILK:

Regular contamination occurs - it is a good culture media for pathogenic organisms. (Milk borne infections) -

1. Streptococcal Disease
2. Diphtheria
3. Typhoid
4. Salmonellosis
5. T.B.
6. Brucellosis

IMMUNOLOGY

Immunoglobulin found in breast milk. Although these antibodies are not absorbed they have local protective mechanism on mucous membrane of the G.I. tract and this may explain the lower incidence of enteric infection seen in breast fed infants. Antibodies passed by way of milk to the infant may help to prevent:

1. Respiratory tract infection during the first 2-3 months of life.
2. Polio, mumps, influenza, vaccinia and coxsacki infection.

These antibodies differ from those in the serum in that they reside in IgA fraction rather than the IgG globulin.

NECROTIZING ENTEROCOLITIS:

This condition is presently diagnosed with increasing frequency in the nurseries. It is characterized by necrosis and perforation of the gastro-intestinal tract from the esophagus to the rectum especially involving the small bowel. The etiology of this condition is still debatable, however, the condition is extremely rare in breast fed infants.

FOOD & DRUGS:

Particularly foods in the mother's diet occasionally cause disturbance in the breast fed infants, i.e. tomatoes, berries, cabbage, onions, chocolate, spices may cause gastric disturbance or loose stools in the infant.

DRUGS:

Certain medications like, barbiturates, iodides, salicylate, opium, atrophine, cascara, sulfa and most
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antibiotics pass with breast milk to infants.

BREAST FEEDING PHYSIOLOGICAL JAUNDICE:

Many pediatricians are under the impression that breast fed infants have higher serum bilirubin levels during the first week of life than bottle fed infants. However, studies reveal that during the first 4 days of life (at which time the majority of newborns leave the hospital) there is no significant difference in bilirubin concentrations between the two groups. However, the breast fed infants have significantly higher bilirubin levels than bottle fed infants during the first 5-7 days. The cause of this hyperbilirubinemia is attributed to unusual derivative of progesterone (pregnane - 3 alpha 20 beta dial) which inhibits glucuronyl transferase. However, interruption of breast feeding for 2-3 days will usually provide sufficient lowering of serum bilirubin to permit safe resumption of nursing.
