

## Nutritional and Immunological Importance of Colostrum for the new born

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### Abstract

The nutritional and immunological importance of colostrum for the survival and development of the neonate is reviewed. A neonate is born with low body energy stores and devoid of serum immunoglobulins. Colostrum provides the neonates with both energy and maternal antibodies. Because of syndeschoroidal nature of the placenta, the neonates must acquire maternal immunoglobulins from ingested colostrum for passive immune protection until the immune system of the neonate is fully developed.

**Keywords:** Colostrum, Immunology, Nutrition, New Born, Passive immunity, Antibodies.

Maintenance of health is a key to profitable livestock production. The most common health problem in calves less than one month of age is diarrhoea caused by infectious organisms. Survey reports of researchers indicates that the mortality in cattle and buffalo calves ranged from 29.1 % to 39.8% (Afzal *et al.*, 1983), whereas Martin and Wiggin (1973) estimated that 20 % calf mortality resulted in reduction of 38 % profit of a livestock farm. Therefore, Keeping newborn alive and healthy is the greatest management challenge facing farm owners. An important strategy for meeting this challenge is making sure that newborn receive adequate colostrum during the first two to three hours of life. The effect of colostrum on the health, survival and performance of newborn cannot be overrated.

### Colostrum

The thick yellowish, first milk produced by the female after she gives birth (parturition) is called colostrum. All mammals produce colostrum. Colostrum is so important that it is sometimes called "Liquid Gold". Colostrum is very digestible and more nutritious than normal milk. Colostrum differs in composition from the milk secreted later in lactation. Colostrum is rich in energy, it contains more proteins like (lactalbumins, lactoglobulins and immunoglobulins), fat, minerals (iron, magnesium and sodium) and vitamins (A, E, D, B) than regular milk, while the concentration of lactose is lower (Jain *et al.*, 2007 and Georgiev, 2008). Colostrum has 3-5 times higher concentration of both water soluble and fat soluble vitamins and some what higher concentration of minerals and trace elements than normal milk. The iron content is 10 to 17 times higher in colostrum than in normal milk. Colostrum

contains 22% solids compared to 12% solid in normal whole milk (Sjaastad *et al.*, 2003). Apart from these components there are other major important components of colostrum, which are immunoglobulins (IgG, IgM, IgD and IgE), peptides (lactoferrin, transferrin), hormones (insulin, prolactin, thyroid hormones, cortisol), growth factors (prostaglandins) enzymes, cytokines, acute phase proteins (C1-glycoprotein), nucleotides, polyamines, cell elements etc. (Georgiev, 2008). Much of the extra solid material in colostrum is immunoglobulin. And most importantly, it contains maternal antibodies that help protect the newborn from disease pathogens during the early part of its life. Colostrum provides needed energy to help newborn stay warm and acts as a laxative which helps to eliminate fecal matter (meconium) in the newborns digestive tract (Sjaastad *et al.*, 2003).

### Transfer of immunity

In human and rabbit the transfer of immunity from mother to foetus occurs mainly before birth through blood via placenta, but in ruminants transplacental transfer of immunoglobulins does not occurs and they are devoid of maternal immunoglobulins at birth due to syndesmochorial type of placentation. The ruminant neonates are entirely dependant on intestinal absorption of colostrum immunoglobulins/antibodies in the first few hours of life for its immunity (Tizard, 1987). The transfer of immunity occurs through colostrum after birth of the foetus. The immunity a newborn attains by consuming colostrum is called passive immunity. Colostrum has high concentration of protein due to transfer of immunoglobulins from blood to milk.

**Table-1. Components of Colostrum and milk in different species: (Banerjee G.C., 2005)**

Components	Colostrum (%)				Milk (%)			
	Cow	Ewe	Goat	Sow	Cow	Ewe	Goat	Sow
Water	77.5	58.8	81.0	69.8	87.5	83.7	88.0	80.1
Fat	3.6	17.7	8.2	7.0	3.5	5.3	3.5	8.2
Lactose	3.1	2.2	3.4	2.4	4.6	4.6	4.6	4.8
Protein	14.3	20.1	5.7	18.8	3.3	5.5	3.1	5.8
Ash	1.5	1.0	0.9	0.6	0.8	0.90	0.79	0.63

### Absorption of colostrum

In ruminants colostrum like milk passes directly to the abomasum and small intestine. In newborn, immunoglobulin in colostrum is absorbed through intestinal epithelium without degradation (Sjaastad *et al.*, 2003).

The concentration of immunoglobulins in colostrum decreases rapidly after parturition. Therefore, the sooner colostrum is consumed, the better. Thirty minutes is considered optimum whereas 18 hours is considered a must. When a calf is 6 hours old, it is able to absorb 66% of the immunoglobulins in colostrum, but by the time it is 36 hours old it is only able to absorb 7%. Newborn should receive 10% of the body weight as colostrum within 24 hours after birth. Ideally they should receive half of this within 6 hours of birth (Banerjee, 2005).

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### Quantity and quality of colostrum

The concentration of immunoglobulins in colostrum is a common indicator of colostrum quality. Colostrum containing greater than 50 gm Ig/L is considered to be high quality. The diet of the mother is very important to colostrum production. Colostrum containing less than 100gm Ig are at risk for failure of passive transfer. Dam on low energy diets produces less colostrum than the one with adequate nutrition. Younger females tend to produce less colostrum than mature females. Inadequate nutrition during late pregnancy can reduce the quantity and quality of colostrum (Rodastitis *et al.*, 1994)

Consumption of colostrum in amount sufficient to meet the energy requirement of the neonate is a major determinant for survival. Since most neonatal losses occur in the first 2 days of life, before acquisition of a maternal IgG for immune protection becomes

important for survival. There are reports showing direct correlation between low Ig levels and susceptibility to and/or morbidity and mortality of calves from infections.

Newborns that do not receive colostrum have greater difficulty emptying the intestine of its content of dead epithelial cells and remnants of swallowed amniotic fluid called meconium than animals that receive colostrum. Animals receiving inadequate amount of colostrum usually grow more slowly than animals that receive adequate amounts and the former often suffer from diarrhoea (Sjaastad, *et al.*, 2003). Colostrum supplies the newborn animal with antibodies persist in the newborn animal for 4-6 weeks after birth.

### Diseases transmitted in colostrum

Some diseases are transferred from the dam to the offspring via the colostrum. (OPP), Caprine Arthritic Encephalitis (CAE), interstitial mastitis and Johne's disease (Oliver R.1984) are the diseases transmitted through colostrum. To prevent the transmission of diseases the offspring should not be allowed to nurse positive dam. They should be fed pasteurized colostrum or colostrum from another dam.

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