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Colostrum: A review

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Abstract

It is the first lacteal secretions in bovines after calving is called colostrums and plays very important role in immune booster for post natal calves' health. Cow colostrums contain basic nutrient such as carbohydrates, proteins, fats, vitamin, minerals, immunoglobulin and several biological molecules which are essential for specific functions. The calves which are born with weak immunity colostrums provide passive immunity and protect the calves from different infectious diseases. For proper growth and health of calves colostrums should be provided both in quantity and in quality.

Keywords: Cows, colostrum, immune, milk

Introduction

Colostrum is defined as the first four days or early lacteal secretions after calving which is used for nourishes infants (Gopal and Gill, 2000) [4]. Colostrum is rich in immune factors like immunoglobulin, lactoferrin, lactoperoxidase, and proteins like insulin like protein I and II, Epidermal protein, Transforming protein β I and II, somatotropin. Colostrum has a positive impact on the establishment and development of the gut microbial communities (Malmuthuge *et al.*, 2015) [11]. The calves which are born with very weak immune power and are more prone to various diseases until the acquired immunity is developed against diseases by the exposed of harmful microbes or by providing colostrum to calves. Colostrum contains more amounts of protein, vitamin and minerals as compared to conventional milk. In neonates the fat is major source of energy (Foley and Otterby, 1978) [3] and provides the warm condition to maintain its normal body temperature by the process of gluconeogenesis (Hammon *et al.*, 2012) [5].

Colostrum: Colostrum is the first lacteal secretions of dam after calving which contains high levels of maternal antibodies which provides the passive immunity to the calves against various infectious diseases (Larson *et al.*, 1980) [9]. Bovine colostrums contain many important substances like immunoglobulin, lactoferrin, cytokines with vitamins (Kelly, 2003) [6]. It contains higher amount of minerals and vitamin A which are essential to combat disease. Ingestion of those through colostrums it might increase the calf survivability.

When should and how much colostrums should be fed? As soon as birth happens colostrums should be fed ideally within one hour. The calf is capable of absorbing the antibodies within the colostrum for less than the primary 24 hours after birth. Inadequate feeding of colostrum to calves it showed Hypogammaglobulinemia in blood (reduced immunoglobulin) (Kolb, 1981; Levieux and Ollier, 1999) [7, 10]. Colostrum given within 24 hours after birth at a dose rate on 1/10th of total body weight of calves. It is given Colostrum by bottle feeding or stomach tube. Colostrum contains gamma globulins which are nothing but anti-bodies produced by the cow and are absorbed through neonate's alimentary canal and supply acquired immunity to young calves. The gamma globulins must be absorbed intrinsically across the intestinal wall into the blood stream without being weakened into the constituent peptides or amino acids. These globulins transit the gut wall and the fore most rapid rates during the primary first 1-2 hours of life. Colostrums provide a laxative effect which is useful in the expulsion of meconium (first faeces).

Composition of Colostrum: Colostrum is having a good source of nutrient having 7 times the protein, twice the entire solids of normal milk. Colostrum contains 22% solids as compared to 12% solid present in normal milk (Sjaastad *et al.*, 2003) [16]. Composition of Colostrum and milk shown in the table. 1, 2, 3. Jersey cattle contain more amount of IgG as compared to

Holsteins (Muller and Ellinger, 1981; Parrish *et al.*, 1950; Quigley *et al.*, 1998; Shearer *et al.*, 1992) [13, 14, 19, 17]. The concentrations of hormone in Colostrum shown in the table. 4

Table 1: Composition of colostrum

| Constituents | Colostrum of cow milk | Colostrum of buffalo milk | Milk |
|---------------|-----------------------|---------------------------|-------|
| Total Solid | 28.30 | 31.0 | 12.86 |
| Ash | 1.58 | 0.9 | 0.72 |
| Fat | 0.15-1.2 | 4.0 | 4.0 |
| Lactose | 2.5 | 2.2 | 4.8 |
| Casein | 4.76 | 7.7 | 2.8 |
| Albumin | 1.5 | 3.6 | 0.54 |
| Globulin | 15.06 | 12.5 | - |
| Total Protein | 21.32 | 23.8 | 3.34 |

Table 2: Major mineral content of bovine colostrum

| Minerals | Ca | P | Na | K | Fe | Mg | Zn | Cl |
|------------|------|------|------|------|------|-----|------|----|
| Kehoe,2007 | 4999 | 4719 | 1122 | 3017 | 5.33 | 777 | 40.3 | - |

mg/kg values converted to mg/L assuming 1.06 g/ml for 27.6%

Table 3: Trace mineral content of bovine colostrums

| Mineral | Cu | I | Mn | Se |
|------------|-----|---|-----|----|
| Kehoe,2007 | 360 | - | 106 | - |

mg/kg values converted to mg/L assuming 1.06 g/ml for 27.6%

Table 4: Concentration of Hormone (ng/ml) in colostrum

| Hormones | Colostrum |
|----------------|-----------|
| Insulin | 4.2-34.4 |
| Total Cortisol | 4.4 |
| Free Cortisol | 1.8 |
| Prolactin | 150 |
| Progesterone | 2.6 |

Non-nutritive components of colostrums: Colostrum contains various growth factors and antimicrobial substance as compared to conventional milk. Antimicrobial substances like lysozyme, lactoferin, and thus the components of the lactoperoxidase/thiocyanate/hydrogen peroxide provide nonspecific protection against infection and will aid the newborn during the gap between passive immunity and therefore the development of the active immune system (Reiter, 1978) [15].

Absorption of colostrum: Absorption of Immunoglobulin Ileum and jejunum regions of the intestine in newly born calves has ability to soak up the immunoglobulin molecules directly without changes. Digestion of immunoglobulin proteins is prevented by a trypsin - inhibitor, which is present in colostrums. This absorption process had been thought to occur only within the terminal portion of the tiny intestine (Comline *et al.*, 1951) [2]. Kruse (1970) [8] describes the share of absorbed immunoglobulin increased with early feeding of colostrum. The levels of immunoglobulin's in colostrum shown in the table 5.

Table 5: Immunoglobulin levels in colostrums (Larson; Roy, 1980) [9]

| Immunoglobulin | Colostrum |
|----------------|-----------|
| IgG1(g/L) | 75.00 |
| IgG2(g/L) | 1.90 |
| IgM (g/L) | 4.90 |
| IgA (g/L) | 4.40 |

Quantity of colostrum

- Quantity of colostrums to be fed is 1/10th of body weight.
- 15-30 minutes of life - 5-8 % of body weight
- 10-12 hours of life - 5-8 % of body weight.
- 2nd day - 10% of body weight.
- 3rd day - 10% of body weight

Importance of colostrum

Unavailability or shortage of colostrums will impair or reduced the growth and development of the immune system and causes early mortality. Feeding and absorption of colostrum in appreciable quantities is more important in activating the immune system and destruction of the disease causing agents within the first weeks after birth (Baumrucker and Bruckmaier, 2014) [1]. The antimicrobial properties of the colostrums Lactoferin which is one among the foremost potent immunomodulator present in cattle colostrums. Lactoferin features a broad-spectrum antimicrobial activity against bacteria (e.g. *Escherichia coli*), fungi, viruses, and protozoa.

Supplementation of lactoferin: decreases occurrence of infection in calves it leads to reduce the chances of mortality and culling of calves (Still *et al.*, 1990; Manzoni, 2016) [18, 12]. Colostrum Substitute Due to non-availability or due to accidental death of dam colostrums substitute often used. By mixing 2 whole eggs in 1litre of milk and 30 ml of castor oil. It should be fed three times in a day.

Conclusion

Immune system isn't fully developed at birth, therefore infants are at greater risk for developing infection. Immune transfer developed through feeding colostrums. Immunoglobulins are absorbed by the pinocytotic process in intestine about 24h after birth. Colostrum should be fed immediately after birth to make sure feeding the specified quantity.

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