

Colostrum: Wonderful Natural Gift for the Newborn Calf

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Introduction:

The term “neonate” defines calves under 28 days old. During the neonatal period, the calf is at high risk of suffering different diseases, and neonatal morbidity and mortality cause large economic losses. In fact, 75% of the mortality of dairy heifers occurs during the first month of life. In beef cattle, the mortality rate until weaning is lower, around 10%, but it also peaks during the neonatal period. During the neonatal period, the first infectious pathological disease is neonatal septicemia, affecting calves between 2 and 6 days old. Neonatal diarrhea is by far the main infectious problem, followed by pneumonia in older neonatal calves aged 2-28 days old or even older. Calves are born with no immunity against disease. Until they can develop their own natural ability to resist disease, through exposure to the disease organisms in their surroundings, they depend entirely on the passive immunity acquired by drinking colostrum from their dam.

Colostrum is a Natural Gift:

Colostrum is a wonderful gift of nature to the young ones to boost their new life on earth. The first secretion from the mammary glands of cows and buffaloes after giving birth to the calves is usually called colostrum. The term colostrum is generally used to describe all the milk produced by cows up to 5 days after calving, until it is acceptable for use by owners/human consumptions. However, a more correct term for milk produced after the second milking post-calving is transition milk (Moran 2002).

Colostrum is the thick, creamy-yellow, sticky milk first produced by cows initially following calving, and contains the antibodies necessary to transfer immunity onto their calves. Calves should receive colostrum from their mothers within 2 hours of birth and the process should continue up to first 4 days of birth. If calves are not able to take by themselves, then they should be fed manually.

Wonderful Role of Colostrum in New Born Calf Life:

In cows, during pregnancy there is no transport of antibodies across the placenta. Therefore, calves are born with a native immune system; basically they do not have an active immune system of their own. Passive Immunity in cows is the short term immunity transfer from mother to offspring by way of colostrum consumption. Colostrum contains antibodies, technically called immunoglobulins (Ig), for priming the calf's immune system; in addition it has a high content of fat to provide energy to the calf.

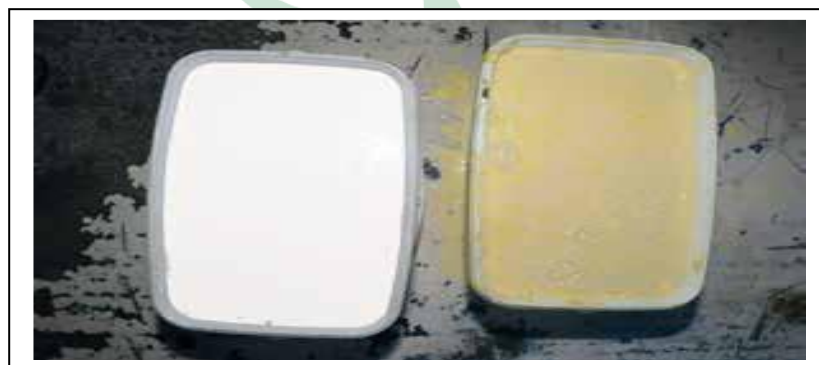
A newborn calf's small intestine is permeable or "open" and is able to absorb the Ig contained in colostrum; however, it can also absorb environmental pathogens that can cause diseases. For this reason, it is important that newborn calves receive colostrum as soon as possible not later than 3 hours of birth and the calving pen must be kept clean to reduce the bacterial load to which newborn calves are exposed to. It contains higher amount of minerals and vitamin A which are essential to combat disease. Ingestion of these through colostrums substantially increases the calf's survivability.

The nutritive value of colostrum is more and it also acts as a mild laxative for smooth expulsion of *meconium* (first faeces) from calves. Usually calves receive the colostrums from their mothers by themselves. But situations may arise where the calf is not able to take colostrum or the mother dies just after parturition. In such conditions, colostrum can be collected from the mother and fed to calves of any other mother manually.

Colostrum Feeding Techniques:

These principles can be categorized into 3 Qs, namely:

- ❖ **Quality** is providing good-quality colostrum.
- ❖ **Quantity** is ensuring calves ingest sufficient antibodies.
- ❖ **Quickly** is timing the first feed to ensure efficient absorption of the antibodies into the blood.



Colostrum (right) is far richer than milk (left) and contains valuable immunoglobulins to protect the calf against disease.

1. Natural Suckling Method:

The last twenty years ago, it was considered acceptable for all calves to run with their dams for 1, 2 or even 3 days and for her to pass on passive immunity through natural suckling.



The calf should be assisted for its first suckle from its dam

2. Pail Feeding/ Nipple Feeding Method:

The most recommended method for colostrum feeding is using a clean bottle with a nipple, allowing the calf to nurse at its own pace. Calves should never be forced to drink from a bottle because the milk can get into the airways and cause aspiration pneumonia or even death.

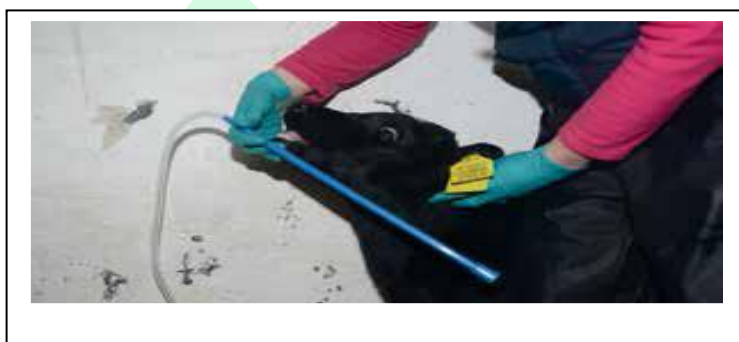


digestive disturbances. However, the benefits of nipple feeding may be lost if strict equipment hygiene is not maintained. A calf can be taught how to drink from a bucket within a few days after birth. This technique is easy, rapid and requires little cleaning work. Two feedings during the first day, 6–12 hr apart, and each of 2 L of good-quality colostrums used to be considered sufficient to provide passive immunity, mainly because of concern about the small capacity of the abomasum in newborn calves. Excess colostrums can be milked out daily otherwise the calves can drink in excess and results in calf scour. The excess colostrums can be stored by

refrigeration and can be used to other calves or orphan calves. Quantity of colostrums to be fed is 1/10th of body weight.

- 3. By Stomach Tube :**Where calves are weak or poor drinkers, stomach tubing is a quick and efficient method of getting colostrum into the calf. It is not uncommon for farmers to stomach tube all calves immediately after birth. Great care must be taken as incorrect stomach tubing can severely damage the calf and can be fatal.

The Process of Stomach Tubing:



- ❖ Determine the correct length of tube by measuring the distance from the tip of the calf's nose to the point of its elbow behind the front leg, usually 45 cm or more.
- ❖ The tip of the stomach tube should be smooth and not damaged or sharp. Place the tube in warm water to make it more pliable. Dip the tube into a lubricant, such as vegetable oil, and dip the tip of the tube into colostrums.
- ❖ Once the calf's mouth is opened, the empty tube is passed slowly along the tongue to the back of the mouth. Aim to the left side of the throat. When the tube is over the back of the tongue, the calf starts chewing and swallowing it and the tube is then passed down into the oesophagus.
- ❖ If the tube is properly positioned, the rings of the trachea (leading into the lungs) and the rigid enlarged oesophagus can be felt easily. The exposed end of the tube should be checked for spurts of air, which indicates that the tube has gone into the lungs.
- ❖ Once in place correctly, the tube can be unclipped or straightened out or the container can be tipped up to allow liquid to flow down into the stomach. Liquids should be at body temperature (38°C) to prevent shock and to optimize antibody absorption. It can take three minutes or more to allow sufficient fluid to be administered. The calf will regurgitate less with a slow flow rate. When feeding is finished, the tube should be

slowly removed. The tube should be cleaned and sanitized, then allowed to drain and dry.

Physical Properties of Colostrums and Milk:

Properties	Colostrums	Milk
Colour	Yellowish	Whitish to slightly yellowish
Taste	Slightly bitter	Sweet
Odour	Abnormal	Normal
Acidity	0.2 to 0.4	0.12 to 0.14
Freezing point (0C)	-0.606	-0.52 to -0.56
Specific gravity	1.05 to 1.08	1.029 to 1.032
Refractive index at 200C	More than milk	1.344 to 1.348
Electrical conductivity	More than milk	0.005 mho
Viscosity	More than milk	1.5 to 2.0 centipose

Constituents	Colostrum of Cow milk	Colostrum of Buffalo milk	Whole Milk
Total solids	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

The Difference in Nutrient Composition between Colostrum, Transition Milk and Whole Milk:

	Milking Numbers			
	1	2	3	11
Composition (%)	Colostrum Transition	Transition Milk		Whole Milk

Total Solid	23.9	17.9	14.1	12.5
Fat	6.7	5.4	3.9	3.9
Protein	14.0	8.4	5.1	3.1
Antibodies	6.0	4.2	2.4	0.09
Lactose	2.7	4.2	4.4	4.9
Minerals	1.11	0.95	0.87	0.74
Vitamin A, µg/dL	295	190	113	34

Quality of Colostrum:

The quality of colostrum should be high to ensure adequate IgG availability to calves. Colostrum quality depends on many factors such as breed of the dairy animal, number of pregnancies etc. IgG concentration must be greater than 50 g/L. The quality of colostrum is highest when collected immediately after the cow calves, with the immunoglobulin content halved by the second milking. If colostrum quality is poor, it should not be used for the calf's first feed.

Rating	Measure of quality (milligrams of IgG in each ml of colostrums)
Very good	60 mg/ml
Good	50 mg/ml
Poor	30 mg/ml

Methods of Mesruring Qualiity of Colostrum:

There are several methods available to do this but the most convenient is to use a colostrometer. This instrument is a type of hydrometer and measures the relative gravity (specific gravity) of colostrum. The working principle of this instrument is that the concentration of immunoglobulins is directly proportional to the specific gravity of colostrum. In simple words, colostrums with high specific gravity will have high concentration of immunoglobulins. Most on-farm methods involve the indirect measurement of colostrum quality by using either a Brix refractometer or colostrometer. Visually assessing colostrum is not an accurate method of determining its quality.

Factors That Affect the Level of Immunoglobulins in Colostrums:

There are a number of factors that influence the volume and the immunoglobulin concentration of the colostrum from a dairy cow.

These include:

- ❖ **Lactation number/parity:** First and second lactation cows produce colostrum with a lower IgG concentration than cows in their third and fifth lactation.
- ❖ **Breed of cow**
- ❖ **Length of the non-lactating period** (if less than three weeks)
- ❖ **Time interval from calving to first milking:** Colostrum harvested later than nine hours post-calving has a lower IgG concentration than colostrums harvested before this time. **Colostrum produced by cows** that are milked up to six hours post calving has the greatest mean IgG concentration.
- ❖ **Month of calving:** Later calving cows (April/May) produce colostrum with a lower IgG concentration than cows calving in the earlier spring months or in the autumn months.
- ❖ **Colostrum weight:** Colostrum IgG concentration decreases linearly with increasing colostrum weight (1.7g/l per kg increase).

Colostrums Substitute: in case of non availability of colostrums due to accidental death of mother or agalactia colostrums substitute can be used.

Colostrum Contamination:

Bacterial contamination of colostrum often occurs on farms, with two associated concerns:

1. The risk of transfer of infection to calves.
 2. Decreased absorption of IgG in the intestines.
- ❖ Best practice suggests that the total bacterial count of colostrum should not exceed 100,000 cfu/ml and faecal coliforms should be below 10,000 cfu/ml.

Achieve Desirable Bacterial Counts In Colostrum:

Desirable bacterial counts can be achieved through hygienic colostrum collection, avoiding bacterial contamination, immediately refrigerating or freezing surplus colostrum or implementing heat treatments of colostrum. Storage of colostrum at room temperature increases the growth of bacteria. Heat treatment (pasteurisation) of colostrum at 60°C for 30 or 60 minutes reduces the bacterial count, preserves IgG concentration and increases the apparent

efficiency of absorption of IgG compared to calves fed raw colostrum. In addition, calves fed heat treated colostrum are at lower risk of illness.

Storage of Colostrum:

Colostrum can be stored at 4°C for two days without negatively affecting the absorption of colostral IgG by the calf. Storing colostrums at any higher temperature leads to decreased absorption of IgG due to an increase in bacterial contamination. Temperatures above 50°C cause colostral proteins, including immunoglobulins, to denature. Therefore, colostrum should never be thawed in boiling water.

Thawing of Colostrum:

Colostrum must be slowly thawed at temperatures below 50°C, i.e. in a water bath, in order to not affect its quality. Cold, refrigerated colostrum should be warmed in a water bath before feeding. This helps increase antibody uptake by the calf.



Colostrum should be thawed (if necessary) and warmed to body temperature (38°C) in warm (maximum 50°C) water. A microwave should not be used to thaw colostrum as it can cause slight coagulation of the proteins in the colostrum. In addition, lower volume and total protein content are associated with microwave thawed colostrum.

Pooled Colostrum Feeding:

Research has shown there is no difference in calf serum IgG or calf weight gain between calves fed pooled (mixed colostrum from various sources) or individual dam colostrum. However, feeding pooled colostrum is a biosecurity risk and should be undertaken with careful consideration and extreme caution. Pooling of colostrum can lower colostrums quality due to dilution, therefore only pool high quality with high quality colostrums.

Determination of Received Sufficient Colostrums by Calf:

If calves do not get enough colostrum soon after they are born, they will have failure of passive transfer (FPT) of antibodies. Failure of passive transfer markedly increases calf



morbidity (disease incidence) and mortality in calves, therefore being able to determine if a calf has received adequate antibody protection from colostrum is extremely useful. This can be done by measuring the Ig levels in calf blood serum.

Conclusion:

Colostrum management is the single most important management factor in determining calf health and survival. All calves must receive sufficient colostrum immediately after birth to support their growth and optimize their welfare. Calves that do not receive adequate quantity or quality colostrum in the right time frame will be compromised and more likely to contract infection and ultimately affect the overall health and growth performance of calf that's why colostrum is a wonderful gift of nature to the young ones to boost their new life on earth.

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