

The Newborn Calf & Colostrum Management

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Disclaimer: The following material presents general guidelines; each farm should develop their own Standard Operating Procedures.

Administering High Quality Colostrum to the Newborn Calf

Passive Immunity in cattle is the short term immunity transfer from mother to offspring by way of colostrum consumption. This is very important in cattle because during pregnancy there is no transport of antibodies across the placenta. Therefore, calves are born with a naïve immune system, basically they do not have an active immune system of their own. 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.

Processing newborns calves



Processing newborn calves is an important job, and with an excellent system in place it is possible to prepare calves to have a healthy productive life. The following is a list of common practices in successful calf management systems:



- Move calves to a clean and dry environment immediately after birth to reduce the chances of environmental bacterial contamination.
- Dip the navel or umbilical cord in chlorohexidine solution or 7% iodine as possible after birth to disinfect and prevent bacteria from infecting the newborn.
- Vaccinations can be used to increase levels of specific antibodies and to boost the calves developing immune system; each farm should have a written and reviewed vaccination protocol to follow the first few weeks of life

Colostrum management: harvesting and storage

Harvest

The following practices will help to minimize the pathogen load in colostrum at first milking. Cleaning and prepping the cow's teats and udder is the first step to collect clean colostrum. Remember that this cow has not been milked in about 60 days so the pathogen load on the teat surface is greater than when she is in the milking barn. The cow's teats should be thoroughly cleaned using a disinfecting pre-dip solution like the one used on

the lactating cows. The disinfecting solution must have a contact time of at least 30 seconds to effectively kill bacteria; after this time, the solution is wiped off with a dry, clean towel or rag. The objective is to milk clean and dry teats!

Having sanitized milking equipment is also essential for collection of clean colostrum. The milking unit should be well cleaned and sanitized before milking the cow. All milking equipment should be cleaned and sanitized immediately after every milking to avoid any cross-contamination to the next cow to be milked.

Storage

It is important to know the immediate intent for colostrum. Will it be fed shortly after collection or will it be stored for future use? If not being fed shortly after collection, proper storage procedures should be taken to avoid further bacterial growth as the amount of bacteria present in colostrum can double in less than 20 minutes.

Colostrum may be refrigerated for no more than 24 hour because bacteria can still grow slowly at refrigerated temperatures. Colostrum can also be stored in a freezer. If freezing colostrum, it is recommended to put it in a gallon size zip-top bag and immediately place flat in a freezer. Bags are better than bottles because they allow for more even and quick thawing which minimizes the presence of frozen chunks of colostrum. To thaw, place these bags in a water bath at 120 degrees Fahrenheit (49° C) and bring them to feeding temperature slowly; this temperature should be close to body temperature at about 102 degrees Fahrenheit (39° C). Do not try to shorten the thawing process by using water above the recommended temperature, doing so will destroy or inactivate some of the antibodies that a calf needs to survive. It is recommended to thaw only the necessary colostrum, repeated cycles of freezing and thawing may decrease the quality of the colostrum.

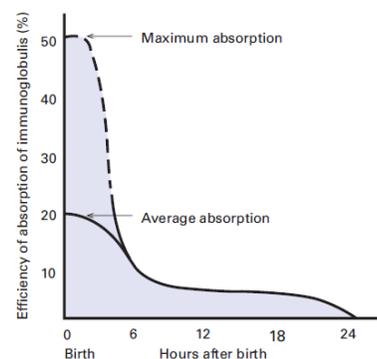
Information on Colostrum Replacer

Colostrum replacers should be used when good quality colostrum collected from a cow is not available. Good replacers have a high content of immunoglobulins per dose, which should be at least 150 grams of immunoglobulin. Cows on the farm produce specific antibodies to infectious pathogens that they have encountered in their life and from their environment; therefore, when calves receive colostrum replacers, they will not receive the added benefits from the colostrum sourced from a cow on site. The amount of water used and the temperature of this water are very important in preparing colostrum replacer. Please follow label instructions to deliver consistent and adequate amounts of colostrum replacer.

On-farm Monitoring of Colostrum

Failure to obtain and absorb Ig across the small intestinal wall into the blood stream will result in higher mortality and morbidity rates (illness and death rates). This is referred to as Failure of Passive Transfer (FPT). Calves with FPT are associated with decreased growth rates and increased health problems which represents a direct economic loss.

How to detect and prevent Failure of Passive Transfer (FPT). Preventing FPT begins with excellent colostrum sources. As a first rule, do not feed colostrum from cows identified as positive carriers of Johne's disease. Absorption of Ig through the intestinal into the blood stream starts to decline after the first 4 hours of life. Therefore, it is important to feed newborn calves their first meal of colostrum no later than 3 hours after birth. The sooner the better!



Source: Raising Dairy Replacements (1991).

These are four reasons for the cause of FPT and how to correct or prevent it.

Issue	Solution
Delayed colostrum feeding	Make sure calves consume colostrum within 4 hours after birth
Amount of colostrum consumed was not enough	Calves should consume at least 1 gallon during their first 18 hours of life. If needed, use an esophageal feeder.
Low quality colostrum	Use tools to determine colostrum quality and only feed high quality colostrum to newborn calves. Consider colostrum replacer
Low absorption of colostrum antibodies	Feed highest quality colostrum for the first 2 meals, feed in a timely manner.

Evaluation of colostrum quality

Colostrum is extremely important to promote a good start in calf's life after birth. It very important to invest time and resources to make sure that the colostrum fed to calves is of high quality. Colostrum quality depends on the content of immunoglobulins which are the proteins that convey protection against disease. There are laboratory tests to determine the exact amount of these proteins in colostrum; however, there are also approved on-farm methods to do the same. These methods are quick and practical. Below is a brief description of them.

Visual Assessment: practical, but not very reliable

This method is the easiest but the least reliable. Make sure colostrum is clean and free of manure. It should have a thick consistency and color should be yellowish, avoid feeding any colostrum that looks brown or has blood in it. Watery colostrum is of low quality and should not be fed to newborn calves if possible. If the colostrum has high content of proteins, it will be very thick. The thicker the better!



Colostrometer: practical, reliable, delicate instrument



The colostrometer is a large thermometer-like glass instrument that measures the specific gravity of colostrum. In other words, it measures how thick a sample is, and this correlates to the Ig content of the colostrum. It is important to carry out the measurement when colostrum is at room temperature because cooler temperature will cause the colostrum to thicken and which results in an overestimation of its quality. When the instrument floats in the green zone area, it indicates high quality colostrum, medium quality is within the yellow are and very low quality is in the red area.



High quality	Medium quality	Low Quality
More than 50 mg/mL	Between 20 and 50 mg/mL	Less than 20 mg/mL

Brix Refractometer: practical and reliable

The Brix refractometer is an instrument that measures sugar content in a variety of solutions and has been adapted to correlate this measurement with the content of Ig in colostrum. There is an analog or manual model similar to the scope of a rifle and an electronic model with a digital screen that displays the result. It is common to see a lot a variation with the analog model because the scale may look blurry, if at all possible, it is recommended to use the electronic or digital version because it allows more consistent readings. With either version, the reference value for high quality colostrum is 22% Brix or higher.



Evaluation of protein absorption from colostrum

When a calf consumes colostrum, the immunoglobulins are absorbed through the intestinal wall into the bloodstream. This cause the protein content in blood to rise and this increase in blood protein can be measured to evaluate if a calf has received the necessary amount of antibodies to start a healthy life. If there are disease outbreaks or negative trends in mortality, it is convenient to review colostrum feeding protocols as well as total serum protein to determine where the pitfalls may be. Following is a brief description of the procedure for measuring total serum protein.

This test requires a blood sample and a clinical refractometer (it is not the same as the Brix refractometer). This instrument is available in both analog and electronic versions. The blood sample must be drawn at 18 hours



after birth at the earliest to ensure that there has been enough time for the proteins to be absorbed. After collecting the sample, the vial must stay upright for 24 hours or overnight for the serum to separate. The serum is the semi-crystalline yellowish liquid that rise to the top of the blood tube. Place a couple of serum drops on the glass of the refractometer and read by looking though the eyepiece. The minimum value for successful passive transfer is 5.5 mg/dL.



There have been some recent reports of the possibility of using a Brix refractometer to assess passive transfer. The procedure is identical as previously described but the reference values are yet to be unified, acceptable readings fall between 7.8 and 8.4% Brix.

Colostrum Feeding Techniques

The following is a general description of a colostrum feeding program but it is important to highlight that specific colostrum feeding programs must be designed for specific farms according to their management practices. A common question is: how soon should a newborn be fed first colostrum meal and how much colostrum should be fed? A rule of thumb is that calves should consume 10 to 12% of their birth weight as colostrum within the first 8 hours of life. A calf should receive their first meal of up to 4 quarts of high quality colostrum within the first 4 hours of life. A second feeding of colostrum of at least 2 quarts should be fed at 6 to 8 hours of life. Sometimes all 4 quarts are fed within the first 4 hours of life and then a second feeding no later than 12 hours after birth. The objective is to feed between 100 and 150 g of IgG as soon as possible after birth. If possible colostrum should be fed on days 2 and 3 of life, this can be colostrum of lesser quality or transition milk from the cow's second and third milking.

The appropriate temperature of colostrum and milk for calves is very important. Calves naturally prefer liquids that are close to body temperature at 102 degrees Fahrenheit (39° C). Colostrum or milk that are below this temperature may be less palatable, and calves may even refuse to drink. One of the consequences of feeding cold liquids is that internal temperature may drop and calves will use energy to generate heat and bring their temperature back up to normal instead of using energy for growth. It is important to consider the time elapsed between milk preparation and delivery to calves to avoid excessive cooling. Milk should be fed between 102 –

107 degrees Fahrenheit (49 to 41° C), above this range there is risk for burning of mouth and esophagus. It is important to take temperature readings of the first and last bottles delivered to monitor and make sure that calves receive their meals at the right temperature.

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. Never cause stress while feeding a calf, *it is very important to be patient with these young animals!* They are just learning how to suckle, and it may take a few minutes to coordinate this action. If a calf is having difficulty suckling it is then time to use an esophageal tube feeder. The esophageal tube feeder is not a tool or shortcut to speed up feeding of any calf!

Using the Esophageal tube feeder to administer fluids to a calf.

First and foremost, seek out instruction and training on how to appropriately use an esophageal tube feeder. Each farm should have a Standard Operating Procedure for esophageal feeding. If the caretaker does not have proper training it is very likely that results will be poor and even fatal. Before using a tube feeder, there are 2 things that must be checked:

- The tube feeder must be clean: dirty equipment harbors bacteria that can infect the newborn
- The tube and mouthpiece must be free of any jagged edges: sharp edges may irritate the esophagus and they may also carry a high bacterial load

When introducing the esophageal tube, it is preferred to have the calf in a standing position of the calf, with its head and neck looking straight forward, otherwise there is a greater risk of introducing liquid into the airways and cause aspiration pneumonia. Clamp off the flow of fluid, pass the tube along the side of the mouth allowing the calf to swallow and then pass down the esophagus. The esophagus is the tube that transports feed and liquids to the stomach and lies above the trachea that carries air to the lungs. You may have to position the head of the calf downward to advance the tube past the epiglottis and into the esophagus. Once the tube is fully inserted, release the clamp and allow liquid to freely flow into the stomach.

After each use, clean, sanitize, and allow the esophageal tube feeder to dry. It is very common to use a tube feeder to provide electrolytes to sick calves so it very important to keep a separate esophageal tube feeder for colostrum and a separate one for electrolytes to minimize the risk of spreading diseases.

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