



NEWBORN CALF REARING GUIDE



ScourGuard® 4(K)

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Over 4 million dairy calves are born alive every year¹ with approximately 2 million reared for heifer replacements or dairy beef. Rearing good replacement heifers is vital on any New Zealand dairy farm. The job of calf rearing is a rewarding one but it can also be very stressful when things go wrong. There are many factors that affect the health and survival of newborn calves, including their antibody status, the ambient temperature, diseases and husbandry.

This **Guide** covers the factors involved in successful neonatal calf rearing systems. It presents gold standard husbandry methods.

The aims of calf rearing are to:

1

Produce healthy calves, keeping losses to a minimum

2

Maximise growth rates

3

Maximise calf welfare

4

Manage labour requirements

5

Maximise profitability



THE CALF GUARDIAN

Calf rearers are very important because they raise the future dairy herd.



Skilled and committed staff are central to the success of the calf rearing operation. Increasing the number of healthy, well grown calves allows for flexibility in the management of replacements; for example selection of premium calves to rear as replacements or surplus heifers to sell to add to farm income.

There should be enough calf rearing staff so that they are fresh, enjoy their work and are able to take the time required to manage all the calves effectively.

Communication between staff is essential. Therefore it is advisable to have a pre season meeting to discuss everyone's roles and set goals for the season. Planning can greatly reduce stress throughout the rearing period on the staff and the calves. Weekly staff meetings improve clarity and reduce the chances of mistakes, particularly when there are different groups of calves requiring special management, such as calves under treatment or with different feeding programs or routines.

Consistency is ideal. The same person should feed the calves at the same time every day. The calves know what to expect and any sick animals can be identified quickly.

COW PREPARATION

Scourguard 4(K) is a vaccine given to pregnant cows to boost the concentration of specific antibodies in their colostrum. These antibodies are immune proteins that protect calves from the four key causes of infectious scours.



Schedule pregnancy testing so that accurate expected calving dates are available for feed budgeting and planning calf scours vaccination dates. Aim for a body condition score (BCS) of 5.0 for cows and 5.5 for heifers at calving. In addition to the many benefits such as improved milk production and fertility, optimal BCS management also improves colostrum quality, which is beneficial for calf health. While BCS measured at calving wasn't found to be associated with colostrum quality in a New Zealand study², American researchers showed that cows that maintain or gain BCS in the dry period had superior colostrum quality over cows that lost BCS.³

Scourguard 4(K) is a vaccine given to pregnant cows to boost the concentration of specific antibodies in their colostrum. These antibodies are immune proteins that protect calves from the four key causes of infectious scours.

Scourguard 4(K) aids in the prevention of calf scours caused by bovine rotavirus serotypes G6 and G10, bovine coronavirus and *E.coli*. It should be administered in the neck by intramuscular (IM) or subcutaneous (SC) injection. Previously unvaccinated heifers and cows should receive two doses at least 3 weeks apart with the second dose given 2–12 weeks prior to calving. For seasonal calving herds the booster injection should be given 2–4 weeks before the planned start of calving so that all calves born in the first 8–10 weeks are protected. For herds with extended calving periods, split herd vaccination should be considered. Annual revaccination with a single dose 2–12 weeks prior to each subsequent calving is recommended.

Scours vaccination relies on the calf receiving adequate colostrum, so excellent colostrum management is crucial. The importance, timing and quantity of colostrum intakes for calves are discussed in the following pages.

CALF COLLECTION, TRANSPORT AND REARING

Paddocks should be checked and new calves removed twice daily to reduce mastitis in the heifers/cows and ensure adequate colostrum intake in the calves' first few hours of life. Calves left on cows for more than 12 hours have a high risk of failure of passive transfer of antibodies (not receiving enough colostrum in the first 24 hours after birth, which is the window in which antibodies are absorbed from the gut into the bloodstream) and are therefore at a high risk of neonatal disease (disease in the first few days of life), ill thrift and mortality. Only 50% of calves have been shown to receive adequate colostrum when left with their dams for 24 hours.⁴

Calves must be handled gently because harm can be done at this first point of human contact. Damage can occur to limbs and navels resulting in navel ill, fractures, wounds and joint infections including septic arthritis.

Trailers should be cleaned after every pick up from the paddock and sprayed daily with an effective virucidal spray. The trailer floor should be sturdy and lined with bedding or sacking. Each calf should have enough room on the trailer to stand or sit comfortably. The aim is to have 5 calves per pen on the trailer, with a maximum of 10 calves per pen. Large trailers should be divided into smaller compartments if necessary. The driver of the vehicle must be patient and take their time returning to the shed.

Once calves have been delivered to the calf shed, their navels should be sprayed with an iodine tincture containing at least 7% iodine.

When purchasing calves for rearing it is important to select good quality calves from the start.

Criteria for selection of replacement heifers for rearing:

1. No heifer calves born as a twin to a bull calf.
2. No calves that are under 40kg.
3. Calves should be at least 4 days old.
4. Must have been fed colostrum since birth. Ideally the calves are born to cows that have been vaccinated pre-calving with a vaccine that aids in the prevention of calf scours – **Scourguard 4(K)**.
5. Must have a good suck reflex.
6. Must not have been given antibiotics.
7. The navel must be dry.



COLOSTRUM COLLECTION AND STORAGE



Colostrum is energy-dense and has high concentrations of antibodies and vitamins. Antibodies, which are part of the immune response to infections, do not cross the placenta in cows, so calves are born without any protection. Consuming colostrum within hours of birth is therefore essential for giving calves temporary protection (passive immunity) against disease until they develop their own immunity.

Collection and separate storage of the first milking colostrum is an effective way of ensuring that newborn calves get enough antibodies in their first feed in the calf rearing shed, referred to as 'passive transfer of immunity'. The concentration of antibodies is highest in the first milking after calving. In the second milking, the concentration of antibodies drops to half. Only high quality first milking colostrum should be fed to calves in the first 24 hours of life. For more information on managing failure of passive transfer use the Scourguard colostrum calculator at www.dairywellness.co.nz

A Brix refractometer can be used to confirm the quality of fresh or stored colostrum. Colostrum with a Brix reading of 22% or higher is suitable for feeding in the first 24 hours. For more information on the use of the Brix refractometer go to www.dairywellness.co.nz

Don't let the following factors reduce the antibody concentration of first milking colostrum in your cows⁵:

- Milking cows precalving or cows leaking milk prepartum.
- Delaying the time until first milking significantly reduces the antibody level. Therefore twice a day collection of freshly calved cows and calves from the paddock is recommended.

Scourguard 4(K) studies show that vaccination of heifers produces excellent quality hyperimmune colostrum so heifers should not be overlooked as part of a calf scours vaccination programme.⁶

STORAGE OF COLOSTRUM

GENERAL TIPS

It is recommended to preserve colostrum that won't be used on the same day as it was collected. Colostrum quality starts to deteriorate straight after collection, but good preservation minimises that reduction in quality. Regardless of the method you choose, preservation cannot remedy colostrum that is already contaminated or of poor quality to start with.

Recent NZ research has shown that gold colostrum often has high concentrations of harmful bacteria like coliforms.⁷ High bacterial loading in colostrum decreases immunoglobulin absorption, increasing the risk of failure of passive transfer (when the calf does not absorb enough antibodies from the colostrum to fight infections until its own immune system is active), even when the quality, quantity and timeliness of colostrum feeding are excellent.⁸ Equipment must be kept clean and the colostrum harvested in a hygienic manner. When emptied, all colostrum storage containers should be scrubbed with hot water and dish washing liquid and disinfected. Do not keep colostrum for longer than four weeks unless it is frozen.

Keep colostrum in a plastic container with a loose-fitting lid to keep bird droppings, animals and other contaminants out. Stir the colostrum twice daily.

PRESERVING COLOSTRUM WITH POTASSIUM SORBATE

New Zealand research showed that potassium sorbate, a food grade preservative, performed better than other preservation methods (no preservation and yoghurt culture).⁷ More information on how to use potassium sorbate can be found at DairyNZ at www.dairynz.co.nz/media/4968621/How_to_preserve_colostrum_with_potassium_sorbate.pdf

REFRIGERATING COLOSTRUM

If possible, stored colostrum should be refrigerated at approximately 4°C. Refrigeration also boosts the preservation effect of other methods, with the exception of potassium sorbate (which performed the same with or without refrigeration).⁷

NATURAL FERMENTATION AT AMBIENT TEMPERATURES

This process involves fermentation by natural bacterial inoculation of colostrum. Colostrum must be stored in a cool place (5°–15°C) in a plastic container - metal containers or parts can corrode due to the acid production from fermentation.

The colostrum should have the top crust broken and be stirred twice a day to keep the fermentation process alive. The stirrer should be rinsed with water only (no detergents) and hung up close to the storage area so that it doesn't touch the ground and contaminate the stored colostrum. The container can be washed after being emptied but only with water, no detergents. This allows the beneficial bacteria to seed the next batch of stored colostrum. Do not add to these containers extremely bloody colostrum, mastitis milk or colostrum/milk from cows that have been treated with antibiotics - this includes any cows that are still within their milk withholding period from an antibiotic treatment and cows within their dry cow therapy treatment to calving interval withholding period.

BACTERIAL INOCULATION OF COLOSTRUM

Bacterial cultures are used to stimulate the production of desirable microbial populations to ferment colostrum. These include: *Streptococcus lactis*, *Streptococcus thermophilus*, *Lactobacillus bulgaricus* and *Lactobacillus acidophilus*.⁹ Colostrum can be preserved with yogurt (*Lactobacillus* sp). A practical example of this is the addition of a dried packet of yogurt, like EasiYo®, to the first batch of colostrum. Further containers of colostrum can be seeded with part of the initial batch, keeping the development of beneficial microbial populations going. However, New Zealand research showed that potassium sorbate performed better than bacterial inoculation (see above).

FREEZING COLOSTRUM

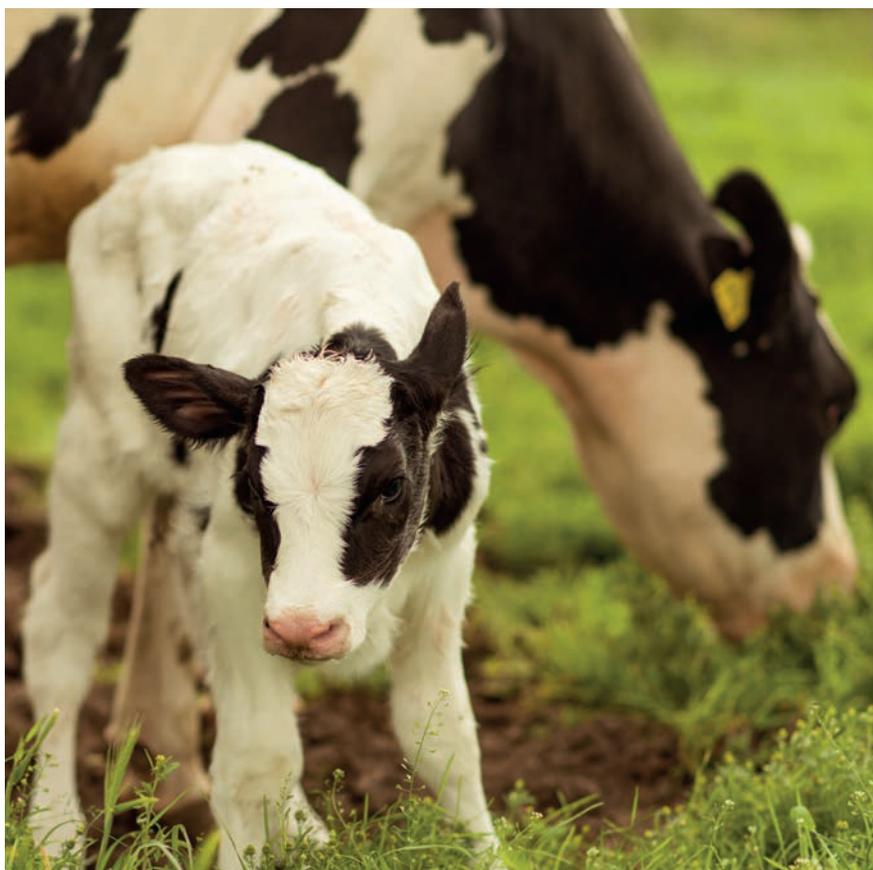
Colostrum can be frozen and stored for greater than 6 months with very little nutrient or Ig antibody loss.⁹ Care must be taken when warming for use so that proteins aren't broken down by heat. It is recommended to warm the colostrum slowly or allow to come to room temperature once removed from the freezer. Freezing small amounts of good quality first milking colostrum (i.e. in 2L milk containers) can ensure a sufficient supply for calves born late or out of season.

COLOSTRUM CODE OF PRACTICE

If the farm is to supply colostrum to milk supply companies the welfare of the cow and the calf must come first. Therefore, adequate supply of colostrum to the calf in the first few days of life is stipulated by Fonterra. The farmer should inform their consulting veterinarian at the dry off milk quality consultation if they are supplying colostrum to Fonterra.

FIRST COLOSTRUM FEEDING

After the first 24 hours of life, the ability to absorb colostrum antibodies ceases.



Calves must receive antibodies from colostrum in the first 24 hours of life. After this time the ability to absorb colostrum antibodies ceases.¹⁰ The first 6 hours of life is the most effective time to absorb antibodies and absorption efficiency is decreased when colostrum intake is delayed.¹⁰

A general guide is 2L of fresh, good quality first milking colostrum within 6 hours of birth, and a total of 10-12% of the calf's body weight within 12 hours of birth. It is important to use the very first milking from cows for this first feed. The use of quality colostrum from cows vaccinated with **Scourguard 4(K)** ensures high intakes of antibodies against rotavirus G6 & G10, coronavirus and *E.coli*.

As it can never be known if the calf has stood and suckled from the cow in the paddock after birth, it is necessary for the calf rearer to ensure that every calf receives the full colostrum requirement in the necessary timeframes. Many calf rearers find the best method is to provide the correct volume of colostrum via stomach tube. This method only improves antibody absorption by the calf if the colostrum being tubed is of high quality.

Most common reasons for the failure of passive transfer are⁹:

- Colostrum with poor antibody concentrations (discussed above)
- Delayed ingestion of colostrum by the calf

Less common reasons for the failure of passive transfer are⁹:

- Cows with large conical shaped teats or udder conformation where teats hang very low to the ground, blocked teats, blind teats, mastitis, muddy teats and sore teats
- Poor mothering or recumbent cow (metabolic disease or other illness)
- Birth injured, weak or cold calves (e.g. swollen head or swollen tongue)

CONTINUED COLOSTRUM FEEDING

Colostrum should be fed ad lib to the calves for the first four days as a minimum.

Feeding colostrum after 24 hours of age will not increase blood antibody concentrations but will provide local immunity in the gut, where the causes of infections calf scours enter the body, giving continued protection to the calf. Fresh or stored hyperimmune colostrum should be fed ad lib (without limit) to the calves for the first 4 days as a minimum. Monitoring of the calves is important during this time to ensure that all calves in each pen are drinking successfully without assistance by the calf rearer.

Colostrum is also a good source of energy and nutrients (see Table 1 below). Having almost twice the amount of solids, 4 times more protein and 60 times more antibodies per litre than cow's milk. High energy intakes are important for growth and development and also for stimulating the activity and growth of the intestinal tract.

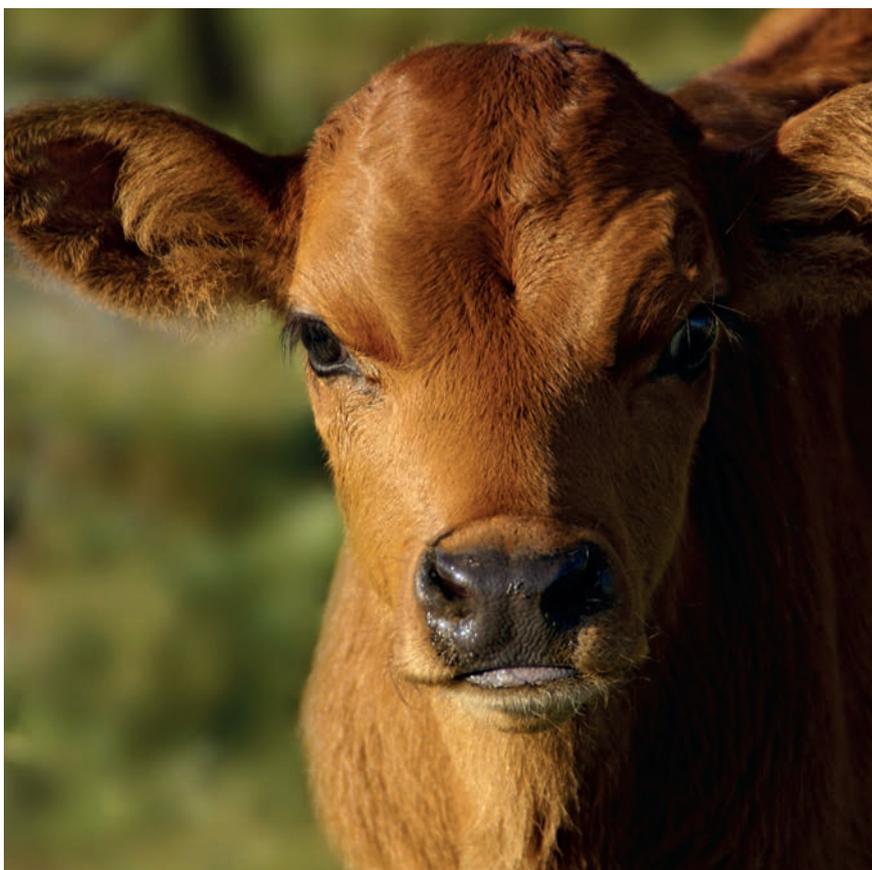
For this reason, colostrum feeding is recommended for as long as colostrum is available.

Table 1: THE COMPOSITION OF COLOSTRUM^{8,11,12}

	COLOSTRUM	COW'S MILK
Fat %	6.7	4.7
Protein %	14	3.5
Lactose %	2.7	4.6
IgG %	6	0.09
Total solids %	23.9	13.6
Total energy (MJ/Kg DM)	25	23.9

HOUSING

Calves must be kept dry and draught free at all times.



Calves should be kept as far away as possible from the older animals on the farm. They should be allocated a pen on first arrival in the shed and they should stay in this pen the entire indoor rearing time. They should be grouped with calves of the same age. The minimum space allowance per calf is 1.5 m². Pens should group a minimum of 10 calves together, 20 at the most. Each shed should house a maximum of 100 calves. Ideally the shed should be twice as long as it is wide. This prevents draughts at the back of the shed. Calves must be kept dry and draught free at all times, however ventilation is also important. There should be no ammonia smells from the pooling of urine. Open sheds should be north facing to allow for sunlight to enter the open calf rearing area and reduce draughts. In very cold or windy areas of New Zealand wind breakers or roll down screens may be helpful to keep the calves sheltered.

There should be no free lying water, mud, drains or cowshed effluent near the calf rearing sheds. The bedding should be untanned sawdust, shavings, post peelings, straw or wood chip with a depth of 200–300 mm. Bedding should be topped up regularly as needed. The flooring should drain properly, ideally from the back to the front. This removes effluent and water and prevents pooling. A suggestion is a coil drain placed in sand or metal under the bedding to remove excess urine and reduce the ammonia concentration. Grated flooring can be covered with wind or shade cloths and layered with bedding materials.

Do not use high pressure hoses in the shed as this causes bacteria and viruses to become air borne and contaminate other pens. Use a broom if necessary to remove excess materials from lane ways.

Ensure that the truck collection site for bobby calves is well away from the replacement calves and public view and that it complies with regulations. For more information, visit the DairyNZ bobby calves website at www.dairynz.co.nz/animal/calves/bobby-calves

HYGIENE

Spray the barn with an anti-bacterial and anti-viral product twice a week.

In dirt floor sheds the floor should be scraped out and the top level of soil removed at the end of the rearing season and left to stand dry until the next rearing season. Should drainage or improvements be required these are best undertaken well before the rearing season. Adequate bedding needs to be organised and stored close by for topping up the bedding.

Spray the shed and all calf pens with a complete antibacterial AND antiviral product twice a week.

Foot baths are useful to clean boots before coming into the shed as people can be a major source of contamination for a calf rearing shed. Therefore, people who aren't involved in calf rearing should not come into the shed during the season.

A rodent control system is often necessary especially around areas where milk powder and meal is stored. Remove birds from the shed if possible, to reduce the occurrence of bird droppings in the shed. Do not allow dogs or children to roam from pen to pen as they can spread disease.

Milk should be brought to the calves rather than moving calves to a milk feeding area. This reduces the chance of infectious spread between groups of calves. It is also advisable to keep the milk lines as short as possible, again to reduce the chance of contamination as well as to reduce the chance of the teats or milk line blocking.

The sick calf pen should be positioned so that they are seen often by staff. This ensures that calves are constantly monitored and action can be taken quickly if a calf deteriorates. It is important to be conscious of spread of disease from this pen so a calf rearer should not go straight from this pen to other pens in the shed where healthy calves are. Although the calves in the sick calf pen often need special attention, it is advisable to feed them last or attend to their treatments after the other pens have been fed or checked thereby minimising the spread of disease. Gloves are recommended for use in the shed at all times, however all clothing worn by staff can be a source of viral or bacterial spread.

Use foot baths and scrub coveralls between pens, especially the sick pen.





FEEDING

Be observant during feeding. Look for blocked teats, slow feeders and bullying by other calves.

In a neonatal calf the colostrum is channelled through the oesophageal groove into the abomasum, the stomach where milk is digested. The rumen is bypassed via this groove to avoid ruminal indigestion or bloat and to allow abomasal digestion of milk. The closure of the oesophageal groove is stimulated by suckling. The oesophageal groove is functionally absent by 12 weeks of age.⁹ Suckling is therefore important for healthy milk digestion; so the calf should be fed standing with its head up. Drinking from buckets at ground level is not advised.

When feeding calf milk replacer (CMR) it is very important to follow the instructions carefully. Use one brand of CMR throughout the milk feeding programme. If changes/increases are being made, make them slowly i.e. gradually over three or more days. Monitoring the calves for nutritional 'white' scours is advised.

It is advisable to use a CMR from a company who is a member of the New Zealand Feed Manufacturers Association (NZFMA). This is a voluntary organisation which asks its members to adhere to its code of practice and promotes high standards and quality product.

When using CMRs there are a number of important management practices:

- Mix up the milk powder just prior to feeding. If it is mixed up the day before the powder can settle out and the milk can go off causing harmful bacterial growth.
- Store bags of powder in a cool, dry area that is free from rodents and birds.
- Mix powder thoroughly with warm water. Add milk powder to half the final volume, mix well and then top up to the required volume with warm or cold water as required. Feeding warm milk is advised as it reduces the need for energy expenditure to get the milk up to the body temperature of the calf. The temperature of the milk should be between 18–20°C when fed to the calf.
- Use a thermometer to be sure of the correct temperature.
- Always use clean fresh water. Rinse all equipment thoroughly after use. Ensure that teats do not become blocked. Ensure that milk feeders are stored in such a way so as not to collect bird droppings.
- Be observant during feeding. Look for blocked teats, slow feeders and bullying by other calves.
- Use a compartmentalised feeder for the first 3 weeks at least, so that each calf gets the same volume.

The aim of newborn calf feeding is to give 10% of bodyweight in milk to calves. (i.e. a 40kg calf should get at least 4 litres of cow's milk or 4 times 125g/L of CMR i.e. 500 g of powder equivalent).

The CMR intake should provide the same amount of powder (energy) intake but volumes are often reduced when the concentration is increased to say 150 or 200 g/L.¹³

CALF MILK REPLACER (CMR) FEEDING GUIDELINES¹⁴

If a feeding level of 13% of body weight is selected, as the preferred feeding regime, the below example will provide you guidance on feeding quantities. If your calf is larger or smaller than the averages indicated below, please adjust accordingly.

TWICE A DAY FEEDING - 300G/L

Age	Approx. Weight	Volume per feed*	Grams per feed	Grams per day
0-4 days	0-30kg	Colostrum or Jumpstart fed ad-lib		
5-10 days	30kg	2L	300g	600g
11-21 days	40kg	2.5L	375g	750g
22-32 days	50kg	3.0L	450g	900g
33 days to weaning	60kg	3.5L	525g	1050g

One 20kg bag makes 113L of calf milk replacer

ONCE A DAY FEEDING - 150G/L

Age	Approx. Weight	Volume per feed*	Grams per feed
0-4 days	0-30kg	Colostrum or Jumpstart fed ad-lib	
5-10 days	30kg	Follow twice a day feeding guide	
11-21 days	40kg	2.5L	750g
22-32 days	50kg	3.0L	900g
33 days to weaning	60kg	3.5L	1050g

One 20kg bag makes 66.5L of calf milk replacer

Note: the latest advice supports twice daily feeding due to animal welfare. However, if you are running a farming operation where once daily feeding is best suited this is still a viable option. Automatic feeders are also now becoming more popular and provide more flexibility in feeding options. Mixing rates should be carefully checked when using automatic feeders and the machines calibrated weekly.

FEEDING CONTINUED

A suggestion to manage slow drinking calves is to make a pen specifically for slow drinkers.



Once a day feeding works by restricting the feeding volume and increasing the concentration of the milk. This encourages earlier consumption of concentrates, whilst the full nutritional requirements are met.

Feeding of mastitis or antibiotic milk to calves is not advised.¹⁵ Some studies suggest that there is a higher incidence of heifer mastitis after feeding milk from cows with mastitis to calves.

A suggestion to manage slow drinking calves is to make a pen specifically for slow drinkers. This way they can all be monitored together and not be bullied and miss out on their complete feed.

Meal or concentrates are valuable to stimulate rumen function. This prepares the gut for an all grass diet. Concentrates should be highly palatable and highly digestible. It should contain high protein concentrations of between 18–20% whilst the calves are indoors. It should contain a ruminal buffer to prevent acidosis and a coccidiostat. Trough space is important to consider so that every calf can get to the meal at the same time. 300mm per head should be allowed for space even when ad lib feeding as calves usually come to the trough all at the same time. Meal should be available to calves from one week of age.

Fibre (hay or straw) contributes to the development of the rumen but has less energy than concentrates so should only be fed at a maximum of 10% of the diet. This fibre source helps to “stretch” the rumen. It should be sweet smelling and dry, with no moulds or dust. Hay or straw should be available to calves from day 1. Clean, fresh water must be made available to the calves from day 1. Troughs must be checked daily and cleaned as necessary.

RECOGNITION AND MANAGEMENT OF SICK CALVES

Carefully observe every calf daily to identify sick calves. Healthy, happy calves will move around the pen, play, feed eagerly and stretch after getting up.

They will have shiny coats, bright eyes, wet noses, dry navels, and dry hind legs. Use all your senses when looking at sick calves and the environment in which they live:

LOOK

Recumbent, dull sunken eyes, droopy ears, swollen wet navel, lame on one or more legs, disorientated, separate from the others, not playing, slow to the feeder, discharge (blood, mucus, pus) from the nose or mouth, hair loss.

LISTEN

Grinding teeth, bellowing, coughing.

SMELL

Ammonia, milk, meal, hay, water.



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Isolate and treat sick calves as soon as possible. Spray the pens of sick calves daily with a complete anti-viral and antibacterial spray. The rectal temperature of the calf is influenced by the ambient temperature. Take the temperature of a healthy pen mate before you take the temperature of the sick ones for comparison. Generally over 39.5°C is considered a fever.

Veterinary intervention early in a disease process is advisable. Failure of passive transfer of antibodies from the colostrum into the calf in the early stages of life can be measured by taking a blood sample from the calf.

Post mortems can be very beneficial to rule in or rule out certain diseases. They can be done quickly and give the veterinarian good information.

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