



Rearing healthy calves
2nd edition

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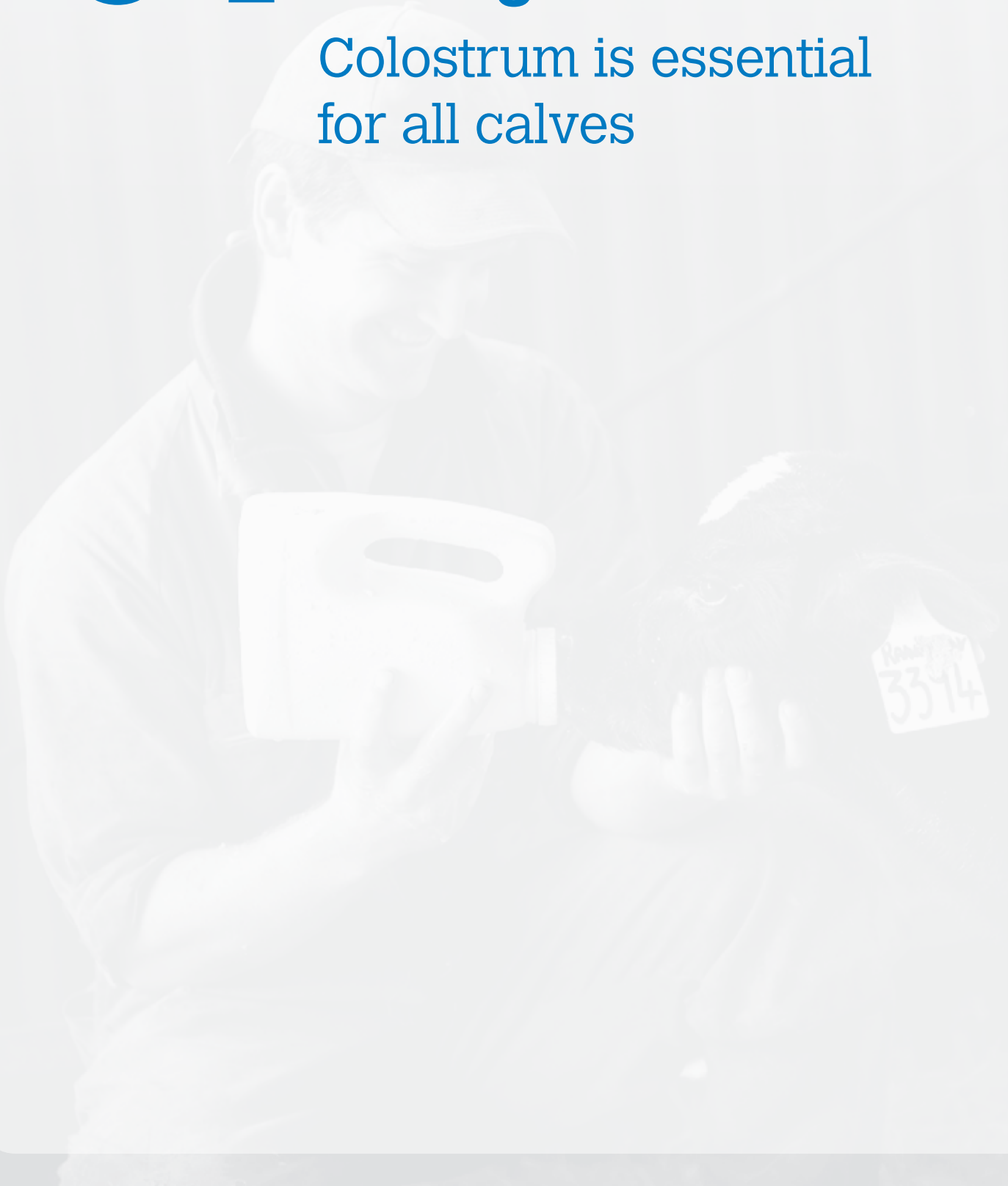
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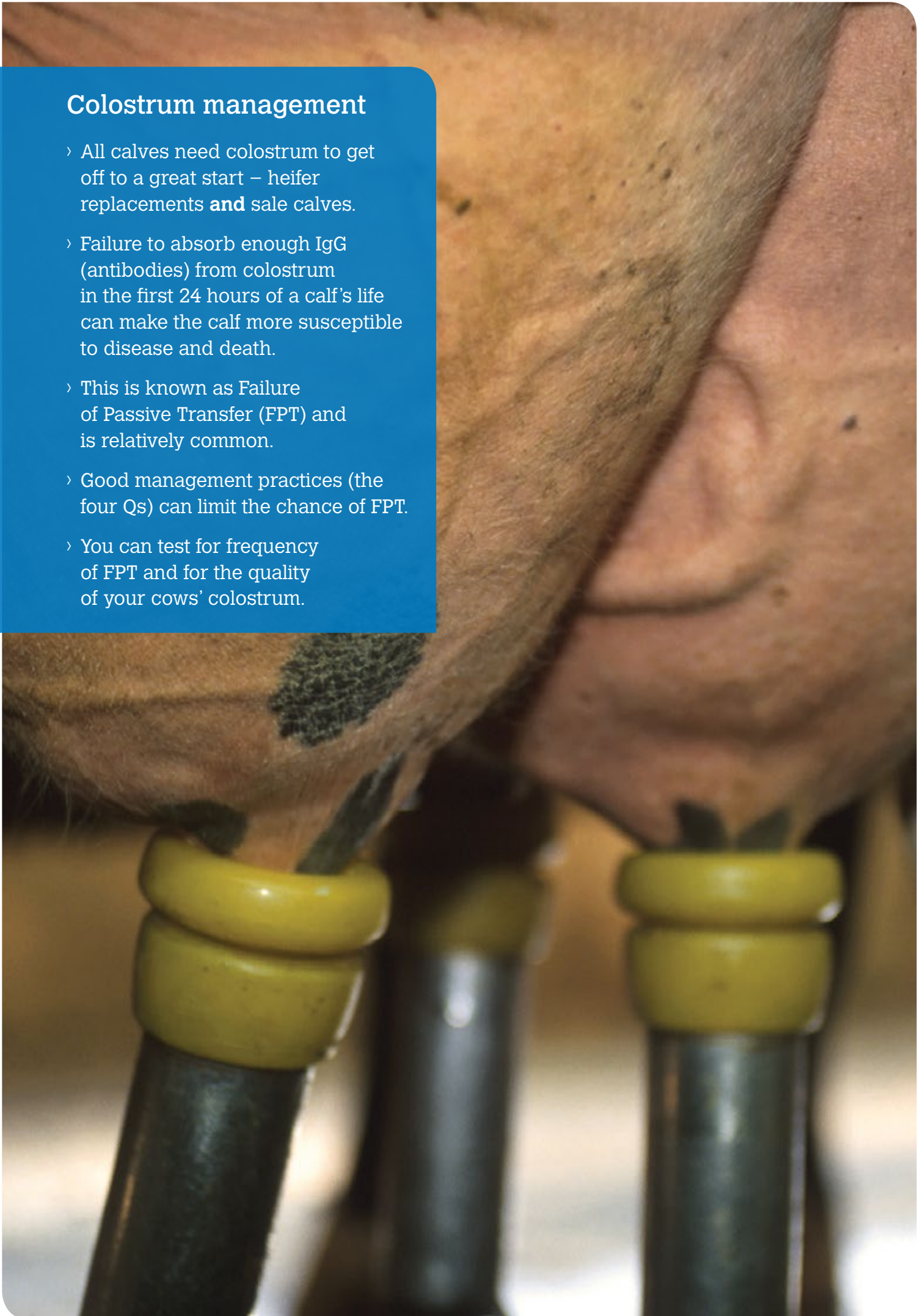
04 Colostrum management

Colostrum is essential for all calves



Colostrum management

- › All calves need colostrum to get off to a great start – heifer replacements **and** sale calves.
- › Failure to absorb enough IgG (antibodies) from colostrum in the first 24 hours of a calf's life can make the calf more susceptible to disease and death.
- › This is known as Failure of Passive Transfer (FPT) and is relatively common.
- › Good management practices (the four Qs) can limit the chance of FPT.
- › You can test for frequency of FPT and for the quality of your cows' colostrum.



04 Colostrum management

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04 What is colostrum?

Colostrum is the first mammary secretion produced after calving. Unlike in humans, the placenta of the cow keeps the maternal blood supply separate from that of the developing foetus. This means that the calf is born without antibodies in its bloodstream.

Colostrum provides maternal antibodies for the newborn calf that help it fight disease. A calf that does not receive colostrum has a higher risk of illness until it develops antibodies of its own at around 6 weeks of age.

Colostrum begins forming in the udder about 5 weeks before calving and production ceases completely once the cow gives birth. It is most concentrated and of highest quality at the point of calving.

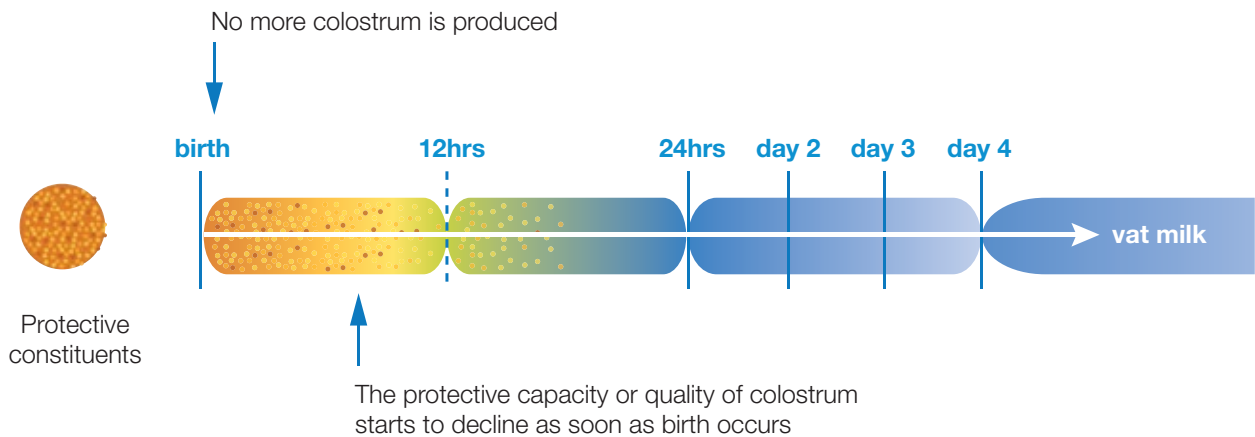
“All newborn calves need colostrum – herd replacements and sale calves.”

Colostrum is a unique mixture of factors derived from the cow's udder and blood that work together to provide nutrition, growth factors and immunity for the newborn calf. No wonder good calf rearers treat colostrum like 'liquid gold'.

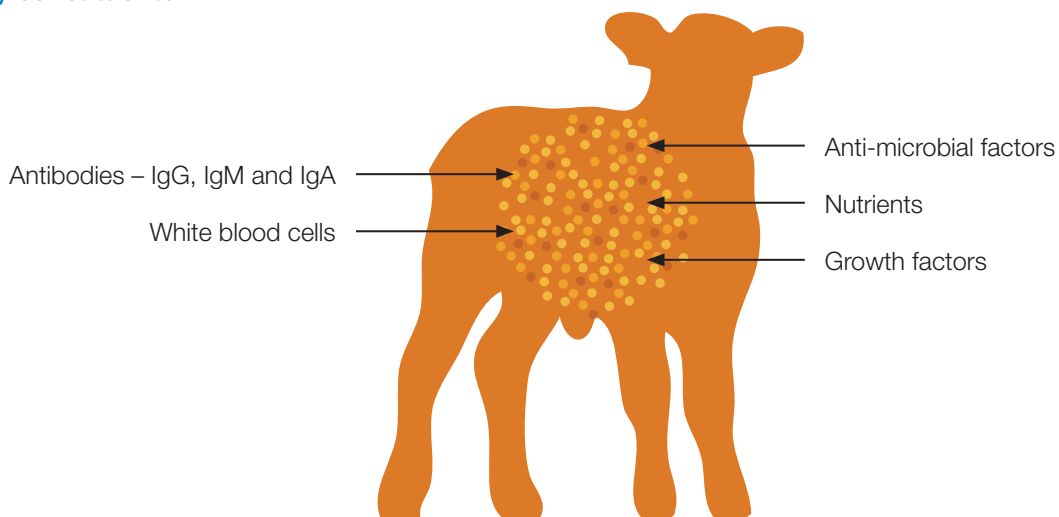
Why is colostrum so important?

Providing the correct amount of high quality colostrum to newborn calves will help ensure:

- > less scours and other diseases
- > reduced death rates
- > better growth rates
- > improved lifetime milk production and fertility (in females).



Key constituents



Remember

- › No additional colostrum is produced by the cow from the moment the calf is born.
- › The protective quality of the cow's colostrum declines after calving even if the cow is not milked or suckled.
- › Colostrum collected straight after birth maintains its protective capacity if stored correctly in the fridge or freezer.

“Only use ‘first milking’ colostrum for newborn calves.”

Milk companies may define colostrum differently!

Milk for human consumption must have a specific composition so colostrum (from the first milking) and the transition milk (from the next 7 milkings) must be excluded from the milk vat. Some companies refer to all substances from the first 8 milkings as ‘colostrum’. Only first milking colostrum will ensure passive transfer of immunity to newborn calves. Transition milk is still very nutritious and can be fed to newborn calves.

Failure of passive transfer of immunity

The only way a newborn calf can receive antibodies (IgG) from the cow is through consuming colostrum. This is referred to as passive transfer of immunity.

Failure of passive transfer (FPT) means that calves do not have protective levels of antibodies in their blood stream 36–72 hours after birth.

Calves with FPT may remain healthy, particularly where there is a low disease challenge, but have an increased risk of disease and death prior to weaning.

Longer term issues include:

- › increased veterinary costs associated with sick calves
- › increased losses in the pre and post-weaning periods
- › decreased rate of growth
- › increased average age at first calving
- › lower milk production during their early years in the milking herd.

FPT is common. It is estimated that approximately 31 per cent of pre-weaning deaths in the first 3 weeks of life could be related to this issue. A study of 100 herds in south west Victoria showed that 38 per cent of heifers had FPT and two thirds of herds had more than 25 per cent of calves with FPT.

Why do calves get failure of passive transfer?

- › Feeding colostrum with inadequate levels of IgG.
- › Feeding insufficient volumes of colostrum.
- › Feeding colostrum too late after birth.

- › Bacteria contaminating colostrum at harvest, during storage or at feeding. Coliforms (bacteria from faecal material) have the worst effect on immunoglobulin absorption.

Calves left on their dams are at high risk of FPT.

One study showed that 64% of calves left on their dams failed to consume enough colostrum compared to 11% of those fed colostrum by stomach tube. Another showed that calves left to be suckled were 2.5 times more at risk of FPT.

Relying on suckling alone to provide transfer of immunity places the health of newborn calves at risk and is not recommended.

Removing calves as soon as possible after birth and giving them a known quantity of colostrum is far more reliable than suckling.

You can test for the prevalence of FPT by blood sampling 12 healthy calves (not scouring or dehydrated), between 24 hours and seven days of age, for laboratory analysis of total protein. It is recommended that this is done both at the beginning and peak of calving when the prevalence of FPT is typically higher.

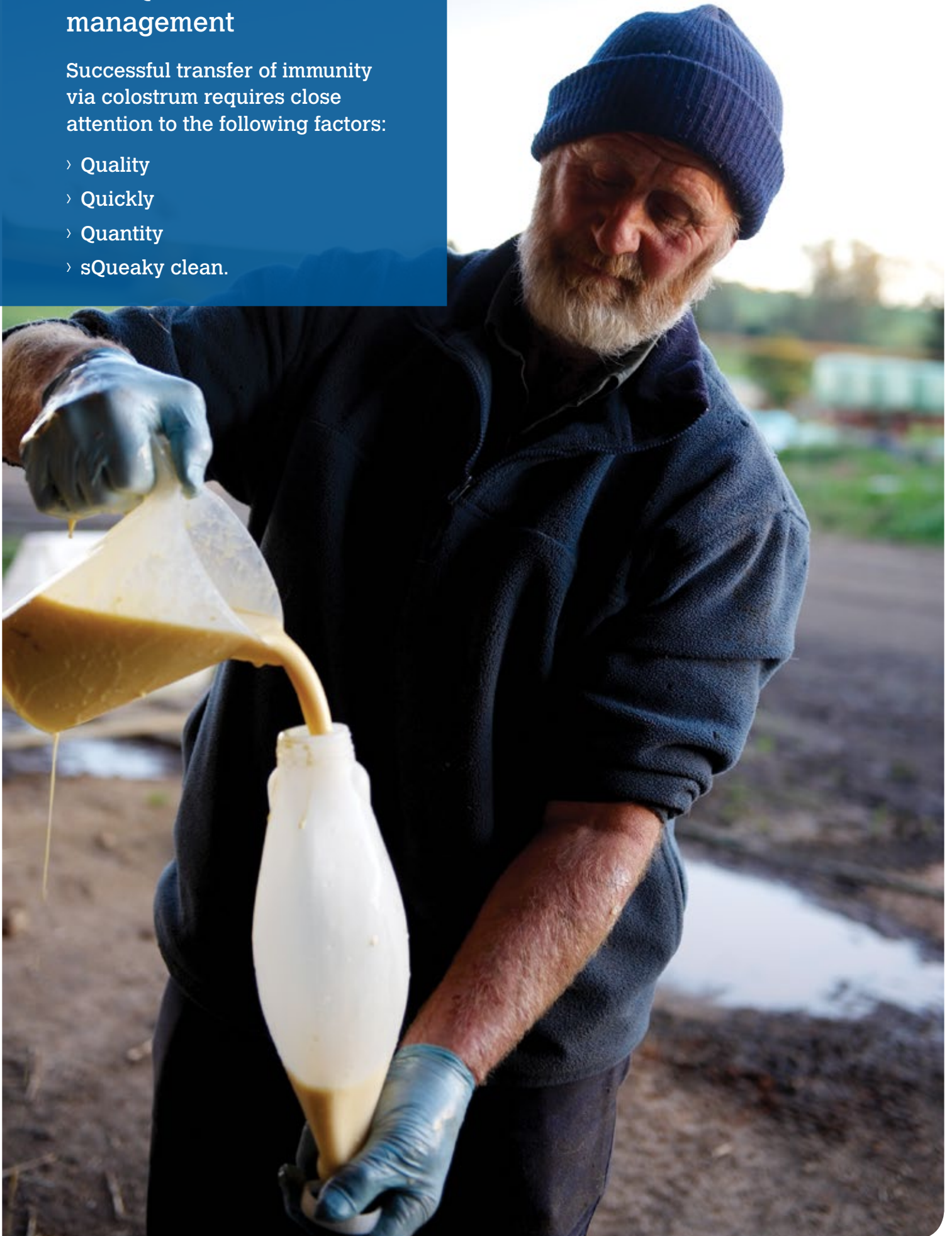
A total protein value of 55 mg/ml (or above) indicates that successful passive transfer has occurred. Australian research has shown that these calves have half the odds of being treated with antibiotics or electrolytes compared to calves with values less than 50 mg/ml. Recent overseas research indicates that values of 58–63 mg/ml may be even better to aim for – the higher, the better!

If 20 per cent or more of tested calves are below 55 mg/ml then you should review your colostrum management system.

Four Qs of colostrum management

Successful transfer of immunity via colostrum requires close attention to the following factors:

- › Quality
- › Quickly
- › Quantity
- › sQueaky clean.



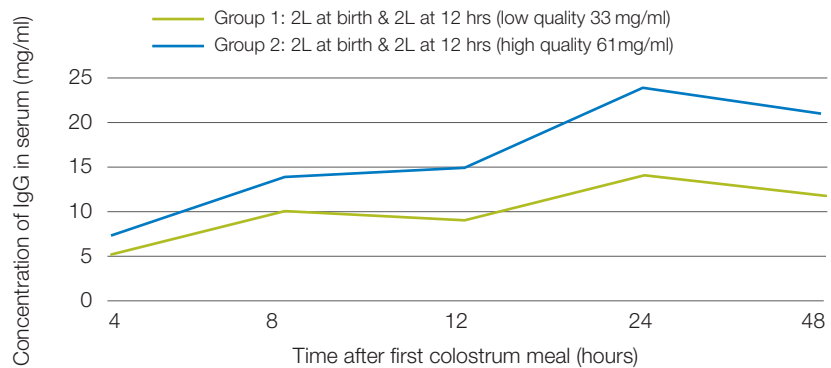
High quality colostrum has an IgG (antibody) concentration of greater than 50 milligrams of IgG in each ml of colostrum.

- Very high** 60mg per ml
- High** 50mg per ml
- Low** 30mg per ml

These results show the benefits of using high quality colostrum.

Calves were fed the same quantities within the same timeframes. Calves fed better quality colostrum had much higher concentration of blood serum IgG.

“Colostrum with a high IgG concentration is more reliable at transferring immunity to the calf.”



Factors affecting the quality of colostrum – you can control some of these

Factor	Notes
Length of the dry period	› Dry periods less than 5 weeks are likely to decrease colostrum quality.
Delay in first milking after calving	› The quality of the colostrum declines the longer it is held in the udder.
Volume of colostrum at first milking	› High volumes of colostrum at first milking (i.e. more than 8.5 litres) may mean that the quality is poorer, but you should always test colostrum before discarding.
Vaccination of the dam	› Vaccinating your herd 3 to 6 weeks before planned start of calving will boost specific antibody levels in colostrum.
Age of dam	› Older cows generally have better quality colostrum (due to greater exposure to disease) but some heifers produce high quality colostrum. › Always test colostrum quality before discarding.
Breed of dam	› Jerseys tend to have higher levels of IgG because of lower volume, but you still need to test the colostrum quality.
Mastitis/High cell counts in dam	› Colostrum that is stringy, flaky or bloody should not be used. › Test and check IgG levels of colostrum from cows with high cell counts as it can still be good quality.
Early calvers	› Cows that calve early (induced or naturally) generally produce colostrum with lower IgG level.

Assessing the quality of colostrum

You should routinely assess the quality of each colostrum sample you collect. Testing individual cows only takes five seconds using a Brix refractometer. It is difficult to judge IgG content of colostrum visually.

How to use a Brix refractometer

Brix refractometers are robust, pocket-sized tools that are well suited for use in the dairy environment. Inexpensive Brix refractometers can be purchased on-line, through some veterinary clinics or local scientific suppliers. Check that the device is measuring on the Brix scale with a range of at least 15–25%. Both optical and digital versions are available.

The Brix refractometer uses a beam of light to determine the optical density of the colostrum. The greater the protein level in the sample, the more light is bent from the light path. Values are read as a percentage.

Mix the colostrum sample well before taking a single drop for testing. Results are accurate and repeatable. A digital Brix refractometer does not need a bright light source to read

the scale, and takes the guess work out of the reading by supplying an exact number.

Tip: If a reading on the scale of an optical Brix refractometer appears fuzzy, try wiping the face of the refractometer clean and then re-apply a smaller drop of colostrum. Alternatively, choose a point midway between the end and start of the blue fading.

A Brix score (or density) of 22% is the cut off for detecting good quality colostrum (IgG above 50mg/ml). If the colostrum sample has a value below 20% it is of poor quality (less than 30mg/ml). Do not feed it to calves during the first 24 hours of life. Save it for feeding to calves at days 2 and 3 of age.

Newborn calves should be given the freshest, highest quality colostrum.

Older calves can be given older and lesser quality colostrum.

“Use a Brix refractometer to check the quality of colostrum rather than your eye.”



Refractometer

Pooling colostrum from different cows

Pooling colostrum can greatly reduce the quality of colostrum – mixing high quality (high IgG/ml) with low quality colostrum creates a more dilute and lesser quality colostrum. Pooling colostrum is usually practiced to achieve a greater quantity. If high quality colostrum is harvested and fed to newborn calves then the quantity required is much less. If pooling is unavoidable then only mix like with like i.e. Brix >22% with Brix >22%. This way the quality will not be changed.

Special care calves

Research has found that calves born in weather extremes are more likely to have difficulty in standing and suckling and so are likely to have reduced IgG intake and absorption. Calves that experience a difficult birth or are born prematurely are also at risk. Identify high risk calves as soon as possible after calving and make sure that they get the highest quality colostrum.

Colostrum replacement products

Be wary of commercial colostrum replacements. They may be promoted as a viable alternative to cow's colostrum but remember nothing beats fresh, high quality colostrum. Many products promoted as colostrum substitutes, supplements and replacers have been found to have very low levels of IgG and have little value in preventing FPT.

Quickly

Time is of the essence in the transfer of immunity to the newborn calf. The clock starts ticking as soon as the calf is born because the calf's intestine can only absorb antibodies (IgG) for a short time.

- › Straight after birth – the calf's intestine absorbs the large IgG molecules easily.
- › Within 6 hours of birth – the intestine's ability to absorb IgG has decreased by 30 – 50%.
- › Between 24 to 36 hours after birth no more IgG can be absorbed.

Calves should be removed from the calving area as soon as possible after birth to reduce exposure to pathogens that cause diseases like calf scours and Johne's disease.



Leaving the calf to suck colostrum from the dam is no guarantee of successful transfer of immunity.

Continuing to feed colostrum to calves beyond the initial 24 hours (after the calf gut 'closes') may also have advantages, as the IgG can still bind to pathogens in the gut and help protect the calf from infections. Colostrum is also a highly nutritious food for calves.

Poorer quality colostrum should be reserved for feeding calves over 24 hours of age.

“Get good quality colostrum into all calves as soon as possible after birth.”

Quantity

The quantity of colostrum each calf needs to achieve successful passive transfer depends on:

- › the amount of antibodies (IgG) contained in the colostrum
- › the time elapsed after the birth of the calf
- › the cleanliness of the colostrum
- › any special needs of the calf.

Testing quality with the refractometer takes the guess work out of how much to feed:

- › **Good quality** ($\geq 22\%$ Brix) – give 2 x 2 litre feeds within the first 12 hours of life.
- › **Poor quality** ($\leq 22\%$ Brix) or if not tested – give 2 x 3 litre feeds within the first 12 hours.
- › An additional feed of 2 litres of good quality, fresh colostrum in the next 12 hours is beneficial.

Greater volumes and more frequent feedings can be used to increase the likelihood of transfer of immunity

but if overfeeding problems are a concern, avoid feeding more than 2–3 litres in a single feed and space out feeds by at least 2 hours.

Remember

Even if your colostrum management is perfect, some calves may still get sick or die. Colostrum is only one piece of the puzzle and it will not compensate for lack of attention to other areas of calf rearing such as protection from the elements, nutrition and calf shed hygiene.

You can also use the Dairy Australia Colostrum Calculator to work out the optimum volume to feed. Go to dairyaustralia.com.au/healthycalves

Or scan the QR code below:



Check the volume

Some stomach tube bottles only hold about 1.8 litres at best – this is not the same as 2 litres!

Giving 2 nearly full stomach tube bottles could only provide the calf with 3 litres of colostrum when 4 litres was the plan.

Keeping track of colostrum feeds

It is useful to have a recording system to ensure each calf receives the correct number of feeds of colostrum: such as a white board with ticks i.e. 2 ticks = 2 feeds or paint marker on calves i.e. 1 strip/dot = 1 feed.

04 sQueaky clean

Excellent hygiene is necessary to maintain colostrum quality and minimise the growth of bacteria.

Large numbers of bacteria in collected colostrum may bind to the antibodies and interfere with absorption by the calf. Bacteria present in colostrum and other pathogens may also cause disease in the newborn calf. You can minimise these issues by:

- › avoiding direct contamination of colostrum during collection, storage and handling
- › preventing any bacteria present from multiplying up to high levels.

Clean colostrum is defined as:

Total Plate Count (TPC) <100,000 cfu/ml (cfu = colony forming units)

Total Coliform Count (TCC) <10,000 cfu/ml (coliforms indicate faecal contamination)

High numbers of bacteria may interfere with IgG absorption across the calf's intestine in the first 24 hours of life. Feeding contaminated colostrum can contribute to FPT from the cow to the calf, putting it at greater risk of disease. The newborn calf's intestine is also very 'leaky' for the first 14 days of life so bacteria can more easily enter the body and cause disease.

Laboratory testing

A Total Plate Count (TPC) or Total Coliform Count (TCC) can be obtained for fresh or frozen colostrum by submitting samples to a laboratory via your vet practice. It is best to submit samples from a few different batches of colostrum over the calving period. As a guide, if more than 80% of samples come back with TPC exceeding 100,000 cfu/ml or TCC over 10,000 cfu/ml then you should review the cleanliness of your colostrum collection and storage practices.

Controlling contamination of colostrum

Cow side

- › Remove the calf from dam as soon as possible after calving to limit the amount of suckling and contact with contaminated udder skin.
- › Clean, disinfect and dry teats prior to harvesting colostrum.
- › Do not use colostrum from cows that are sick or suspected of being positive for disease such as Johne's disease, Salmonellosis or Mycoplasma.
- › Discard colostrum if you can see evidence of contamination i.e. faecal or other organic material present.
- › Do not pool raw colostrum – it increases the risk of spreading bacteria.


Equipment

- › Collection, storage and feeding equipment must be spotlessly clean and disinfected before use.
- › Stainless steel buckets are easier to clean.
- › Rubber teats must be washed and dried.

Most colostrum is not sQueaky clean!

A recent study of colostrum quality on northern Victorian dairy farms found that only a minority of samples met all quality standards. Only 23% of the 240 samples taken around the Rochester area met industry recommendations for total plate and coliform counts as well as Brix quality standards. These findings demonstrate that a large number of calves were at risk of receiving colostrum of poor quality, with high bacterial loads that may have interfered with the transfer of passive immunity and affected calf health.

“Bacteria in colostrum can double in number every 20 minutes if left at room temperature.”



How to clean equipment containing milk

Containers

1. Rinse

Use lukewarm water. DO NOT rinse with hot water. Rinse/scrub off dirt and milk residue.

2. Wash

Use hot water (>50°C) and add detergent. Brush all surfaces to remove any milk residue. Disinfection can be added at this step. Virkon-S or bleach can be used as per label directions. To achieve disinfection the solution needs to be in contact with equipment for at least 5–10 minutes.

3. Rinse

Use warm water to thoroughly rinse containers. Can finish with an acid rinse and leave on to dry.

4. Dry

Allow the bottles and buckets to drain and dry – preferably on drying racks. Do not stack buckets inside each other. Do not sit buckets upside down on a concrete/solid floor as residues build up around the rim.

Rubber nipples should be thoroughly cleaned inside and out following the above protocol. A firm brush will help. Discard nipples that are cracked and showing signs of aging. It is good practice to replace nipples at least annually (or sooner if required).

Storage: short term

- › Store colostrum in a container with a lid to avoid further contamination.
- › Refrigerate excess colostrum within an hour of collection.
- › Refrigeration at 4°C will maintain bacterial quality for up to 48 hours.
- › Very short-term cooling can be achieved by adding some clean plastic containers containing frozen water into the buckets holding the warm colostrum. Any plastic container used for this purpose must be thoroughly cleaned between uses.
- › Colostrum should be fed to calves at 35–38°C – place container in a warm water bath (not hot water).

Potassium sorbate

Potassium sorbate (a preservative commonly used in the food and wine industry) can be added to colostrum immediately after collection to inhibit bacterial growth for at least 4 days. Refrigeration at 4°C is still essential – if potassium sorbate is added to colostrum which is then left at room temperature, bacteria will quickly multiply up.

Potassium sorbate is not helpful if colostrum is already heavily contaminated or starting to go off. Your vet can provide advice on sourcing, handling and using this product at the correct concentration.

Storage: long term

- › Always test colostrum quality before storing – it is unwise to store poor quality colostrum. Record the Brix reading on the container, along with date of collection.
- › Deep freezing is recommended – small freezers in the top of refrigerators do not reduce the temperature quickly enough to prevent microbial growth.
- › Use thin, flat storage bags (e.g. plastic bags laid on trays) rather than plastic containers (e.g. old milk cartons) to reduce both freezing and thawing times.
- › Frozen colostrum should be discarded within 12 months of collection.
- › Colostrum should be thawed in a water bath at no hotter than 49°C i.e. lukewarm! Do not use a microwave as this will destroy the antibodies.
- › It is a good idea to freeze some good quality colostrum towards the end of calving, ideally from vaccinated cows. This will provide a ‘colostrum bank’ for calves born to heifers at the beginning of the next calving season. Heifers commonly produce low volumes of colostrum and the quality may also be poorer.

Heat treatment and pasteurisation

Heat treatment of colostrum using commercial pasteurisation units on farm is a relatively new approach to improving the cleanliness of colostrum. This practice involves heating colostrum to 60°C for 30 or 60 minutes in a special pasteurising unit. This process differs from traditional milk pasteurisation, which causes damage to the antibodies in colostrum. Other pasteurisers using UV light are also available but limited information suggests that they are not as effective at reducing bacterial counts.

Although the initial setup can be expensive, pasteurisation can deliver significant benefits. Studies have shown significantly reduced TPC and TCC, without damage to colostrum IgG and when fed, resulted in higher IgG levels in calves. It is a valuable method for reducing pathogens that cause calf health problems like scours (*E.coli* and *Salmonella*), Johne’s disease and *Mycoplasma bovis*. Pasteurisation of milk fed to older calves confers similar health benefits.

If using heat treatment or pasteurisation of colostrum it is recommended to regularly test the bacterial levels of the treated colostrum (by culturing), to ensure the processing system is working correctly.

Colostrum can be given to a calf via an oesophageal tube (commonly referred to as ‘tubing’) or a teat feeder.

Tubing (oesophageal/stomach)

Oesophageal feeding tubes (sometimes referred to as stomach tubes) are preferred by some farmers. Once the practice of ‘tubing’ calves is learnt it can be quickly carried out.

- › Oesophageal feeders ensure rapid ingestion of a known volume of colostrum without the need to teach the calf how to suck. This is valuable when the calf is born weak or has had a difficult birth.
- › Care needs to be taken as poor technique may damage the oesophagus and incorrect tube placement can result in colostrum being taken into the lungs causing pneumonia or even the death of the calf.
- › The operator must be trained to ensure correct placement of the tube and to regulate the rate at which the colostrum is administered.

Check the volume of the stomach tube bottle – many only hold a maximum of 1.8 litres when full.

Teat feeding

Teat feeding requires training the calf to suck on a teat before the colostrum can be given.

Teat feeding is preferable to tube feeding in calves over 12 hours of age. It may also be best to teat feed if you have poor quality colostrum.

Colostrum given by tube does not go directly into the true stomach but is deposited into one of the forestomachs. This can delay the absorption of the colostrum by up to 3 hours.

If fed good quality colostrum in the first 12 hours, this slightly slower absorption is of little consequence but if colostrum intake has been delayed, the best strategy is to feed colostrum via a teat.

“If for some reason a calf has not received colostrum in the first 12 hours of life it may be better to teat feed it.”

Summary of recommendations

Remember the four Qs

Feed newborn calves with the highest quality colostrum available – as soon as possible after birth.

1. **Quality** – Colostrum should be harvested as soon as possible after a cow has calved. Test colostrum quality!
Use a Brix refractometer to assess the antibody concentration in the colostrum before you feed, store or discard it.
2. **Quickly** – Feed calves as soon as you can – remember the calf can only absorb antibodies for a short time after birth.
3. **Quantity** – use the Brix reading to adjust the volume – if in doubt give more rather than less.
4. **sQueaky clean** – Make sure the colostrum is collected hygienically into clean collection containers. If storing colostrum, refrigerate or freeze quickly and avoid pooling from different cows.