



# Calf Rearing Guide

---







**What you put in impacts  
what you get out**

# Contents

Goals for calf rearing	4	Feeding systems	32
Achieving growth targets	5	Milk feeding	34
The Kiwi challenge	6	Fortifying cow's milk	36
Calf selection	7	Preparing milk powder	37
Calf transportation	8	Nutrition and rumen development	39
SOP - Handling Day 1 Calves	9	Monitoring growth around weaning	41
NAIT guidelines/tagging	10	Hard feeds	43
Calf housing	12	NRM Moozlee®	46
Calf husbandry	14	NRM GrowUp® 20%	47
Colostrum	15	NRM GrowUp® 16%	48
Optimal calf well-being	18	NRM Sweet 16 Pellets	49
Disease management	19	Calf rearing shopping list	50





# Goals for calf rearing

---

**How calves are reared will set the tone for the lifetime productivity of the animal. Well-reared calves will be an asset to the herd.**

Whether rearing calves for heifer replacements or beef animals, goals are similar:

- To develop the rumen of the calf (which is immature at birth), so that when it is weaned it can get nutrients from eating high fibre feeds such as grass.
- To produce quality replacement heifers that become high producing cows and will last over time in the herd.
- To grow beef animals to target weights faster and in better condition so they achieve slaughter dates earlier, or on time, at better weights.
- To do both in a way that is both cost effective and without compromising of animal well-being.
- Achieving calf rearing goals also includes taking a dairy industry by-product and producing it for niche markets in a best practice calf rearing system that is affordable and well managed.





# Achieving growth targets

**Achieving set growth targets is important as growth rates impact on the reproductive and lifetime production performance of cows. There is increasing evidence that increasing average daily gain pre-weaning is correlated to milk production in the first lactation.**

Calves not reaching growth targets will be on the back foot and will not perform as well as those reaching target — with the consequences being heifers possibly not getting into calf, or heifers performing poorly in their first and subsequent lactations due to pending growth requirements, inability to compete with cows in the herd and/or poor mammary cell development. Growing calves consistently and continuing to reach growth targets is the most efficient way to put on weight and is also the best way to ensure you are growing calves that are well grown in regards to muscle and skeletal development. Having periods of no growth followed by periods of catch up growth is inefficient and catch up growth can often be fatty deposits rather than lean muscular growth.

Successful calf rearing is not just about reaching weight targets. The protein and fat composition of the diet can influence the composition of the growth, as protein supports muscle and skeletal development whilst a high fat diet is more likely to encourage fat deposition.

Keeping track of calf weights is important as it provides an indication of how successful the overall calf system is and if goals are being achieved.

There are several ways of doing this. Weigh scales are the gold standard, with other options being measuring wither height with measuring sticks or using girth tape. Wither height sticks are becoming increasingly popular with calf rearers as they are quick and easy to use but still give accurate measurements, as wither height is strongly correlated with calf weight.

Ask your local NRM Nutrition Specialist for more information on sourcing and using a calf wither measuring device.

**Any measurement device used must be calibrated regularly in order to check for accuracy.**

## Targets for heifers (% of mature body weight)

Puberty	50%
Service/Breeding	60%
Pre-calving 22 months	90%

Unlike unhealthy animals, healthy well-grown calves support more efficient and cost effective beef production, and/or longevity of milk production for dairy animals.



# The Kiwi challenge

---

**Calves in New Zealand tend to face more challenges than the average calf in other countries due to many factors.**

- The tight calving pattern of the New Zealand dairy herd and large herd sizes means that a high number of calves are reared in a short period of time, which can put pressure on both the calves and staff.
- Calves are often reared in groups, compared to overseas calf rearing methods, which can have calves in individual pens. Group housing can increase the risk of disease spreading and can put more stress on the smaller calves in a pen. Calves may also be removed from the main calf sheds earlier than preferred due to limited spacing.
- Cows in New Zealand calve outside in often variable spring weather, which means that calves can be born into a wet, cold, muddy environment and initial colostrum intake can be depressed by these environmental factors.
- Cows in New Zealand are often wintered on crops that may not be well balanced in terms of energy, protein, trace elements and minerals, which can impact on nutrition to the foetus in late pregnancy, colostrum quality post-calving, and ease and speed of calving.
- The New Zealand herd has a significant portion of Jersey genetics, which produce lighter calves with poorer cold tolerance than black and white calves.





# Calf selection

---

Selection of calves for rearing is important as it determines how successful the calf operation will be. It is best to avoid calves that are hindered from the start, as these calves will tend to be the poor-doers and will lag behind their age group.

## Top tips for calf selection

---

- Buy from a reputable farmer if purchasing calves in and try and buy from as few sources as possible.
- Ensure calves have been fed sufficient colostrum of the right quality soon after birth. If you are unsure if calves have received adequate colostrum, there are tests available to check the levels of immunoglobulins in the blood — contact your local veterinarian for more details. If you have excessive calf health issues every year, it may be a good idea to look into this — particularly if you are purchasing the calves at 4 days old and have no control over the colostrum intake in those important first few days of life.
- Check that no navels are infected — check for swollen navels. The navel should be dry and shrivelled.
- Ensure calves are strong and bright — ears should be alert and not droopy and eyes should not be sunken (this indicates dehydration).
- Ensure calves are not lame or sick.
- Ensure calves have a good suck reflex.
- Try and stay away from rearing calves from twins or premature born calves.
- For heifer rearers, early born calves may not be the best animals genetically as later calving cows tend to be the higher producing animals. Rather than rearing the first born calves, it may be more beneficial to select calves throughout the calving period.
- If buying calves in, ideally buy calves from farmers who take active steps to minimise disease threats such as rotavirus.
- Do not purchase calves under 4 days old.
- Make sure calves are able to stand and bear weight evenly on all 4 limbs.
- Calves' hooves should be firm and worn flat, not bulbous with soft unworn tissue.
- Try and buy locally as much as possible to minimise transport stress.
- If you are paying a premium price, make sure you are getting premium calves.

---

**Following these guidelines will mean that sick and unhealthy calves are avoided from the start. These calves would only cost money and reduce the overall profitability of calf rearing.**

---

# Calf transportation

---

Care should be taken when transporting calves. The less stress calves experience during transport, the healthier they will be on arrival. Bruising of the navel during transport can encourage navel infections, which can develop into joint ill. Take care of calves and handle gently to avoid this.

## Top tips for transporting calves

---

- If transporting calves straight off mum to the calf sheds, spray navel cord with at least 7% tincture iodine before and after transport.
  - Any calf trailers used must be cleaned, disinfected daily and bedding material kept dry.
- 

- There should be sufficient room for all calves to lie down.
  - Ensure there is a protective cover on the floor, such as hay, sawdust or a soft mat. This will ensure animals are kept warm and will also reduce injury.
  - Protect calves from wind chill, rain and keep them as warm as possible.
  - Avoid overfeeding prior to transporting.
  - Educate carriers about low stress handling techniques.
  - Feed electrolytes for the first 12 hours after delivery if they have travelled a long distance.
  - Drive carefully.
- 





# SOP - Handling Day 1 Calves

STEP	CHECK / REQUIREMENT
 	<ul style="list-style-type: none"> <li>• Approach calf quietly. Firmly catch</li> <li>• One hand around bottom, one around chest (hug the calf)</li> <li>• Bend knees to lift; keep back straight</li> <li>• Keep calf between you and cow; keep an eye on cow for signs of aggression</li> <li>• Minimum 2 people must be present when picking up calves</li> </ul> <p><b>Never</b></p> <ul style="list-style-type: none"> <li>• Lift calf above shoulder height</li> <li>• Drag, hit, throw, or drop calf</li> <li>• Pick up calf by tail or leg</li> </ul>
	<p>Spray navel with iodine</p> <p>Do not spray iodine in eyes</p>
	<ul style="list-style-type: none"> <li>• Carefully load onto trailer</li> <li>• Maximum load per trailer of # calves (insert number to suit trailer)</li> <li>• Follow speed limit when towing trailer</li> </ul>
	<ul style="list-style-type: none"> <li>• Exercise extreme caution when driving near calf sheds</li> <li>• Be aware of other people and their location.</li> <li>• Check surroundings before moving vehicle</li> <li>• Observe speed limit</li> </ul>
	<p>Be patient and carefully unload calves into pens using correct lifting technique.</p>
	<p>Spray navel with iodine again</p> <p>Do not spray iodine in eyes</p>
	<p>Quality control: sort calves by gender and spray/mark</p>

# NAIT guidelines/tagging

---

When purchasing your calf either direct from a farmer or from a sale yard there are some rules around identification that by law is required, even if you are only purchasing 1 or 2 calves for your lifestyle block.

## What do I need to do?

---

Calves must be registered in the NAIT system within seven days of being tagged or before moving off-farm, whichever is sooner. All animal movements must be recorded with NAIT, including confirming receiving movements within two days of the movement start or movement end date. All animal deaths or missing animals must be recorded with NAIT within two days of occurring, once in the NAIT system. You can contact NAIT to register. **Email:** [info@ospri.co.nz](mailto:info@ospri.co.nz) or **Phone:** 0800 482 463

## Tagging

---

NAIT tags are the only tags required by law. Animals only need one NAIT tag each. You don't need to tag an animal with your own NAIT tag if it already has one. Calves less than 30 days going directly for meat slaughter do not need a NAIT tag, but require an issued tag by the meat processor.

Once you are registered with NAIT, the next step is to buy tags for your animals. You can order through your local farm supply store.

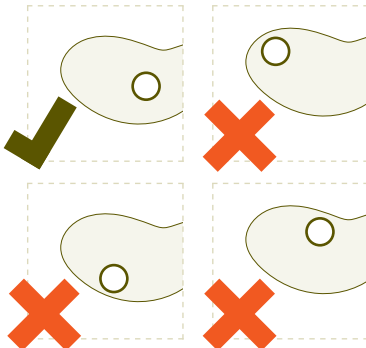
To avoid ears getting infected check that the tagger is working correctly and the pin is straight and lines up with the upper jaw of the tool. When the tag is loaded check that they will align correctly, make sure your calf is restrained securely. Make sure the ear location is clean and before tagging your calf, dip the tags in the applicator into antiseptic or disinfectant before tagging the ear.





## Tips for applying tags

- Correct tag placement ensures maximum retention and visibility.
- The tag should be applied between the two main ear cartilages and approximately half way between the head and the outside tip of the ear.
- Tags should always be applied with the male tag being inserted from the back of the ear as this increases retention.
- Always apply the tags firmly and quickly with one smooth positive action.
- Ensure you follow the supplied tagging instructions.
- Use the correct applicator as indicated by the instructions.
- Ensure tags are positioned correctly in the applicator.
- To lower the risk of infection and where possible tag during a dry weather event. This allows the wound to dry and heal more efficiently.
- If using disinfectant please ensure that it is at the correct manufacturers ratio.



# Calf housing

---

**To get the most out of calves, it is essential they are provided with good housing. Poor comfort increases energy demand and stress, which results in reduced performance and immune response.**

Young calves are born with very little fat reserves to use to keep warm, so they are susceptible to the effects of wind and rain. Calves should ideally be sheltered inside for at least 3–4 weeks after birth as cold, wet calves will put their energy into staying warm rather than growing. Calves can be moved outdoors at 3–4 weeks old but should still always have access to shelter from wind chill and draughts e.g. thick hedging, large straw bales or covered shelter.

Keeping calves free from thermal stress - not too hot or too cold, but warm and dry will prevent them from shivering — which increases energy demand and depresses growth rate. Friesian calves start to shiver at 3°C when dry and 13°C when wet. For jersey calves, this can be around 8°C if dry and 18°C if wet. When calves are out at grass, calf covers can be a good option to keep out the wind and rain and this can be particularly beneficial in exposed surroundings.

## Guidelines for calf housing

---

- Allow adequate space for calves — at least 1.5 – 2m<sup>2</sup> per calf.
  - Keep calves in groups according to age and/or fast and slow drinkers where possible, this will minimise bullying and stress, meaning calves will be healthier and will grow faster.
  - Dry, draught free pens with good daylight exposure are best. If you can feel a draught on the back of your hand at calf level, it's too draughty.
  - Supply fresh clean running water in troughs at a reachable calf height, preferably set to the front of pen and not where animals sleep.
  - Pens should be constructed with three solid walls using sheet metal or untreated plywood, with one end open to allow good ventilation and the removal of gases and ammonia from urine. This open end should ideally face leeward and north for sunshine.
  - Pens should be twice as long as they are wide to allow calves to move to the back to get out of wind and rain.
  - Ideally the floor should be coarse gravel, sand or small stones and have adequate depth of drainage.
  - Bedding should be straw, untreated bark/wood chip or sawdust and should be 300mm deep or more. The bedding must be kept clean and dry.
  - The barn, pens and bedding should be sterilised with a calf-safe virucidal spray (such as Virkon™S) before calves arrive, to kill any viruses. This should then be re-done twice
- A calf shed with separate pens is necessary. The rule of thumb is 10 – 12 calves per pen, with an extra pen specifically for sick animals.



weekly thereafter. See page 30 for more details on Virkon™S and how best to use it.

- Keep birds from roosting in the barn, as their droppings can cause disease (such as salmonella).

## Top tips for managing the housing environment

- Monitor pens regularly to maintain consistency and upkeep hygiene. Remember ammonia = pneumonia.
- Minimise the effects of changes in ambient temperature and humidity through well ventilated housing.
- Assess bedding daily and provide additional as required. The “knee test” provides an easy assessment of bedding. Soiled knees = insufficient bedding, risk of bacterial challenge. Wet knees = insufficient bedding, taking heat from the calf.
- Check with a naked flame that calves are not in a draught at ground level but have good air flow well above calf height to prevent ammonia accumulating.
- For further expert advice on designing calf pens and housing, contact your local Technical Field Officer or our in-house experts.



# Calf husbandry

---

Attention to detail goes a long way when it comes to calf rearing and taking the time to assess calf behaviour and health each day can be very beneficial in terms of calf survivability and productivity.

Calves should have a daily routine, with the same person feeding them every day if possible and at the same time each day. The calf rearer should be quiet and relaxed as this will reduce stress for calves and they will be more likely to drink their share of milk. The rearer should have plenty of time to do their job and complete their daily checks, as it is important that no part of the rearing programme (feeding, cleaning or animal health) is overlooked and that any problems are not unnoticed or put off.

## Top tips for caring for calves

---

- In the first 12 hours of life the calf should have at least 10% or more bodyweight of good quality, day one colostrum (see colostrum section for more detailed information).
  - If possible, pick up calves as soon as they are born. Getting them into the calf shed fast will ensure they are not cold for an extended period of time and will ensure they get the colostrum they require quickly.
  - Don't be afraid to stomach tube calves as required if they don't willingly drink their required volume of colostrum or milk. Going off their milk feed can indicate sickness, so keep your eye on these calves and tube them again next feed if required.
- 

- Always feed calves in the following order: young through to eldest, with calves in sick pen last of all.
  - Calves should have their navels sprayed with at least 7% tincture iodine and checked regularly. If at 3 days of age the cord is bigger than a little finger, then it will require veterinary attention.
  - Bring milk to the calves where practical, not the other way around. This will ensure calves are as relaxed as possible at feeding time.
  - Always have electrolyte on hand and try and use it in a proactive way as much as possible. For example, use an electrolyte to aid hydration and reduce leaky gut or disease risk after transport, or during times of other stress. Be the fence at the top of the cliff rather than the ambulance at the bottom of it. If you can identify calves that are heading towards a sickness and get electrolyte into them sooner rather than later, you will be surprised at how much you can prevent issues developing.
  - Make clean water available at all times.
  - Take time to observe your calves' behaviour so you can pick up on the slightest change – the earlier you intervene with sick calves, the better.
  - Keep records to help identify problems. You may be able to trace problems back to events, or it may help you in future seasons.
-

# Colostrum

---

It is crucial that calves receive high quality colostrum on their first day of life - preferably within the first 6 hours after birth. Because calves are born without having their own protective or 'active immunity', they have a high risk of infection until this develops with age. Calves that do not receive adequate immunity in the crucial period in early life will be on the back foot from day one and may be more likely to get sick and have poor growth.

Colostrum is important for new born calves as it contains high levels of **immunoglobulins (IgG)**, otherwise known as antibodies. These are large protein molecules that are absorbed by the immature gut and provide passive immunity to help calves fight off infections for the first month of life and partially up to 6 months of age, while the immune system of the calf develops.

There are 5Qs to remember when it comes to colostrum. Get all your 5Qs right and you will have calves in a good position to fight off the health challenges they may be exposed to in the first few months of life.

## 1. Quickly

---

It is crucial to get sufficient levels of colostrum into calves quickly in the first day of life, as after this the gut begins to lose the ability to absorb the IgG. After 24 hours no antibodies will be absorbed into the bloodstream from the calf's gut. It is best to feed colostrum within the first few hours of birth and feed the

total quantity of colostrum they require optimally within 6-8 hours of birth to ensure highest absorption of IgG. It is important to remove calves from cows as soon as possible after birth to ensure colostrum is received quickly — do not rely on calves getting colostrum from their mothers following calving, always assume they have not received any.

## 2. Quantity

---

The quantity of colostrum consumed by calves is crucial. Calves must consume enough colostrum in order to absorb enough IgG. However, quantity is closely linked to colostrum quality and more of a lower quality colostrum needs to be fed in order to satisfy IgG requirements. Typically, the total volume of colostrum required is 10-15% (2-4 litres depending on body weight) of birth weight, so larger calves will need more colostrum than smaller calves.

*Recommended levels of colostrum are dependent on the IgG level in the colostrum. It is recommended that a calf receives a minimum of 100g IgG (10-15% of body weight) within 6-8 hours of birth. Ideally this would be through either suckling or by using a stomach tube.*

## 3. Quality

---

Quality is another extremely important factor when it comes to colostrum. High quality colostrum will have a higher concentration of IgG and therefore calves



# Colostrum

will absorb more immunoglobulins when it's consumed. With very poor quality colostrum that has low IgG levels, calves can often not drink enough colostrum to satisfy their IgG requirements. Ideally, colostrum should have an IgG level higher than 50g/L and have low bacterial count. Colostrum is best fed at body temperature 38.5 - 39°C) to ensure optimum IgG absorption. Feed colostrum at an optimal temperature: Not too hot, not too cold, just right, 38-39°C is optimal.

## 4. sQueaky clean

Avoid bacterial contamination. Keep all buckets clean and covered to avoid any bacterial contamination with harmful bugs that can be passed onto calves. Adding a quality 'colostrum keeper' helps keep harmful bacteria at bay.

## 5. Quietly

Always handle calves quietly and gently. A stressed calf is not as good as absorbing IgG across the gut wall, weakening its immunity.

## The Five Qs of colostrum

Quickly — within 6-8 hours of life

Quantity — 4-6 litres  
depending on size of calf

Quality — IgG level >50g/L

sQueaky Clean - avoid contamination

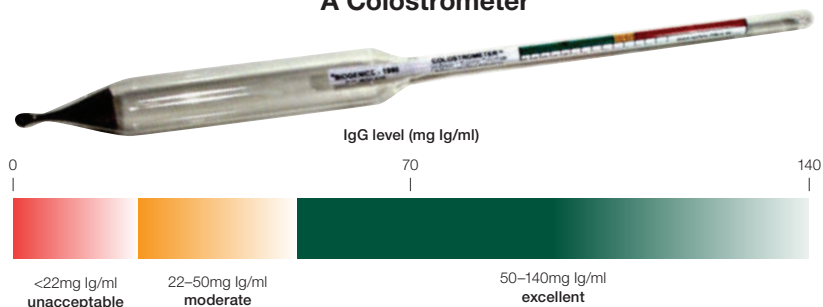
Quietly - calm, quiet handling

## Checking colostrum quality

Checking colostrum quality cannot be accurately done by simply looking at the colostrum, as colour is not always linked to immunoglobulin level.

Colostrometers are a good tool for testing colostrum quality, as they measure IgG concentration as correlated to the specific gravity of the colostrum. The colostrometer is placed into a full measuring cylinder of colostrum and the level the colostrum comes up to on the colostrometer's colour coded scale is indicative of the colostrum quality.

### A Colostrometer



# Colostrum

---

Colostrum tested must be at room temperature (22°C). If higher or lower temperature colostrum is used, results can be adjusted using the following temperature correction:

$$\text{Corrected IgG (mg/ml)} = (\text{IgG} - 13.2) + (0.8 \times \text{temp } ^\circ\text{C})$$

Using a colostrometer you can determine if the colostrum is high enough quality to feed to newly born calves. Colostrum that measures in the red zone is not high enough quality, colostrum that measures in the orange zone is average quality and it is best not to feed this colostrum to young calves.

**Note:** Colostrum that tests in the red and orange zone may not be high enough quality to feed to newly born calves in the first few days of life but it is still good to feed to older calves who have lost the ability to absorb immunoglobulins.

For more information on sourcing and using a colostrometer, contact your local NRM Nutrition Specialist.

*\*Note you can also use a Refractometer to test colostrum quality.*



# Optimal calf well-being

---

It is important that calves are raised with high standards of welfare, including caring for their physical and psychological health. Calves should be housed in a comfortable environment and kept injury free as then they not only feel and eat better, they grow faster.

- Always handle calves gently, quietly and calmly as they have soft bones/joints that are easily damaged.
- 

- Always check pens and remove any sharp objects/surfaces, and avoid slippery floor surfaces to prevent injury.
  - Always house in optimal quality shelter to ensure correct temperature - not too hot or cold, and with proper ventilation.
  - Plan ahead, identify and source required equipment, train everyone how to check competently and confidently manage sick calves, or apply any animal health interventions.
- 





# Disease management

The young calf has a very delicate balance between health and disease as their immune system is underdeveloped, relying on passive immunity from colostrum in the first few months.

Disease can come at huge cost and burden to the calf rearer in terms of loss of growth or animal deaths, loss of future production and also in terms of treatment and prevention measures. Attention to detail and monitoring calf health and housing management are the essential tools when trying to prevent disease.

Some calf infectious diseases are transmissible to people, so be sure that you do not get sick too.

## Recommendations include:

- Always practice good personal hygiene by using protective equipment, wear gloves
- Cover and clean any cuts on your skin
- Immediately wash out any urine splashes into your eye with clean running water
- Thoroughly wash your hands before you eat, drink, smoke, or vape.
- Ensure you control rodents and seek medical help early if you feel unwell.

**Prevention is better than the cure in terms of both economics and staff morale.**

## Top tips for preventing disease

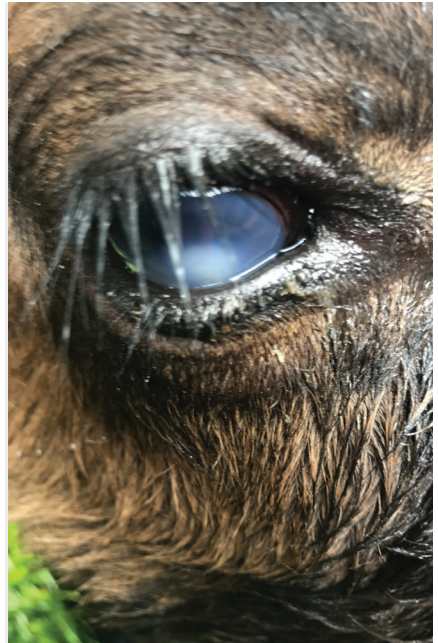
- Ensure that people who are picking up fresh calves from the paddocks are as clean as possible.
- Ensure calves have adequate colostrum intake in the first few hours of life (see colostrum section).
- Feeding a cow pre-calving can have an impact on her calf while in the womb. A cow that is well fed pre-calving is more likely to have a trouble-free birth and produce a calf that is healthier, more lively and set up to do well.
- Ensure calves are fed high quality, clean milk or milk replacer.
- Ensure calves always have access to clean water.
- Ensure calves have all necessary vaccinations.
- Ensure calves have access to a high quality, palatable hard feed, with a coccidiostat included (to prevent coccidiosis).
- Decrease stress inducing factors such as transportation, sudden feed changes, poor ventilation, crowding, temperature fluctuations and draughts. These factors can impact disease resistance because stress disrupts normal gut function and allow harmful bacteria toxins to enter the body, (leaky gut). This is why giving calves a quality electrolyte prior to any known stress event can help prevent a unwanted health issues.

# Disease management

---

- Have a hygienic facility that will minimise exposure to bacteria and viruses. Use a Broad-Spectrum disinfectant such as Virkon™S. A regular routine to clean and disinfect the shed, water troughs, feeders and surfaces.
- Have limited people through the calf shed. Try to keep the same person feeding the calves each day at the same regular time. Have footbaths and a sprayer with Virkon™S available to spray clothing and equipment before and after contact with calves.
- Always wash hands with soap and warm water before and after handling calves, feed and feeding equipment.
- Keep sick calves in a separate pen away from others. Keep hygiene foremost when handling sick calves including dedicated equipment.
- Situate the calf barn away from cows and dairy effluents. Cows can be carriers of disease.
- Keep bedding topped up to prevent odours and dampness that build ups.

Put together a management plan and keep careful watch on all calves, intervening early if calves are not doing well or showing signs of illness. Attention to detail and early observation will reduce the impact of health issues and the chance of spreading infections to other calves. Twice daily observations by the same person (for consistency) is the gold standard.



Eye irritations leading to pinkeye.

# Disease management

## Signs that could indicate a sick calf

- Droopy ears, head down, unresponsive to environmental noise.
- Refusing to drink the milk feed/coming on and off the teat/slow feeding
- Calves that are cold to the touch
- Standing apart from the group
- Abnormal rectal temperature (normal range is 38.5 - 39.4 °C)
- Grunting, whistling or coughing
- Panting, rapid and increased breathing rate.
- Abnormal dung (see scours section)
- Lethargy/weakness
- Sunken eyes/hydration skin test (skin slow to flatten when pinched)
- Reluctance to stand
- Dull, rough, starry coat
- Poor growth
- Nasal discharge
- A run to the eye
- Teeth grinding/salivation
- Kicking tummy/unsettled and getting up and down a lot
- Swelling of the navel and/or joints, walking with a stiff gait

## Signs of a healthy calf

- Bright eyed and alert
- Head up, ears pricked and following noise with ears
- Interactive with environment -visual/sounds
- Breathing quiet and effortless
- Shiny, groomed, and supple hair coat
- Even gait, move freely, playful behaviour.





# Disease management

---

## Scours

---

Scouring (diarrhoea) is the most common health issue seen in calves. There are two types of scours seen in calves — nutritional and infectious.

### Nutritional scours

---

Nutritional scours most commonly occur due to dietary changes that are made too rapidly, environmental stressors and/or feeding set-up issues, for example worn teats or feeding habit, (keep a 'u-shape' in neck'). Nutritional scours are not contagious, but can lead on to more significant health issues as immune function can be compromised during the scour period. However if a nutritional scour is caught early and treated promptly with electrolytes, calves should 'pop back up' quickly with no issues.

#### Prevention:

- Make sure milk powder is mixed to specifications and that warm water used isn't too hot. (Drinking temp should be 38-39°C)
- Calves should be fed at the same time each day, by the same person.
- Feed calves using teats that induce natural suckling behaviour which stimulates oesophageal groove closure directing milk into the right stomach compartment.
- Use new teats each season – worn teats can cause feeding issues. Calves should not be overfed, diet changes should be made slowly and good quality milk or milk replacers should be used.

## Infectious scours

---

Can be caused by bacteria (E.coli and salmonella), protozoa (coccidiosis and cryptosporidium) and viruses (coronavirus and rotavirus). Infectious scours are contagious, with transmission from calf to calf via faeces, urine, saliva and secretions from the eye, mouth and nose. It's best to consult your veterinarian when confronted with infectious scouring to ensure targeted effective treatment.

#### Prevention:

- Ensure good colostrum management so calves have good immunity.
- Maintain strict hygiene procedures — cleaning equipment and pens regularly with an effective disinfectant.
- Keep calves warm and in a draught-free environment.
- Run a hygienic facility with good processes in place/refresh bedding regularly.
- Put new calves into their own pen and don't mix them with older groups if possible.

#### Look out for:

- Loose, watery, bright yellow or green dung with a strong odour. Can be mucousy (however, don't rely on dung appearance alone to identify what the issue may be – take faeces samples if worried.)
- Blood in the dung (indicative of coccidiosis, salmonella, or coronavirus infection).

### Is it a nutritional or infectious scour?

Take the rectal temperature of the animal. If they have a high temperature ( $>39.5^{\circ}\text{C}$ ) it is likely to be an infectious scour. Keep monitoring temperatures, compare the temperature of another pen mate that is not showing any signs of sickness.

**Treatment:** Initial treatment for both types of calves is similar. Calves should be fed a good quality electrolyte, which will provide them with energy and water and replace body salts that have been lost through scouring. Electrolytes alone may not provide scouring calves with adequate energy, so it is recommended that milk is still fed as well as electrolytes where possible. In a severe scour situation milk should still not be withheld for more than a 24 hour period. Contact your veterinarian if chronic scouring persists. Do not mix milk with electrolytes – 2 hours minimum period between milk and electrolytes is recommended.

Calves die from dehydration and a lack of energy when faced with scours – not the scours themselves. A calf can lose 5-10% of their body water from 1 day of scouring. Look out for signs of dehydration by viewing the calf's eyes, gums and skin.

Calf symptoms	% dehydration
Diarrhoea	5%
Eyes slightly sunken, skin losing elasticity, calf staggers but still sucking	7%
Eyes sunken, skin slow to flatten if pinched, gums sticky, calf depressed	9%
Eyes very sunken, skin won't flatten out if pinched, calf cannot stand	12%
At a water loss of more than 14%, a calf will die.	



### Suggested electrolyte therapy regime

	AM	NOON	PM	OVERNIGHT
Moderate scours	Milk 1-2L	Electrolytes 2L	Milk 1-2L	Electrolytes Ad-lib 2-4L
			Total 6-8L	
Severe Scours	Electrolytes 2L	Milk 1-2L	Electrolytes 2L	Electrolytes Ad-lib 4-6L
			Total 8-10L	

# Disease management

## Coccidiosis

Coccidiosis is caused by protozoa that destroy the finger-like villi in the small intestine that absorb nutrients. The worst cases of coccidiosis will have bloody scours but most calves won't have any visible signs and will just have lower growth rates. Ensure calf feeds contain a coccidiostat to aid in the prevention of coccidiosis. In high-risk situations it is a good idea to include a liquid form of coccidiostat the milk, (if one is not already present), to aid in the prevention of coccidiosis until calves start consuming enough hard calf feed.

All NRM feeds contain a coccidiostat, Bovatec<sup>1</sup> or Deccox<sup>2</sup>.

**Note:** Some coccidiostats can be very harmful to horses and dogs, so make sure they cannot get access to medicated milk/meal. After 2022, MPI require all bags of feed or milk powder product containing an ionophore coccidiostat to display a warning icon on their front to minimise feeding to non-target animals, as shown in the example below. Bobby calves intended for slaughter should not be fed a coccidiostat.



The effects of Coccidiosis after weaning.

1. Bovatec®20CC (ACVM Registration Number: A009679)
2. Deccox® (ACVM Registration Number: A011012) are registered pursuant to the ACVM Act, 1997. See [www.foodsafety.govt.nz](http://www.foodsafety.govt.nz) for registration conditions.

## Worms and parasites

Calves are most vulnerable to worm burdens during the first 12-18 months of life and it can have a substantial effect on growth and wellbeing. Signs of gut worms: loss of appetite, watery scours, rapid weight loss, poor growth rate, emaciation or death. Similar signs seen in areas of NZ where liver fluke is a problem. Calves with lungworm may cough, have a runny nose, difficulty breathing, and death. The use of a combination drench is important to deal with worms that burrow into the gut lining.

**Prevention:** Calves should be on fresh, leafy pasture ahead of the herd and shifted frequently to minimise worms.

Drenching for worms should commence around the 8 weeks of age mark, or when calves are routinely out on pasture. Do not add drench to the milk as this can cause toxicity.

Continue drenching monthly. Faecal egg counts are a tool to help diagnose worm burdens. This requires taking dung samples for testing. For more detailed drenching programs its best to talk to your local Technical Field Officer, store or vet.

## Navel infections

Infection of the navel cord often enter within the first 24 hours of birth. Infection spreads from the navel cord to the liver and the joints. Symptoms can include a hot swollen navel with discharge, progressing to painful joints that make it difficult for the calf to walk.

**Treatment:** Take a temperature for signs of an infection. Seek veterinary advice for treatment.

**Prevention:** Navel infections can be prevented by handling calves with care, avoiding trauma and bruising to the navel. Avoid over-crowding and provide soft/clean bedding during transport. Avoid calves lying in wet/muddy conditions. Spray the navel cord with at least 7% tincture iodine before pick up from the paddock, and again in the shed.

## Calf pneumonia

Environmental factors such as low temperatures and high humidity, direct draughts, poor ventilation and a build-up of ammonia gas (poor housing), dusty environments, all can cause pneumonia or respiratory issues. There is acute Pneumonia (sudden in onset) and chronic Pneumonia (more insidious) which can lead onto IBR (Infectious Bovine Rhinotracheitis). Signs include a dull calf, with a dropped head, a rapid respiratory rate, nasal discharge and/or a cough. Most calves that have Pneumonia have a fever (of greater than 39.5°C).

**Treatment:** Take a rectal temperature. A delay in treatment with the right antibiotic can leave permanent damage to the lungs. Treatment of antibiotics may be needed – contact your vet. A calf that is coughing and has a nasal discharge with no temperature can be a sign of poor ventilation and stale air and won't necessarily need antibiotic help.

**Prevention:** Avoid having calves being cold and wet. Provide warm shelter and ensure enough nutrition is being fed to compensate for any energy loss from shivering. Ensure your shed has good ventilation. Ammonia smells at calf height will lead to respiratory issues.



# Disease management

---

## Bloat

---

### **Abomasal bloat (right side distension):**

Symptoms often appear within 1 hour of feeding, with death resulting from heart failure or asphyxiation 6–48 hours later. It is often due to overfeeding or abrupt diet changes, which encourages the growth of harmful bacteria (clostridia), where gas builds up and is unable to escape. This type of bloat cannot be relieved by stomach tubing to release the gas.

### **Ruminal bloat (left side distention):**

Usually caused by delivery of milk into the rumen due to the oesophageal groove not closing, or overfeeding of milk which can be due to incorrect height of feeders, or

worn teats. Normal rumen contractions decrease and belching to remove excess gas becomes impossible. This type of bloat can be relieved by releasing trapped gases via a stomach tube.

## Vaccinations

---

Calves need to be vaccinated against a variety of diseases including leptospirosis – diseases depend on your local conditions.

Vaccination against clostridial diseases is important for calves - 5 in 1 vaccines are available at your local store. For other vaccinations such as Leptospirosis and Salmonella, contact your vet.





# Disease management

Animal signs	Possible cause	What to do
Lame and/or swollen joints.	Navel infection/joint ill, or injury.	Seek veterinary advice. Careful handling when transporting and 7% tincture iodine can help to prevent this.
Coughing or noisy breathing and/or runny eyes.	Respiratory infection or pneumonia.	Increase ventilation, look into your shed health. Make sure bedding is dry. Seek veterinary advice for treatment.
Shivering/shaking	A draughty shed or inadequate shelter from cold and wet conditions. Shaking during/just after a milk feed could indicate that the calf is full.	Improve the shed facilities. Use calf covers. Ensure you are feeding warm milk. Monitor feeding to avoid over feeding/division feeders if possible for the first 2 weeks.
Sunken eyes, dry gums.	Dehydration.	Ensure all calves have access to clean water. Scours could be the issue causing dehydration — feed electrolytes.
Kicking belly/unsettled.	Abdominal discomfort caused by overfeeding or potentially a variety of gastrointestinal issues such as colic, bloat, ulcers, etc.	Check you're not overfeeding the milk feed. If issues continue seek veterinary advice.
Excessive bellowing or unsatisfied calves.	Under-feeding.	Check your feeding rates and mixing rates of calf milk replacer. Check that they haven't eaten all hard feed available and need a top up. Make sure there is clean water available and if in the paddock can they actually reach the water.
Not eating calf meal.	Stale or vermin/pest contaminated feed. Feeding too much milk or too much hay/fibrous feeds on offer.	Replace feed regularly. Get rid of feed that calves have slobbered over. Reduce amount of milk. Make hay harder for the calves to get at.

Animal signs	Possible cause	What to do
Slow milk drinking.	Broken teats. Palatability of stored milk/colostrum. Calf may have been born with poor suckle reflex or calf could have an undiagnosed illness causing reduced appetite.	Change teats for new ones. Put slow drinkers together where possible. Ensure stored milk is still palatable and not rancid. Monitor calf health by taking a temperature, look inside mouth for ulcers on the gums or tongue. Iodine levels in the cow pre-calving can affect the suck reflex.
Closed eye/runny eyes	Bruised from being bumped in transport. Environment with dust or pollens. Pinkeye infection.	Bumps can occur easily during travel, yarding and feeding. A bruised eye can develop into pinkeye (blue looking ulcers to the eyeball) so watch the calf for eye changes. Anything that effects the eye around dust and pollen can lead onto more sinister issues. Monitor the calves daily and seek veterinary advice.
Swellings or lumps - hard or soft - around face along jaw line or cheeks, under skin on body.	Mouth infection/abscess, ball of straw/hay causing mouth tissue damage, bruise from bunting; under skin abscess or localised bruising/bleeding from trauma, dirty needle scratch, vaccination site reaction.	Monitor for signs of infection, difficulty feeding, and treat as directed by vet. If an infection may need medication or lancing of an abscess.
Navel skin and hair area covered with saliva/wet.	Pizzle/ navel sucking by another calf in pen, navel infection, unsatisfied feed intake - fast feeding as milk delivery has been too rapid and suckle reflex hasn't been satisfied, boredom.	Check that teats aren't worn. Teach good habits by offering handful of hard feed after they've suckled.



# Disease management

---

Prior to the arrival of each batch of calves the calf sheds should be thoroughly cleaned and disinfected with a broad spectrum disinfectant. Pens should be frequently disinfected while in use also to prevent build up of disease organisms.

## Virkon™ S

---

### Protect calves against disease

Virkon™ S is the premium broad spectrum, on-farm, biosecurity solution. A highly convenient, fast-acting, one-stop disinfection package for surfaces, equipment, vehicles, aerial disinfection



and water delivery systems. Virkon™S is proven to kill disease agents on-farm, even hardy pathogens such as rotavirus and salmonella in calf shed environments and is fully effective against all 18 families of viruses known to man – in addition to bacteria and fungi. Virkon™S is also proven to kill *M. bovis* and is recommended by MPI.

Calf disease	Disease Type	Virkon™S effective
Rotavirus	virus	✓
Coronavirus	virus	✓
Salmonella	bacteria	✓
E.coli	bacteria	✓
Campylobacter	bacteria	✓
Mycoplasma bovis	bacteria	✓

Virkon™S is so effective and rapid acting (30 second - 2 minute kill time) that it is the disinfectant of choice for controlling exotic disease outbreaks internationally.

Unlike most disinfectants, Virkon™S does not use glutaraldehyde, which is chemically related to formaldehyde and shares the same dangers. Virkon™S can be misted in the presence of animals. Virkon™S is formulated to degrade naturally within the environment.

### Usage information

Treat calf pens and equipment with Virkon™S at the beginning of the season before the calves arrive and continue treating calf pens and equipment regularly throughout the calf rearing season. Treat

pens weekly/bi-weekly (depending on disease challenges). There is no need to rotate with other disinfectants and it works in a range of temperatures and in hard water.

### Calf sheds and pens

Dilution rate 1:100. Remove all moveable equipment and organic matter (mud, refuse etc.) and using either a pressure washer, knapsack sprayer or watering can, disinfect all surfaces (including in the rafters of sheds) with Virkon™S solution. Allow surfaces to dry before replenishing bedding and replacing equipment. Use the same dilution across all temperature ranges for airborne and surface contamination. Effective in cold temperature and through organic challenge.

### Fogging/Misting

Dilution rate 1:200. Spray upwards with a fine nozzle and low pressure in the pens whilst calves are present to help reduce airborne pathogens. Safe to use in the presence of livestock.



# Feeding systems

There are several different early feeding systems used successfully by farmers, twice-a-day versus once-a-day, ad-lib versus restricted. When the performance of different feeds across early feeding systems is studied there is one common conclusion — a quality feed will out-perform an inferior feed in any system.

Calf rearers should feel free to select the feeding system that fits in with the other things happening on their farm. Undeniably, when it comes to the choice of feed to use in your system, invest in quality.

## System comparison

### Twice-a-day feeding system

**Higher milk usage:** 22kg of calf milk replacer

**Lower dry feed usage:** 72kg of meal or more as required to reach growth targets

**Higher labour costs:** Two milk feedings per day

**Lower animal health risk:** More natural, lower stress to calf

**Lower management:** Outside rearing, less intensive farming

### Once-a-day feeding system

**Lower milk usage:** 18kg of calf milk replacer

**Higher dry feed usage:** 76kg of meal, or more as required to reach growth targets

**Lower labour costs:** One milk feeding per day at the same time each day

**Higher animal health risk:** Milk deprivation, increased stress to calf

**Intensive management:** Indoor rearing, intensive farming, increased biosecurity risk, increased need to monitor and manage individuals

age than those from conventional programs. However, if such aggressive post weaning nutrition programs are not adapted, the potential for reduced growth after weaning actually increases with accelerated programs. Accelerated calf feed programs are not a silver bullet, they require excellent management to realise their maximum full benefit.



## Accelerated Calf Programs

Very good management needs to be adopted when taking on any type of calf program. To achieve adequate growth rates, traditional feeding programs use milk replacers containing well balanced nutrients to provide energy and protein for growth but fed in combination with increasing starter intakes as a calf advances in age. Whereas with accelerated calf programs, young calves receive substantially more milk to support improved growth rates and attain faster and more efficient gains by developing new but more intensive

liquid-feeding programs. Using an accelerated calf program followed by ultra intensive feeding and management does result in calves having greater height, lean tissue, and body weights at a younger age than those from conventional programs. However, if such aggressive post weaning nutrition programs are not adapted, the potential for reduced growth after weaning actually increases with accelerated programs.

**Accelerated calf feed programs are not a silver bullet, they require excellent management to realise their maximum full benefit.**





# Milk feeding

---

## Top tips for milk feeding

---

- Ensure calves have received adequate colostrum in the first 4 days of life (see colostrum section).
- Whether you use whole milk or milk prepared from calf milk replacer, calves will grow better when fed milk at a temperature of around 38–39°C. Calves don't thrive as well when fed cold milk, as cold milk requires more energy to digest compared to warm milk.
- Milk should be fed warm but not too hot. At temperatures above 60°C, proteins in the milk may become denatured and vitamins destroyed. Hot milk can cause calf discomfort and could interfere with the curd process.
- Ensure smaller calves get their fair share, watch out for bullying and ideally group slow drinkers together.
- Handle calves quietly and have a consistent routine, so that calves are more relaxed at feeding time.
- Avoid overfeeding as this can cause nutritional scours (see scours section).
- Ensure you have a stable supply of milk or calf milk replacer, so that the diet is consistent. Any changes must be gradual to avoid digestive upset. The gold standard for changing between calf milk supply (e.g. between different milk replacers or from fresh milk to calf milk replacer or vice versa) is to mix the old and the new milk at 50:50 for 3 days before moving fully onto the new feed.
- Compartment feeders are recommended for younger calves to ensure adequate levels of nutrition are being met daily.
- Take care when preparing liquid milk. Ensure milk is mixed to the correct concentration and is mixing evenly. Milk that is too high in concentration may induce nutritional scours and milk that is too weak in concentration may be mistaken as water by the calf and therefore directed to the rumen rather than the abomasum, causing scouring and bloat (see calf milk replacer preparation section).
- Ensure all equipment used for feeding is cleaned regularly. Dirty equipment causes a build up of pathogens which can cause calf health issues.



## Milk options

**Calf milk replacer:** It is essential that milk powder provided to calves is good quality. Milk powders should contain ingredients that have been selected for digestibility, solubility and stability for easy mixing in warm water and optimum digestion by the calf. Most importantly, the milk replacer must be palatable and meet all of the nutritional requirements for a calf.

Calf milk replacers can have benefits over using whole milk from the vat, as they include a range of additives lacking in whole milk, such as a coccidiostat (not in all calf milk replacers), plus vitamins and minerals, which can be present in whole milk at lower concentrations than are recommended for growing calves. They can also be more economical than taking milk from the vat and more consistent in relation to fat and protein content.

**Whole milk:** Whole milk from the vat, waste milk or milk from cows still within the restricted “colostrum period” (sometimes called transition milk), can be fed to calves. This milk is convenient as it is already in liquid form, however it can be more expensive to feed if it is milk that could have been sold, depending on the pay-out relative to the milk replacer price.

When whole milk is fed from the vat, often it is fed with less constraint compared to feeding a calf milk replacer that is mixed up more precisely for the number of calves being reared. Whilst calves may look well when fed on high levels of whole milk, they may struggle when weaned on to grass if they have

been slow eating hard feed (see rumen development section pages 40-41).

Whole milk from modern dairy cows is not always ideal for calves — it typically contains more fat and less essential minerals, trace elements and vitamins than calf milk replacer. Calves fed a high fat diet are more likely to have a high fat body composition – they may reach weight targets but not be ideally set-up for a healthy and productive life. You are looking to grow calves with good muscle and skeletal development, not over fat calves, so its important to have the right balance of energy and protein in the diet.

Milk that is not fit for sale may contain antibiotics, which may affect the development of natural gut microflora. Raw milk could also carry *Mycoplasma bovis* and Johnes Disease. Internationally many dairy farmers pasteurise their own waste milk before feeding to calves, as they are worried about the possible transmission of diseases to the next generation of cows.



# Fortifying cow's milk

---

## Using calf milk replacer

---

Calf milk powders can be used to fortify whole cow's milk, which can be an effective way to increase the protein content of whole milk, reduce the fat content and add in vitamins and minerals that are often lacking in whole milk.

Whole milk is the equivalent to 125 grams of calf milk replacer powder per litre. This is important to keep in mind when adding calf milk replacer to whole milk, to ensure that you get the correct total amount of energy into calves.



## Tip when using whey powder

---

When fortifying with a whey based calf milk replacer, do not add more than 250 grams of the whey powder to 4 litres of milk, as this can interfere with curdling in the abomasum.

## How do I mix in the calf milk replacer powder?

---

There are three options when mixing calf milk replacer in with whole milk:

1. Mix calf milk replacer at the usual rate of 125g/L with water (or at the rate specified on the bag), then add to the cow's milk.
2. Mix the powder with a small amount of hot water before adding to the cow's milk.
3. Introduce the powder directly into the cow's milk and mix it well (watch out for blocked teats if doing it this way).

Options two and three can work well, as the resultant reduced volume of milk (due to the reduced amount of water added to the whole milk during the mixing process) will encourage the intake of hard feed and enhance rumen development.

# Preparing milk powder

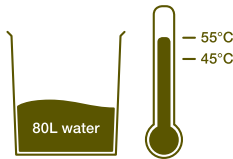
## Mixing

Work out how much calf milk replacer (CMR) powder you require to make up the litres of rehydrated CMR you need. For example, with a CMR that recommends a feeding rate of 125g/L, in order to make up 160L of rehydrated CMR you would need 20kg of CMR powder.

**Amount of CMR powder required per feed (kg) = Number of calves x total litres of CMR per calf per feed x the recommended feeding rate of the CMR (g/L)/1000**

The concentration of the rehydrated CMR is important, so make sure you read recommended feeding rates of products and calculate the amount you require per feed carefully. Add the required amount of powder to half the required volume of hot water, but not boiling (45°C - 55°C) and mix vigorously using a whisk or a paint mixer until smooth (about 1 minute). Top up to the required volume of water using cool water so that the CMR is fed at 38°C - 39°C. Check the temperature before feeding.

## An example of mixing up 160L of a 125g/L calf milk replacer



### Water

Water temperature to dissolve CMR should be between 45°C - 55°C



Add 20kg CMR powder

### Concentration (dosage CMR powder)

Too much CMR powder:

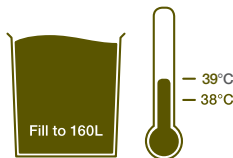
Too many nutrients = feeding diarrhoea (nutritional scours)

### Perfect concentration:

**20kg CMR powder = 160L finished CMR**

Too little CMR powder:

CMR in rumen instead of abomasum = bloat



Fill up to 160L

Calf drinking temperature should be between 38°C - 39°C

**Make sure you calibrate and check all measuring equipment regularly to retain accuracy. Also maintain strict hygiene practices and make sure any equipment used is cleaned between feeds.**



# Preparing milk powder

## How much should I be using?

A quick guide to how much milk replacer you should be going through in different calf rearing systems.

Number of calves	Fortifying whole milk			Typically (4L/calf/day)			Accelerated (high growth rate)		
	1	10	100	1	10	100	1	10	100
g powder/calf/day	250	250	250	600	600	600	900	900	900
kg powder/day	0.25	2.5	25	0.6	6	60	0.9	9	90
kg powder/week	1.75	17.5	175	4.2	42	420	6.3	63	630
kg powder/4 weeks	7	70	700	16.8	168	1680	25.2	252	2520
kg powder/8 weeks	14	140	1400	33.6	336	3360	50.4	504	5040
Bags required/8 weeks	0.7	7	70	1.6	16	160	2.52	25.2	252



# Nutrition and rumen development

---

The main goal of the calf rearing process is to develop the rumen of the calf in a short amount of time, so that when weaned it can get nutrients from eating high fibre feeds such as grass.

When a calf is born it is classed as a pre-ruminant. The rumen is small (30% of the digestive tract) with the main stomach compartment being the abomasum. By weaning time, the rumen needs to develop from 30% to 70% of the digestive tract and be fully geared up for digesting grass.

In the mature cow, a large percentage of carbohydrates and proteins in pasture and supplements are digested by microbes in the rumen to produce volatile fatty acids (energy) and protein for use in maintenance, milk production or pregnancy. Calves are born with an undeveloped rumen and large abomasum. The large abomasum is important for digesting and obtaining nutrients from milk or milk replacer. It is essential that the rumen develops to become the main stomach where digestion takes place for a weaned calf.

Feeding a high starch calf feed from day 1 of life helps to get the rumen working, which in turn stimulates its growth and development. The rumen is a muscular organ and it will not start to grow in a calf until it is being used

Profitable and successful calf rearing relies on weaning the calf at the youngest possible age without hampering growth rates. This means the calf must be provided with the proper ingredients for rumen development, so it can utilise grass at weaning.

## The following are needed for rapid rumen development:

- **A high quality calf feed that contains high levels of starch:** Dry calf feed does not stimulate the closure of the oesophageal groove, so the feed is deposited in the rumen where it stimulates development. Starch promotes the growth of the population of microbes in the rumen and the development of rumen papillae, which are finger-like projections that absorb nutrients. The longer and denser the rumen papillae, the more energy the calf will get from grass and pellets at weaning.
- **Hay or straw for effective fibre:** Hay/straw promotes the development of the muscles that surround the rumen. This is important for encouraging rumen motility, feed movement around the rumen for digestion. A small amount of effective fibre is required for rumen development and rumination stimulation, however a large amount of hay/straw can result in depressed hard feed intake and a large rumen size but with little papillae development. For this reason make sure hay/straw is available to animals but don't offer too much and make sure it isn't too easy for them to over consume it (i.e. use hay bags or netting so they can pull little bits out at a time)
- **Clean water:** The microbes in the rumen require water to survive. Milk or milk replacer is not free water as it bypasses the rumen via the oesophageal groove. Water also helps to stimulate the intake of hard calf feed.

# Nutrition and rumen development

The water should be clean and fresh to reduce the risk of pathogens and disease. Water should be easily reached at calf height and make sure water availability matches calf requirements.

## Weaning off milk

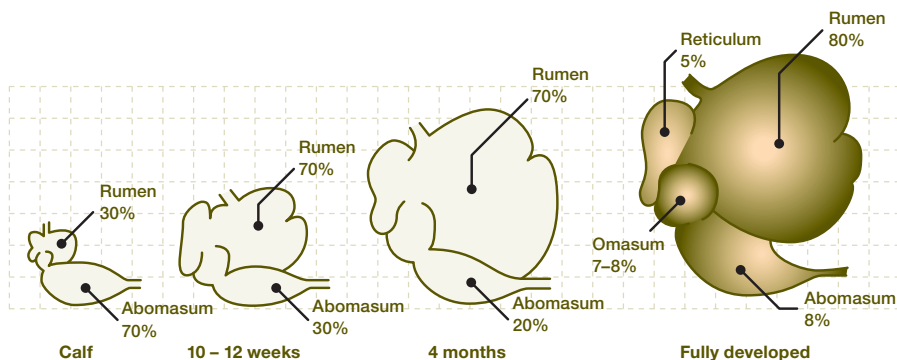
Use at least two parameters together when making weaning decisions for improved success and less of a post-weaning growth check. Wean calves from milk only when they are eating a minimum of 1 - 1.5kg of high quality pellets per day for a minimum of 3 consecutive days. Wean by weight rather than age.

Using scales or wither measuring sticks can be useful to ensure calves are ready for weaning. Be prepared to hold calves back if they are not meeting weaning weight targets. Although leafy young grass appears to contain sufficient crude protein, it lacks the by-pass protein required by calves lacking a

fully functioning rumen. Also, fresh grass is low in dry matter, which can limit dry matter intake due to the size of the developing rumen. Managing calf paddocks can be difficult. Avoid grazing very young leafy grass, which may contain excessive degradable protein for the newly functioning rumen to cope with. Offer straw at grass and continue feeding pellets to ensure a smooth transition to pasture and maintain target growth rates. Continuing to feed pellets at grass is particularly important for later born calves that need more feeding to catch up with early born calves but in reality get less because they are sent away to graze alone when younger.

Continue to feed calf pellets at grass until calves are 100 - 120kg, this helps to maintain growth rates and protects calves against coccidiosis, which can often appear post-weaning. Feeding pellets beyond the 120kg stage can also be beneficial particularly if environmental conditions and/or pasture quality is poor.

## Rumen development stages



# Monitoring growth around weaning

If a calf's rumen has been well developed and they have had adequate hard feed intake, a post-weaning check will be less pronounced as the calf will have an increased ability to digest grass.

The post-weaning growth check found in many calves is due to three factors:

- Low intakes of dry feed up until weaning will result in limited rumen development. This will result in a significant growth check while the rumen becomes accustomed to digesting significant quantities of dry feeds.
- High intakes of bulky roughage such as hay pre-weaning. Calves are physically unable to eat enough roughage to sustain rapid growth weights with a small developing rumen.
- Calves stress when feeds are changed. Continuing to feed familiar hard feed post-weaning will minimise problems.

calf as they go through the weaning process and will ensure they still consume adequate energy and protein. Some calf rearers choose to continue to offer hard feed past the weaning period. The extra energy and added bypass protein helps to support calf growth.

- Do not wean calves during periods of additional stress, e.g. bacterial infection, dehorning, exceptionally hot or cold weather.
- Wean via a graduated method where calves are gradually offered lower amounts of milk, this is the preferred method. Abrupt weaning can be a challenge for calves and create unnecessary stress.
- Keep an eye on calves, monitoring their weight. Continue to offer hard feed for at least a month post weaning and longer if pasture quality or quantity, is not good enough to support optimum growth target rates. Daily visual checks need to continue particularly around time of stress e.g. hot, cold or bad weather.

## Top tips for minimising the post-weaning growth check

- Ensure calves are eating a minimum of 1 - 1.5kg (depending on the calf breed) of hard feed for at least 3 consecutive days before they are weaned. This will ensure their rumen is developed enough to handle the change to fermenting larger quantities of grass.
- Continue to feed hard feed in the paddock – this will help to support the

## Continuing growth post-weaning to mating

Calves that have been grown well up to weaning can slip behind growth targets during their first summer, autumn and winter if pasture supply is limited or pasture quality declines. Falling behind on growth targets can have an impact on the fertility of a calf when it comes to their first mating, as one of the main triggers of puberty is body weight rather than the age of an animal.



# Monitoring growth around weaning

---

If a calf does manage to get pregnant but is still struggling to reach growth targets, this can have a significant impact on the production in their first lactation as they will still have growth to catch up on post-calving and milk production will be sacrificed in order for the animal to continue growing.

Well grown animals with good muscle and skeletal growth will also be able to compete with older animals in the herd, whereas smaller, under-grown heifers may be bullied and miss out on their fair share of feed.



Summer can be a period of pasture deficit, as dry periods or excessive heat can limit pasture growth and encourage reproductive growth and reduced feed quality. Autumn can be a period of higher pasture growth but the pasture can often be lacking in sugar due to decreased sunlight, which can slow down rumen fermentation. Winter can be a tough time for calves, particularly if weather conditions are poor. In all of these situations calves may be struggling to meet growth targets, going through periods of below target growth rates or even weight loss followed by periods of catch-up growth if pasture quality allows. This is an inefficient way to grow a calf and it is better to grow them consistently and to support lean muscle and frame growth and avoid fat deposition.

One way to ensure you continue to meet growth targets regardless of pasture quality or quantity and weather events, is to offer calves hard feed post-weaning through to mating when necessary — particularly if you notice that the calves are not putting on the weight that they need to. Feeding a pelleted feed during periods of poor pasture growth or quality will ensure that calves still reach growth targets and are well set up for a productive life. If calves cannot be weighed, height can be correlated to liveweight and provide a useful indication of how calves are doing.

# Hard feeds

---

In order to get good hard feed intakes it is important to offer fresh, palatable feed in a way that is easy for calves to access.

## What to look for in a hard calf feed

---

It is important to provide calves with good quality calf feeds that are highly digestible, contain balanced levels of energy, protein, minerals and vitamins, promote rumen development and calf growth and that help to protect against coccidiosis.

**Quality ingredients:** It is important that hard calf feeds contain quality ingredients that are highly digestible to calves and have a good level of energy, coming mainly from starch. Take care when comparing different brands of calf feed, that the products are of similar digestibility and have a good level of starch and contain the same level of nutrients. A calf feed may appear cheaper but because the digestibility is lower, the calves get less out of the feed and more is required to get the calf to weaning weight. This means the cheaper feed is less economic in the long run. Fat can be added to boost the low energy content of some by-products but too much fat is detrimental to rumen development and dry matter intake.

**Coccidiostat:** A coccidiostat in calf feed is essential to help protect calves against coccidiosis (see coccidiosis page 24).

**Vitamins and minerals:** Look for a calf feed that contains a wide range of vitamins, minerals and trace elements. Vitamins A, D and E as well as B group vitamins, are important to include in a calf feed and they help to support calves on whole milk where levels of these vitamins have been shown to be low. Also ensure a calf feed contains trace minerals such as cobalt, copper, selenium, iodine, manganese, iron and zinc, which are all essential for calf growth and health.

Premium calf feeds may contain organic trace minerals, which combine an essential trace mineral with a fragment of protein. They are considered more available to the animal because they are less likely to react with other minerals but are also safer to the animal.

**Good pellet quality:** Calf feed usually comes in a pelleted form (excluding start mixes). Pelleting of feed helps to increase utilisation by reducing dust and wastage. Dusty feeds can irritate the lungs of calves and cause pneumonia, which increases the cost of medications and reduces growth rates. Ensure pelleted feed is high quality with minimal dust.

## Hard feed quality checklist

---

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Tastes good          | <input checked="" type="checkbox"/> High quality ingredients |
| <input checked="" type="checkbox"/> Smells good          | <input checked="" type="checkbox"/> Firm pellet/nut          |
| <input checked="" type="checkbox"/> Balanced ingredients | <input checked="" type="checkbox"/> Coccidiostat             |

# Hard feeds

---

## Top tips for feeding hard feed to calves

---

- Offer hard feed ad-lib from day dot. Calves may not eat much in the first few days but it will get them used to it and feed intakes will build with age. For the first 3 weeks it's all about forming habits in calves, so intakes won't be huge, but it's a training period to get them used to eating a hard feed.
- Always make sure fresh feed is put out for calves daily and that any older uneaten feed is removed. Uneaten feed left for too long can go mouldy and attract vermin. Calves will not eat feed that is stale, mouldy or contaminated by vermin. This is even more important when calves are first getting onto hard feed. For this reason, in the pens of young calves, put a small amount in the trough daily to begin with and increase from there.
- Clean troughs very thoroughly regularly, wet compacted feed provides a favourable environment for mould growth and can put calves off feed.
- Avoid dusty feeds — calves don't like eating dusty feeds.
- Introduce calves to hard feed by feeding some by hand each day after their milk feed in the first few weeks of life. This will get them used to the flavour and texture and will also help to prevent cross sucking.
- Ensure fresh water is always available to calves — a lack of water will inhibit dry feed intake and rumen development.
- Ensure unopened bags of feed are stored away from direct sunlight and away from possible vermin contamination in order to keep it as fresh as possible. Take the shrink wrap off pallets of calf feed as soon as it arrives.
- When feeding higher volumes of milk on a twice a day system calves will feel fuller for longer, this decreases hard feed uptake and slows rumen development. Alternatively, to decrease milk volume fed, look at using fortified or accelerated milk feeding programs.
- Ensure you are not overfeeding milk as this can fill up calves and decrease their hunger for hard feed. About 4 litres of milk a day is a good rule of thumb for calves.
- Ensure you are not overfeeding long fibre by restricting hay or straw through using feeders.



## **NRM calf feeds are made in FeedSafeNZ accredited mills.**

FeedSafeNZ tests the ingredients and processes used by feed manufacturers. It includes an on-site audit of ingredients plant, storage and operations. FeedSafeNZ audits are carried out annually by AsureQuality, a company that provides food safety and bio-security services worldwide.

Only FeedSafeNZ accredited manufacturers may use the FeedSafeNZ logo on their packaging.

The FeedSafeNZ mark assures farmers and animal owners that the feed they buy is made to the highest possible standard.



For more details on the specs of products, check out the NRM website.  
[www.nrm.co.nz](http://www.nrm.co.nz)





# NRM Moozlee®

NRM Moozlee® is a high quality, nutritious and easily digestible muesli-style calf starter feed formulated to allow young calves to achieve their full potential. Containing a mix of fibre, highly digestible grains, molasses and pellets, NRM Moozlee® is a palatable feed that enables early rumen development in the young calf. NRM Moozlee® contains Bovatec® to aid in the prevention of coccidiosis and added flavours to help encourage early intake and minimise developmental checks.

## Feeding recommendation

Feed along with whole milk or a high-quality calf milk replacer. NRM Moozlee® should be introduced gradually ad lib in the first week of life to help form habits early. Wean off milk gradually at a minimum 6 weeks of age and 65-80kg when consuming between 1 to 1.5kg NRM calf feed depending on the calf size and breed. Continue to feed NRM calf feed at 1-1.5kg/head/day for 1-2 months after weaning. If fed in troughs, clean these out frequently. Always ensure access to clean reachable drinking water and good quality forage.

## Ingredients

Grain and grain by-products, oilseed meals and by-products, lucerne chaff, molasses, minerals (including limestone, dicalcium phosphate, salt), vegetable oils, organic acids, essential oils, vitamins and trace minerals, flavour, Bovatec® 20CC.



PREMIUM FEED



BALANCED



PKE FREE

Contains added copper and selenium. Do not use at the same time as other selenised fertiliser, prill or product without consulting with a nutritionist or veterinarian.

## Typical analysis

Protein 18%

Moisture 15%

Fat 3%

(Approximate on a dry matter basis)

1. Bovatec® 20CC is registered pursuant to the ACVM Act, 1997. ACVM Registration Number A9679. See [www.foodsafety.govt.nz](http://www.foodsafety.govt.nz) for registration conditions.

# NRM GrowUp® 20%

NRM GrowUp® 20% is a premium quality, high protein, balanced supplementary feed for calves designed to provide the energy and protein required to support calf and rumen development. NRM GrowUp® 20% contains Bovatec® to aid in the prevention of coccidiosis and added flavours to help encourage early intake and minimise developmental checks.

## Feeding recommendation

Feed along with whole milk or a high-quality calf milk replacer. NRM GrowUp® 20% should be introduced gradually in the first week of life to help form habits early. Wean off milk gradually at a minimum 6 weeks of age and 65-80kg when consuming between 1 to 1.5kg NRM calf feed depending on the calf size and breed. Continue to feed NRM calf feed at 1-1.5kg/head/day for 1-2 months after weaning from milk.

NRM GrowUp® 20% should be offered fresh each day. If fed in troughs, clean these out frequently.

Ensure access to clean reachable drinking water and good quality forage.

## Ingredients

Grain and grain by-products, oilseed meals and by-products, molasses, minerals (including limestone, dicalcium phosphate, salt), vegetable oil, essential oils, organic acids, vitamins and trace minerals, flavour, Bovatec® 20CC.

Contains added copper and selenium.  
Do not use at the same time as other selenised fertiliser, prill or product without consulting with a nutritionist or veterinarian.



PREMIUM FEED



BALANCED



PKE FREE

Does not contain PKE.

## Typical analysis

Protein 20%

Moisture 13%

Fat <3%

(Approximate on a dry matter basis)

1. Bovatec® 20CC is registered pursuant to the ACVM Act, 1997. ACVM Registration Number A9679. See [www.foodsafety.govt.nz](http://www.foodsafety.govt.nz) for registration conditions.

# NRM GrowUp® 16%

NRM GrowUp® 16% is a premium calf feed formulated to provide the protein and energy required to support ongoing development in calves over 80kg liveweight and complement protein pasture available for weaned spring born calves. Together with quality pasture, NRM GrowUp® 16% supports continued rumen development in calves, aiding transitioning on to an all pasture diet. Also can be used when performance targets have not been achieved or are under threat.

## Feeding recommendation

Feed 1 to 1.5kg per calf per day between 80 and 120kg liveweight, depending on desired performance, forage quality and availability. For best results, feed unweaned calves on NRM Moozlee® or GrowUp® 20%, transitioning to GrowUp® 16% after weaning off milk, depending on available pasture quality. Wean off milk gradually at a minimum 6 weeks of age and 65-80kg when consuming between 1 to 1.5kg NRM calf feed depending on the calf size and breed. Continue NRM calf feed at 1-1.5kg/head/day for 1-2 months after weaning. Daily offer fresh NRM GrowUp® 16%. Clean out frequently any feed troughs used. Always ensure access to clean reachable drinking water and good quality forage.

## Ingredients

Grain and grain by-products, oilseed meals and by-products, molasses, minerals (including limestone, dicalcium phosphate, salt), vegetable oils, organic acids, vitamins and trace minerals, flavour, Bovatec® 20CC.



PREMIUM FEED



BALANCED



PKE FREE

Contains added copper and selenium. Do not use at the same time as other selenised fertiliser, prill or product without consulting with a nutritionist or veterinarian.

Does not contain PKE.

## Typical analysis

Protein 16%

Moisture 13%

Fat <3%

(Approximate on a dry matter basis)

1. Bovatec® 20CC is registered pursuant to the ACVM Act, 1997. ACVM Registration Number A9679. See [www.foodsafety.govt.nz](http://www.foodsafety.govt.nz) for registration conditions.

# NRM Sweet 16 Pellets

NRM Sweet 16 is an all purpose grower feed, suitable for beef calves and dairy heifer replacements. For calves weaned to pasture after 5-6 weeks on traditional and early wean systems or for finishing stock when pasture is limited.

NRM Sweet 16 contains Bovatec® to aid in the prevention of coccidiosis and added flavours to help encourage early intake and minimise developmental checks.

## Feeding recommendation

Feed up to 1.5kg per calf per day from weaning. Any changes to calves diets should be done gradually.

NRM Sweet 16 is not a complete feed. Always ensure adequate pasture or other roughage is available. Ensure calves have access to clean, fresh water at all times.

## Ingredients

Grain and grain by-products, various plant proteins, molasses, non-protein nitrogen, minerals, vegetable oils, organic acids, vitamins and trace minerals, Bovatec®20CC.

NRM Sweet 16 may contain up to 15% by weight of PKE. Contains added copper and selenium.

Do not use at the same time as other selenised fertiliser, prill or product without consulting with a nutritionist or veterinarian. time as other selenised fertiliser, prill or product without consulting with a nutritionist or veterinarian.



## Typical analysis

Crude Protein	16%
Moisture	13%
Fat	3%

(Approximate a dry matter basis)

1. Bovatec® 20CC is registered pursuant to the ACVM Act, 1997. ACVM Registration Number A9679. See [www.foodsafety.govt.nz](http://www.foodsafety.govt.nz) for registration conditions.

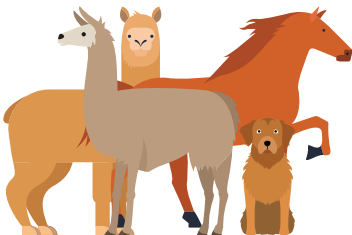


# Calf rearing shopping list

---

- ☐ Good quality NRM hard feed
- ☐ Disinfectants, e.g. Virkon™S
- ☐ Adequate meal troughs and water troughs
- ☐ Hay racks
- ☐ Rodent and bird control
- ☐ Thermometer (rectal and one for calf milk)
- ☐ ID neck ties
- ☐ Colostrometer
- ☐ Replacement teats
- ☐ Calf feeders, e.g. Stallion or Milk Bar
- ☐ Milk mixing equipment and utensils
- ☐ Measuring stick/girth tape/scales
- ☐ Coccidiostat for milk if using whole milk
- ☐ Colostrum/milk tubing equipment
- ☐ Milk warmer if using whole milk
- ☐ Electrolytes
- ☐ Iodine spray/dipping cup (At least 7% tincture iodine/spray bottles/dipping cup)
- ☐ Spray marker
- ☐ Disposable gloves
- ☐ Calf covers
- ☐ Ear tagger and tags
- ☐ Metabolics for the cows
- ☐ Notebook
- ☐ Wall chart
- ☐ Vet supplies, e.g. antibiotics, anti-inflammatories
- ☐ Bedding
- ☐ Sprayer
- ☐ 5 in 1 vaccinations, eg Multine
- ☐ Combination worm drench and faecal egg testing kits, e.g. FECPAK<sup>G2</sup> kits.
- ☐ NRM Calf Rearing Guide

## Notes



Remember that calf feed containing a coccidiostat, while great for your calves, is very dangerous for your dogs, horses, alpaca and llama. Make sure you keep these animals away from calf feed and if accidental ingestion occurs, contact your vet.



Nobody is closer to your animals than you – and nobody understands their unique nutrition needs more than our qualified NRM nutritionists. It's their expertise that make our range of feeds some of the most scientifically advanced in the market. Plus having nationwide access to their in-depth knowledge will support your understanding of animal nutrition to improve the productivity and profitability of your farming operation.

**If you have any queries, please contact us.**

**0800 800 380**  
**nrm.co.nz**

