

Disease prevention in calves

This chapter describes the clinical symptoms of the major calf diseases and the first aid and nursing during the calf's sickness and convalescence.

The main points in this chapter

- There will invariably be some calves born dead or will die pre-weaning. In developed temperate dairy systems, excluding abortions, 7–9% of calves are expected to die between birth and 3 months of age, although when well managed, the norm is 2–4%. However, a range of 15–25% pre-weaning mortality would be typical on many tropical dairy farms.
- The best way to maintain calf health is to ensure an adequate intake of colostrum immunoglobulins within the first few hours of life. Prevention through adequate colostrum intake is far more effective than cure by drugs.
- The two major diseases of calves are scours and pneumonia, which account for 80% of all calf deaths. Bloat, navel-ill, accidents and poisoning make up the bulk of remaining mortalities.
- The cause of scours in calves under 21 days of age is difficult to determine. There is usually not one single cause, but an interaction between calf management, diet, the environment, poor immunity, and the presence of pathogenic viruses and bacteria.
- Most of the scours can be controlled through good management and appropriate preventative measures.
- Pneumonia is a problem with housed calves, particularly when stocking density is high and ventilation is poor. Control is mainly through improved housing.
- Clostridial diseases, such as pulpy kidney, can be easily prevented through a routine vaccination program.
- Internal parasites are less of a problem with housed than grazed calves.
- Sick calves can be most easily recognised through changes in behaviour. They are more likely to be culled for poor performance later in life. Keeping records will assist with decision making on their future.
- In the event of a veterinary visit, there is much the dairy farmer can do to prepare for it and to care for the convalescing calf.
- Because calves are the class of dairy stock most susceptible to diseases, every effort should be made to maintain a healthy shed environment. Developing an effective biosecurity program, which restricts high-risk visitors, is an integral part of good calf management.

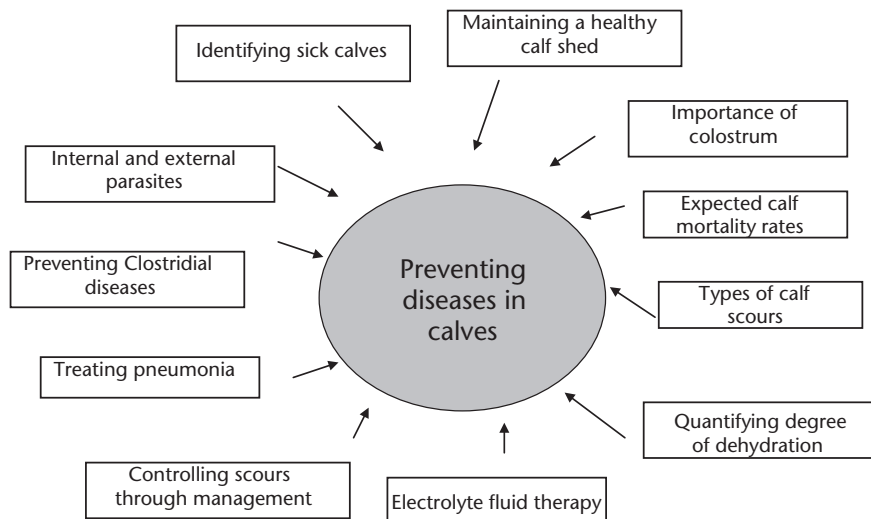


Figure 11.1 Some of the key factors to consider to control and prevent calf diseases

This chapter concentrates on the clinical signs of the major calf diseases and on first aid and nursing during sickness and convalescence; many of these are summarised in Figure 11.1. This chapter does not present a comprehensive catalogue of calf diseases, nor does it follow the pursuit of a diagnosis through post-mortem examination, microbiology and clinical pathology.

There will invariably be calves that are either born dead or die pre-weaning. What constitutes an acceptable death rate? Roy (1990) considers that under good management in temperate, developed dairy industries, expected mortality rates are:

- abortions (stillbirths <270 day gestation): 2–2.5%
- peri-natal (stillbirths >270 day and during first 24 hr of life): 3.5–5%
- neonatal (between 24 hr and 28 days of life): 3%
- older (29–84 days) 1% or (84–182 days): 1%.

So excluding abortions, 7–9% of calves often die between birth and 3 months of age. This seems to be the reported rate in the US, whereas in Australia it is generally lower, say at 2–4%. As discussed in Chapter 6, a range of 15–25% pre-weaning mortality would be typical on many tropical dairy farms.

The basic principles for good calf health are:

- Minimise exposure to disease pathogens.
- Delay any exposure until calves can develop their own immunity.
- Maximise acquired immunity through colostrum and vaccinations.
- Keep calves sheltered, dry and free from stress.

The best way to maintain calf health is to ensure an adequate intake of colostral antibodies within the first few hours of life. Good farm management should ensure this occurs (see Chapter 5). This is obviously difficult if relying on calf purchases to supply

animals for rearing. If calves have to be bought, it is preferable to buy them directly from the property of origin because this reduces their likelihood of picking up diseases in transit and the duration of stress and starvation. Prevention by adequate colostrum intake is far more effective than cure by drugs.

Rearing calves inside sheds at high stocking densities can provide an ideal environment for calf diseases to proliferate, although many still occur in calves reared at pasture. Prevention of future outbreaks through cleaning and disinfection is also more difficult when calves are reared in permanent fixtures. However, a warm, dry and well-managed calf shed usually offers better protection against diseases in young calves, particularly during cool weather, than any cold, windy and muddy calf paddock. Well-ventilated sheds with auxiliary cooling (using fans and sprinklers) provide better climate control in hot weather than exposed paddocks.

There are two major disease problems in calves in Asia: namely scours and pneumonia. These two would account for more than 80% of all calf deaths, with scouring being the most common. Bloat, navel-ill, accidents and poisoning would make up the bulk of the remaining mortalities.

11.1 Calf scours or neonatal diarrhoea

Normal faeces has one colour and consistency when the calf defecates. In milk-fed calves, it usually is dark yellow in colour, but a lot of variation from this is normal. When exposed to air, the faeces becomes darker and more solid. In calves eating some concentrates, normal faeces will be browner and slightly more solid. Changes in colour and/or consistency can indicate scours. However, the colour and odour of the faeces cannot positively identify the invading organisms causing scours.

The causes of scours in calves under 21 days of age are difficult to determine. There is usually not one single cause but an interaction between calf management, diet, the environment, poor immunity, and pathogenic viruses and bacteria.

11.1.1 Types of scours

Dietary scours

This mainly results from overfeeding (especially with cold milk) or incorrect milk replacer concentrations. Sudden changes in feed type – particularly changing from whole milk to milk replacer, or use of poor-quality milk replacers – can also lead to dietary scours. Affected calves get severe diarrhoea but otherwise appear normal. However, they can more easily develop infectious scours. The best control measure for dietary scours is changing from milk to electrolytes for at least 24 hr. Some farmers and experts recommend taking calves off milk only as a last resort and then only after they are certain that an infective agent is the major cause of scours.

White scours

This generally occurs in the first few days and is usually caused by pathogenic strains of bacteria known as *Escherichia coli* (or *E. coli*), which invade the gut wall. Foul-smelling, grey to creamy-white, severe diarrhoea is seen. Calves quickly become dehydrated and

lethargic, will not eat, are ‘tucked up’ in the abdomen and may die suddenly. In chronic cases that linger on, infection of the lungs (pneumonia) or joints (arthritis) can occur. On post mortem, a calf that died from *E. coli* scours will often show no visible signs of having an infection. Stress factors, such as cold or partial starvation (due to irregular feeding intervals as occurs when calves are purchased through saleyards), can increase the occurrence and severity of white scours.

Viral and protozoal scours

These are generally caused by rotavirus or coronavirus (viral) or *Cryptosporidia* (protozoal) and constitute most of the scours in calves less than 3 weeks old. Antibiotics do not kill viruses or protozoa and so are not effective in treating these scours. Furthermore, their overuse in treating scours will increase the risk of antibacterial residues in slaughtered bobby calves.

Salmonella scours

This occurs more commonly in older calves causing bloody, putrid diarrhoea containing mucus. They develop fever, are weak and rapidly become dehydrated and emaciated. They have a high death rate. Less severely affected calves can have rough coats, pot bellies and become stunted; they can also become carriers of *Salmonella* and continually infect other animals. Extra personal hygiene is needed when treating *Salmonella* because the bacteria can be passed onto humans.

Worm scours

These are caused by internal parasites eaten by grazing calves. These would not occur in housed systems unless purchased calves are older and have previously run at pasture. See Section 11.4 on internal parasite control.

Coccidiosis or blood scours

This is caused by protozoa infecting the calf from 3 weeks of age and onwards and can easily be confused with white scours. Affected calves show blood-stained scouring with a lot of mucus and may eventually develop anaemia. Coccidiosis is a stress-related disease and usually affects calves that are reared in wet, crowded and unhygienic conditions.

Scours accounts for 75% of all deaths under three weeks of age. The most important pathogens associated with infectious scours at different ages are:

- *E. coli*: 3–5 days
- rotavirus: 7–10 days
- coronavirus: 7–15 days
- *Cryptosporidia*: 15–35 days
- *Salmonella*: several weeks
- *Coccidia*: older than 3 weeks.

11.1.2 Treating scours

Scouring calves can lose up to 20 times more fluid than healthy animals and they will become dehydrated because they are losing considerably more liquid than they can

Table 11.1. Measures of dehydration in scouring calves

Percentage dehydration	Sunken eyes*	Skin fold test (seconds)	Clinical symptoms
4–6	–	1–2	Mild depression, decreased urine output
6–8	+	2–4	Dry mouth and nose, tight skin, still standing
8–10	++	6–10	Cold ears, unable to stand
10–12	+++	20–45	Near death

* The more +s, the more sunken the eyes.

drink. This lost fluid also contains mineral salts and other nutrients. The degree of dehydration can be assessed using the skin fold (pinch) test. Pinch the skin and note how long it takes to return to normal: in healthy calves this is less than half a second. Another indicator is the degree of sunkeness of the eyes. Table 11.1 provides some visual indicators of the degree of dehydration.

Very dehydrated calves (10–15%) will require intravenous therapy. Calves with less than 8% dehydration and still drinking can be rehydrated orally by electrolyte solutions. Oral fluid therapy is the term used for treating scours with soluble sources of energy and electrolytes by mouth. These supply an energy supplement and replace lost vital minerals and fluids in scouring calves.

The amount of fluid required for daily maintenance requirements and to replace lost fluids can be calculated, based on live weight and the degree of dehydration. For a 40 kg calf with 6% dehydration:

- replacement: $40 \text{ kg} \times 6\%$ or 2.4 L of fluid
- maintenance: 100 mL/kg/day, or $40 \text{ kg} \times 100 \text{ mL}$ or 4.0 L of fluid
- total: $2.4 + 4.0$ or 6.4 L of fluid. Feed this quantity in three feeds per day, and check the degree of rehydration using the skin fold test.

Up to 70% of calves will recover with adequate fluid therapy. Electrolyte treatments do not provide sufficient energy to maintain the animal. After 24 hr, reintroduce milk (if it has been withdrawn), but continue electrolytes for a further 48 hr. Separate milk feeding from electrolyte feeding by 6 hr. Rennet (junket) tablets added to the first two milk feeds will help clot the milk hence assist with its digestion.

The electrolyte solution should be offered to calves in the same manner as their milk (bucket or teat), but, if they do not drink it this way, it can be administered using a drench gun or a stomach tube. It is preferable to ask the veterinarian to give intravenous fluids to very sick and dehydrated calves because force feeding often results in pneumonia because such weak calves cannot swallow properly.

Prolonged use of antibiotics can lead to additional scouring because normal bacteria have been killed. This is known as medicine disease. Dosing the calf with plain non-pasteurised yoghurt helps re-establish the abomasal bacteria (*Lactobacillus*) used in milk digestion.

Veterinary advice should be sought to obtain an accurate diagnosis and the most appropriate treatment. Sick calves should be isolated from healthy calves and tended to

after feeding other calves to minimise the spread of infection. Drinking water should be freely available.

Diarrhoea powders containing kaolin, pectin or chalk or other methods of slowing down feed passage through the gut (such as charcoal tablets, cornflour or even sawdust) can reduce the severity of the scouring. Antibiotics may be required, especially if the calf remains dull after rehydration, and if blood appears in the faeces. Antibiotics must be used under veterinary supervision. Antibacterial compounds and antibiotics (for example calf scour tablets, drenches or injections) should be used judiciously and restricted to cases where *Salmonella* or other bacteria are suspected.

When prescribed, antibiotics are usually given orally for about 3 days. If the scouring is too advanced and the gut wall is badly damaged or the calf is running a temperature, a course of antibiotic injections may be required.

The infective organisms may be resistant to many disinfectants and survive in the environment for long periods. Formalin and hypochlorite are probably the most effective disinfectants, but only on well-cleaned floors and surfaces. Paddocks and yards are impossible to disinfect and require prolonged spelling. If possible, change the calf-rearing area regularly because the risk of the disease is related to the build up of organisms. This is obviously easier if calves are reared outside in paddocks.

11.1.3 Controlling scours through management

Dietary scours (also known as nutritional scours) is caused by stresses reducing the production of digestive acids in the abomasum. Pathogens consumed by the calf are normally killed by the very low pH from these digestive acids. If the acid production is reduced then the abomasum does not protect the calf from these pathogens and they pass through into the intestines. The low acid production also reduces the effectiveness of the rennet in clotting the milk into a curd and so undigested milk then escapes into the intestines where it cannot be properly digested in the alkaline environment.

Because the bacteria that normally reside in the intestines now have a new supply of nutrients, they multiply and irritate the gut wall. This causes the body to secrete fluids into the intestines, thus leading to a loss of valuable minerals. Hence, a scouring calf becomes rapidly dehydrated and deficient in minerals. If dietary scours is not corrected promptly, the pathogenic bacteria that were not killed off by the stomach acids will also multiply in the undigested milk and the calf will develop infectious scours. By removing the initial stress, sufficient abomasal acids are produced, and normal milk digestion will eventually resume. Sudden changes in milk feeding routines are a common cause of scours. For example, calf rearers routinely report scours in calves about a week after changing from whole milk to milk replacer.

Environmental stress is another cause, such as sudden changes in weather or cold, damp, draughty or humid conditions inside calf sheds. Overcrowding is another cause, so sheds should never house more calves than they were designed to. Even changes in staff can lead to scours through different handling of calves, lack of tender loving care (TLC) or changes in standards of hygiene. If reared outdoors, calves should always be offered protection against the extremes of sun, wind and rain. Despite this precaution, a sudden cold and wet spell can introduce sufficient stress to increase the incidence of scours in well-managed calves.

The duration of scours is largely under the control of the calf rearer. During their second week of life, calves are particularly susceptible. By careful observation, experienced rearers can anticipate the onset of scours the day before it happens, after which milk feeding can be reduced, with the calf recovering quickly.

The following signs of impending scours should be looked for:

- dry muzzle
- thick mucus appearing from the nostrils
- very firm faeces
- refusal to drink milk
- a tendency to lie down
- a high body temperature (over 39.2°C).

Scours can occur under the best management but some precautions always help. If using a calving pad for calving down cows, calves should be quickly removed from any area used for holding these cows prior to calving to reduce the chances of manure contamination of newborn calves. This is also important in the prevention of navel infections and Johne's disease (see Section 11.5).

A feeding routine should be quickly established, with set feeding times, constant amounts of milk offered (and drunk) per calf and a consistent milk temperature. Any changes in feeding routine should not be too sudden. It is best to pen newly purchased calves individually for the first 2 weeks, particularly if they are obtained from various sources, to quarantine them against spread of disease to other calves. If buying calves from selected farmers, ensure that these farms give their newborn calves adequate colostrum, have a low level of calf scours and good management immediately following birth. Milk feeding equipment should be thoroughly washed and sanitised between feeds.

It must be kept in mind that in many (if not most) cases, the causes of scours are many. This means that it is due to more than just one type of pathogen, with environmental factors, nutrition and management all possibly contributing to the infection. However, early identification and treatment of sick calves is the key to their rapid return to health. In fact, many scouring calves that are quickly identified, diagnosed and treated can return to a more normal health state after just several days on fluid replacer treatment when they can be gradually reintroduced to their normal milk feeding routine. Delaying treatment can complicate the disease condition because the weakened, hence more susceptible calves, can quickly succumb to other contributory factors to their infectious scours.

Some calf rearers routinely include small amounts of disinfectant or antibiotics in all milk fed to young calves. This is not good rearing management because it may lead to low levels of infection in all animals, with the infection only apparent when these calves develop more advanced symptoms of the disease. This practice can also increase the growth of antibiotic-resistant organisms, so making it even harder to treat sick calves.

Furthermore, many calf rearers routinely used antibiotics to control any potential pathogens, as well as to increase feed intake and utilisation. This is not necessary with ideal management and facilities, such as where colostrum intake is adequate, the rearing unit is clean and well ventilated and not densely stocked and the operator is experienced. Because this ideal scenario is not common, antibiotics have been used as insurance

against disease, particularly when rearing calves bought from often unknown sources. This could mask any disease outbreak for several days and also give a false sense of security, which often leads to an even poorer job in calf raising. Concern about the development of antibiotic-resistant strains of bacteria means that this practice should be discouraged.

11.1.4 Preventing scours

To ensure healthy and disease-resistant calves, the importance of good colostrum feeding management cannot be overemphasised. Up to 40% of calves do not absorb sufficient antibodies into their bloodstream within the first 12–24 hr of life because of inadequate attention given to their colostrum feeding (Moran 2002). Such calves are more likely to succumb to infectious scours. Chapter 5 discusses other aspects of colostrum feeding management, all of which can influence calves' susceptibility to scours. In certain countries, vaccines are available to improve the colostrum quality for certain scouring organisms, such as *E. coli*, *Salmonella* and rotavirus. As the demand increases for these vaccines, so will their availability.

Prevention of scours centres around good hygiene and minimising stress. Measures that can be taken include:

- Avoid buying calves from sale yards, because these could introduce disease agents.
- Only buy calves directly from farms which practise good colostrum feeding management and good hygiene.
- Rest transported calves before their first feed of milk.
- Consider vaccinating cows for *E. coli*, *Salmonella* or rotavirus prior to calving, if the vaccines are available.
- Quarantine purchased calves for the first week or so, then disinfect the quarantine area after use, prior to introducing another batch of calves.
- Ensure that calves are protected from extremes of climate, preferably in a shed.
- Carefully plan shed designs to avoid draughts and overcrowding.
- Minimise stresses associated with routine management practices, such as dehorning and castration.
- Maintain strict hygiene by cleaning and sterilising feeding utensils and facilities during milk rearing.
- Develop a routine milk feeding program, with as few people involved as possible.
- Develop an early weaning system to minimise the period of milk feeding.
- Quickly respond to early symptoms of scours, isolate sick calves and rectify the cause.
- Minimise the use of antibiotics, and then only under veterinary supervision.
- Keep records of treatment of sick calves to assist in veterinary diagnoses and for withholding periods if the calf is subsequently culled.

11.2 Pneumonia and other respiratory diseases

Pneumonia is a problem with housed calves, particularly when stocking density is high and ventilation is poor. In the US, it accounts for 15% of the calf deaths from birth to

6 months of age. The shed temperature and relative humidity are the two most important factors influencing its occurrence. Respiratory diseases are more common in cool, damp sheds, although they can also be a problem in hot, dry shed conditions. Typical signs of pneumonia include lethargy, discharge from the nose and eyes, rapid breathing, and a rise in body temperature and pulse rate. Coughing is especially noticeable after exertion because of lung damage and affected calves are more susceptible to further outbreaks and secondary infections.

The control of pneumonia is mainly through improved housing. Poor ventilation leads to condensation, which results in humid conditions and an increase in the survival and spread of infection through water droplets in the air. Draughts of cold air at animal height in pens will aggravate the condition. Regular use of hoses in cleaning pens and laneways can introduce water vapour and blast infectious particles from the manure into the air. High dust and ammonia levels (the latter from urine in poorly drained pens) can cause irritations in the lungs, making these calves more prone to pneumonia.

Early recognition and treatment of affected calves with antibiotics will minimise losses through deaths and poor calf growth. Sheds should be adequately ventilated but draught-free. The use of solid walls to at least 2 m high and then shutters or blinds to control air movement (particularly during cool weather) is ideal. In poorly ventilated sheds, well-positioned exhaust fans can improve air flow without causing draughts. Shed design is discussed in more detail in Chapter 7.

There are other influenza-type, respiratory diseases normally associated with high stocking densities in poorly ventilated sheds and during lengthy sea transport. These are often called ‘crowding diseases’ in Europe for obvious reasons.

One such disease is infectious bovine rhinotracheitis (IBR). This is caused by a virus and leads to loss of appetite, fever and discharges from the nose and eyes. The muzzle is often bright red (hence the name ‘red nose’ in Europe) and affected calves breathe with great difficulty. Like all respiratory diseases, secondary infections can confuse their initial cause and veterinary assistance is strongly advisable to ensure the correct treatment.

Pneumonia can also occur in grazing calves and lungworms can play a significant role in damaging the lungs. Adult worms lay eggs in the lung and these are coughed up, swallowed and then passed out onto the pasture. Larvae survive best in cool, wet conditions, so numbers build up on pasture in winter and early spring. Mature cattle have a strong immunity to lungworms whereas calves are very susceptible. Most drenches for roundworms also control lungworms.

11.3 Pulpy kidney and other Clostridial diseases

Pulpy kidney can occur when calves are first introduced to high concentrate diets. It is caused by one of the *Clostridia* bacteria that produces a toxin in the gut, eventually killing the calf (hence the name enterotoxaemia). As with all Clostridial diseases, the bacteria are a normal part of the environment and are impossible to eradicate. The classical sign of pulpy kidney is that the fattest calves (the best milk drinkers) die suddenly and their carcasses rot very quickly. Routine vaccination programs of ‘five-in one’ vaccines can prevent the disease.

The other Clostridial diseases controlled by ‘five-in-one’ vaccines are blackleg, black disease, malignant oedema and tetanus. The dilemma with these diseases is that once you have vaccinated, it is hard to prove that it has been worth it – you do not know if you would have lost calves if you had not vaccinated. However, the vaccine is cheap and the cost of a vaccination program is negligible compared with the potential losses incurred through *Clostridia*. It is important to follow the manufacturer’s instructions, with regards ages of initial and booster vaccinations.

Calves that have drunk sufficient colostrum from vaccinated cows soon after birth can be partially protected against *Clostridia* up till 6 weeks of age, after which a vaccination at 6–12 weeks of age with a follow up one at least 6 weeks later, gives good immunity. A booster vaccination 12 months later should reduce the incidence of Clostridial diseases in adult cattle and this should be repeated every 3–4 yr. Deaths from *Clostridia* have occasionally been observed following complete vaccination programs, which means that immunity is not always complete.

11.4 Internal parasites and their control

Roundworms and liver fluke are the two most important internal parasites that require attention. Roundworms cause gastroenteritis in young weaned calves. The intestinal worms damage the gut lining, decrease appetite and interfere with the efficient absorption of nutrients. The signs are scours, weight loss, bottle jaw, dehydration and sometimes death. Mild signs include ill-thrift and a dirty tail.

Calves pick up infective larvae while grazing and these mature in the gut within 2–3 weeks, mate and start to lay eggs. There are seasonal peaks of worm burdens, which should be considered when planning drenching programs. Mature cattle are relatively resistant to roundworms, while young stock are the most susceptible.

Worm control depends, firstly, on strategic drenching to suppress worm burdens and to prevent contamination of pasture by worm eggs and, secondly, on integrating drenching with grazing management. Drenching only kills the worms in the calf and does not prevent reinfection. Housed calves have yet to pick up worms and hence do not need drenching.

Drenching programs vary with the area and local recommendations should be followed. Worm test kits are now commercially available in many countries and these can assist with parasite control programs, particularly in determining which drench will be the most cost-effective.

Liver fluke depend on a freshwater snail to complete its life cycle. Acute fluke disease results from massive damage to the liver caused by the immature flukes and can kill calves. Chronic fluke disease is due to the adult fluke blocking the bile ducts of the liver and can lead to weight loss, anaemia, bottle jaw and scours. Adult cattle build up resistance to flukes. If control of snails or control by grazing management is not possible, for instance in irrigation areas, drenches can be used to remove adult and immature flukes before snails become active in the warmer weather. As with all drenches, it is important to follow the labels for dose rates, warnings and withholding periods.

There are other types of worms or internal parasites likely to infest calves in different areas and local advice on drenching and other control measures should be sought.

11.5 Johne's disease

Johne's disease (or paratuberculosis) is an incurable bacterial infection of the intestines. By the time clinical symptoms develop, the wall of the intestine has become thickened and this interferes with the absorption of nutrients from the digested feed. Cows with Johne's disease show progressive chronic diarrhoea and weight loss, ending in death. However, they generally remain bright and alert and maintain a good appetite up to the time of death.

Most infected cows will not show any signs of the disease and stress is important in determining whether the symptoms appear in infected cows. Stresses may include calving, cold weather and feed shortages or moving cows to a different herd or farm. Once Johne's disease is detected in a herd, it is usually well established and there are likely to be other infected carrier cows.

Apparent freedom from clinical cases, even for years, provides no assurance that the herd is free of the disease. Infection occurs during calfhood, but the symptoms are not usually seen until infected cattle are 4–5 yr old. Cattle become more resistant to infection by about 12 months of age.

The disease is spread by a susceptible calf consuming feed, water or milk contaminated by manure from an infected cow. Occasionally, an unborn calf can even acquire an infection from a diseased cow.

Control of Johne's disease depends on separating calves from their dam within 12 hr of birth and then rearing them until 12 months with no contact with faeces from adult cattle. Attention should be given to paddock drainage and not applying reuse water when irrigating calf or heifer paddocks. Drinking water should be supplied from clean sources via troughs, not dams or irrigation drainage channels.

The infective bacteria can survive for up to 12 months in cool, moist conditions. They are destroyed by sunlight and dry conditions.

Johne's disease is a notifiable disease in many countries. In these countries, all cattle showing clinical signs must be reported to local animal health or veterinary advisers. Any herd with a history of the disease can enter a control program supervised by government veterinarians. Infected or reactor cattle should only be sold for slaughter. The Johne's disease status of the herd can affect the ability of cattle to move between zones, states and countries.

Preventing Johne's disease depends on two important factors: firstly, stopping the spread within a herd by good calf-rearing practices, and, secondly, stopping the spread of infection by sourcing replacement heifers from low-risk herds. Calf-rearing systems should prevent calves ingesting feed or water contaminated with manure, while a closed herd is the most effective method of avoiding the introduction of the disease to a herd. Calf-rearing practices should endeavour to:

- calve cows in a clean paddock, because calving pads or heavily stocked calving paddocks present a very high risk of spreading the disease
- separate the calf from the dam within 12 hr of birth
- ensure no cow manure or dairy effluent comes in contact with calves or the calf-rearing area

- feed calf milk replacer or milk from low-risk cattle
- only supply tank, town, or bore water to calves up to 12 months of age – avoid stock dams, troughs or discharge/reuse irrigation channels
- prevent any adult stock entering the designated calf-rearing area – this includes bulls, dry cows, milkers, sick cows, steers, goats or camelids (alpacas and llamas)
- maintain strict hygiene when entering the calf-rearing area – do not introduce dung on boots, clothing or farm machinery such as tractors and bikes
- fence off the calf-rearing area from laneways and milk tanker tracks
- maintain accurate records of calves reared or purchased.

After the calves are weaned and up to 12 months of age, the risk of them becoming infected will be minimised if:

- weaned calves only graze paddocks that have had no adult cattle on them for at least 12 months
- this grazing area is free of any drainage, effluent or sprayed recycled effluent and discharge/reuse irrigation channels are fenced off
- stockyards that are used by adult stock are not used by the calves
- calves sent on agistment are only mixed with stock that have had the same high Johne's disease rearing standards and only graze on areas free from potential contamination.

11.6 Other diseases in calves

11.6.1 Bloat or tympany

Bloat is an over-distension of the abomasum or rumen due to the gas produced by normal fermentation of feed being unable to escape. It can occur in the abomasum of calves fed milk and the rumen of calves fed milk, concentrates or pasture. It is more likely to occur where calves do not suckle the milk and where too much milk is fed too quickly.

The feeding of chopped straw seems to overcome these problems, except where the bloat is caused by an obstruction in the throat or oesophagus. Animals can often show signs of bloat following feeding, but the gas will escape and the rumen or abomasum will eventually return to normal size before the next feeding. If this does not occur, then the use of a stomach tube or a trochar to relieve pressure in the rumen is recommended and veterinary advice should be sought. Prompt action is essential because affected calves can die within an hour after feeding.

Abomasal-induced milk bloat occurs when partially digested milk from a previous feed is enveloped in a clot in the abomasum together with newly drunk milk. Any gases being produced from this partially digested milk cannot escape, causing distension of the abomasum. Rumen bloat can occur in the calf fed milk or milk replacer through failure of the oesophageal groove to close properly or due to back flow into the rumen from the abomasum. This is particularly associated with diets containing certain non-milk proteins, which are rapidly fermented in the rumen.



The author dosing a heifer with a Rumensin capsule.

Abomasal-induced milk bloat appears to be more prevalent with certain types of milk replacers, particularly those incorporating tallow as an energy source. One experienced calf rearer in Australia includes bloat reducing chemicals, such as teric, with the milk replacer at every feeding.

Bloat in grazing, weaned calves is the result of a stable foam developing in the rumen, which traps the bubbles of gas produced by the rumen microbes. The foaming agent is present in the leaves of certain legumes, such as clover and lucerne. Treatment is urgent and affected animals can be drenched with 150–200 mL of vegetable or mineral oil or even butter, lard or cream. If bloat is so severe that the animal cannot swallow, the oil can be inserted directly into the rumen, on the left side, using a wide bore needle. Leave the needle in place to allow some gas to escape. A sharp knife or trochar should be used as a last resort. A small vertical stab wound (2–3 cm long) can be effective and will heal faster than a large hole. Oils, detergents and Monensin in anti-bloat capsules can also be used to control pasture-induced bloat.

11.6.2 Feed toxicities

These can occur through human errors in preparing feeds, supplying inappropriate feeds for calves or providing access to poisonous items in rearing sheds or at pasture. In one instance, Heliotrope poisoning was diagnosed in early weaned calves through contaminated grain being used in the concentrate pellet. In another instance, a producer suffered calf losses through incorrect levels of antibacterial drugs being incorporated into commercial feed preparations.

Calves are very susceptible to lead poisoning and this has occurred through animals licking or chewing painted woodwork and metalwork, discarded paint tins, batteries and painted tarpaulins.

Gossypol, which naturally occurs in cottonseed, can poison calves. It is usually destroyed by the heat process during extraction of the cottonseed oil. Mature cattle are not affected by gossypol (hence can be fed whole cottonseeds) because it is broken down in the rumen. Young calves cannot tolerate it. Cottonseed meal can be high in gossypol, and, for safety sake, should not constitute more than 20% of calf grower rations.

The incorporation of soya flour in milk replacers can create problems if it has not been heat treated to remove the trypsin inhibitor. Trypsin is involved in digestion of milk in the abomasum. Soya flour (like other non-milk protein sources) cannot be used by calves under 3–4 weeks of age.

Vitamin A deficiency has been diagnosed in calves that were rapidly growing and were not early weaned off milk replacer. These calves had low body reserves of vitamin A, were reluctant to eat concentrate pellets and were only offered limited amounts of milk replacer.

Pasture toxins can be a problem in certain regions. Ryegrass staggers can occur in southern Australia, although this rarely causes deaths. Bracken fern poisoning can kill calves through damaging the blood forming tissue in bone marrow. Calves pass blood from their rectum, nose and mouth and respond very poorly to treatment. Deaths have been reported for up to 6 months after calves have been removed from the area.

11.6.3 Grain poisoning or acidosis

This is the result of rapid fermentation of cereal grains and other high-starch feeds in the rumen, leading to excess levels of lactic acid being produced. Affected calves become dull and refuse food, their movements are unsteady, they often scour and bloat may occur. Mild acidosis can be treated by drenching calves with a sodium bicarbonate solution and feeding a roughage-based diet, but severe cases require veterinary attention because death can be sudden. The routine use of sodium bicarbonate and other rumen buffers when feeding high levels of grain should maintain normal levels of acidity in the rumen. The feeding of chopped straw will stimulate saliva production, which buffers the rumen against rapid changes in acidity.

11.6.4 Navel-ill and joint-ill

This is caused by bacteria infecting the umbilical cord soon after birth, particularly where the calving area is heavily contaminated. Unless treated promptly in young calves, it can lead to severe inflammation or arthritis of the joints. Animals with joint-ill are reluctant to walk and stand for only brief periods. Because the infection is carried in the bloodstream to all parts of the body, reduced appetite, diarrhoea and pneumonia may also occur. Navels in all newborn calves should be swabbed or sprayed with diluted iodine (7%) as a precautionary measure and calving facilities should be kept clean. This and other navel abnormalities (such as umbilical hernias) should be apparent when selecting calves for purchase; these animals should be rejected.



Treating a heifer for pink eye.

11.6.5 Pink eye

Pink eye (or *Moraxella*) is a bacterial infection of the eye, which occurs mostly in the warmer months, possibly as a result of increased fly activity and dust and irritation from young grass. Calves and young stock are more commonly affected than older cattle. The first sign is a discharge from the eye, then it becomes reddened, a shallow ulcer develops and finally the eyeball looks white. Most affected animals recover, leaving small scars that do not appear to interfere with sight. However, in some cases, the eyeball can rupture and blindness results.

Treatment with various ointments, powders or sprays has little effect unless the level of antibiotic is maintained at a high level by frequent applications. Severe cases should be protected by gluing a patch over the affected eye or suturing the eye shut. Control is difficult because little can be done to avoid exposure to ultraviolet light and dust. Fly control helps, but isolation of clinical cases is not effective because the causative bacteria are carried by non-vaccinated cattle.

11.6.6 External parasites

Flies breed in manure and moist feed waste, so these should be removed regularly. Biting flies can cause worry among calves so standard fly control measures (such as fly baits or routine spraying) may be necessary. Lice control using ectoparasite dips or sprays may also be occasionally required due to severe lice infestations, particularly in poor calves.



A dairy heifer suffering from a severe skin infestation of papilloma virus.

Ringworm can occur and should be treated with anti-fungal preparations. Severe skin infections such as papilloma virus may not be easily treated and infected stock may need to be culled. Some external parasite treatments should not be used simultaneously with worm drenches, while others should not be used on young calves. It is important to carefully follow the instructions during use.

Cattle tick and buffalo flies can also be a problem with weaned calves. These parasites suck blood and cause skin irritation and also can carry potentially fatal diseases such as tick fever. Therefore it is important to spray or dip calves routinely during the tick season and also to implement recommended grazing management procedures, such as pasture spelling and rotation.

11.6.7 Leptospirosis

This is a bacterial disease that can occur in all farm animals. The 'lepto' bacteria gain entry through the skin or membranes lining the nose, eyes or mouth, or by ingestion. They multiply in the liver, enter the bloodstream, and settle in the kidneys. They are then passed out in the urine. The two most common types of leptospirosis bacteria that affect cattle are *Leptospira pomona*, which can cause abortion, mastitis and milk production losses in mature cows, while it can cause redwater (blood in the urine), jaundice, anaemia and death in calves, and *L. hardjo*, which seldom causes disease in cattle but it does affect humans who catch it from the urine of cattle. Humans show flu-like symptoms including fever, chills, headache, muscular aches and vomiting.

The best way to reduce the risk of milkers acquiring leptospirosis infection is to vaccinate all heifer calves and cows. This will stop cows shedding the bacteria in their urine in the dairy. Calves should be vaccinated twice, about a month apart, once they reach 6 months of age. Combined leptospirosis and clostridial vaccines, called 'seven in one', are the usual form of vaccination. A booster vaccination should be given 12 months later and followed up by an annual booster at the time of drying off. In-calf heifers are a high-risk group and should always be vaccinated.

Depending on the area, other vaccinations or preventative measures are advisable with young calves, such as for *Clostridia* or for tick fever.

11.6.8 Lameness

Lameness is always a potential problem in housed stock. Foot problems can be caused by the environment (continuously wet floors, uneven or broken concrete), poor sanitation, infectious organisms or nutritional imbalances. Leg problems can be the result of traumatic injuries due to poor pen design and overcrowding. Providing stock with soft bedding, such as dirt lounging areas or rubber mats will improve stock comfort, as well as reduce foot and leg problems. Locomotion scores (Moran 2005) can be used to select stock for hoof examination before they become clinically lame.

11.7 Disbudding and dehorning calves

Unlike some breeds of beef calves, all dairy calves will eventually grow horns. It is routine practice to remove these horns or horn buds in early life. Disbudding refers to removing the horn buds in calves less than 2 months of age, whereas dehorning refers to removing the horns and horn buds in older calves, usually older than 2 months of age. There are several methods available, all of which are successful, depending on the experience and skill of the operator rather than the method applied. Calves should be carefully restrained so as not to injure the calf or the operator. Details of these procedures are described below.

11.7.1 Using caustic potash

This should be undertaken within the first week of life. Any contact of the caustic potash with human skin should be avoided and suckling cows should also be kept away from treated calves. The hair should be clipped around an area 2.5 cm diameter over the rudimentary horns. Heavy grease should be spread around the outer edge of the clipped area to prevent the caustic potash running into the calf's eyes. Rub the potash on the skin area immediately over the horn until the hair is removed and the skin becomes red (that is, for about 15 seconds), leave the calf alone for at least a day and don't let it go outside when the weather is rainy.

11.7.2 Using flexile collodion solution

This should be applied within 2 days after birth. Clip the hair around the rudimentary horns and clean it with methylated spirits to remove the fatty covering. Apply the collodion, firstly with a small brush to rub it in, then secondly without rubbing it in. After 48 hr, check whether the collodion film is still present; if not, repeat the procedure.

11.7.3 Using a hot iron (electrical or charcoal)

This should be done 2–3 weeks after birth and is a very good, if somewhat cruel, method. Clip the hair around the horn and place the calf in a head crush to prevent any head movement. Place the heated iron on the horn bud at short intervals, for 5–10 seconds each time. Continue heating until the colour of the tissue around the horn bud turns to deep copper. The heat will kill the growth cells in the horn.

11.7.4 Using a rubber ring (elastrator)

This method is used when the horns have already developed and it is too late to apply other methods.

11.7.5 Using a scoop dehorner

If horns are apparent in young weaned calves and must be removed, they can be using a scoop dehorner. This is very effective and somewhat cruel, and inexperienced operators should seek advice from veterinarians or other animal health specialists.

11.8 Calf management and disease

As far as animal health is concerned, prevention is better than cure. A generous application of drugs is not the right way to deal with health problems in calves; animal health starts with implementing strict hygiene during and after birth. Disease problems with calves seem to be worse during winter and are more frequent in calves with low birth weights. Calves become more resistant to diseases as they get older.

Scouring is more of a problem in milk-fed calves and in group penned rather than individually penned calves and also seems more common in Jerseys than in Friesian calves. Scours are more prevalent in calves fed milk replacer than whole milk, but this could be related to aspects of mixing the replacer or its more variable quality, rather than any more healthy attributes of whole milk. Feeding the youngest, more susceptible calves first each time will minimise any disease transfer from older animals.

Pneumonia, on the other hand, is more prevalent in older calves (6–8 weeks of age) and is not affected by group or individual penning. Early weaned calves seem more susceptible to pneumonia than those fed milk for a longer period. Purebred Friesians also seem more affected than Hereford × Friesian calves. Scouring and pneumonia are more of a problem in calves purchased from calf auctions than those home bred or purchased directly off farm. Sex and weight for age have little influence on the incidence of these diseases. Unfortunately, little is known about the relative susceptibility of indigenous tropical dairy breeds compared with Friesians and Jerseys.

Diseases are more likely to occur in calves subjected to stress than if adequate attention is given to their physical and nutritional needs. Examples of stress include lengthy transport from calf saleyards in overcrowded, unprotected trailers or weaning off milk before the rumen is fully adapted to dry feeds. If there is a smell of ammonia in the rearing unit, better ventilation and/or floor drainage is required to reduce the likelihood of pneumonia outbreaks.

The protection from the passive immunity passed onto the calf peaks 1–2 days after effective colostrum transfer but then it declines. By 2 weeks of age, it has declined enough to increase the calf's susceptibility to bacteria, viruses and other pathogens, before the calf's own immunity increases to an effective level. Therefore the calf can be quite vulnerable to pathogen invasions coming from dirty feeding equipment or other sources between 14 and 21 days of age.

If there is a sudden increase in the number of calves with scours or pneumonia, as well as seeking professional veterinary assistance, it is worthwhile carefully reviewing any possible changes in the rearing management. It may be related to a sudden change in the weather or feeding a different batch of CMR. Perhaps a different member of the farm staff is now feeding the calves (one with a more aggressive personality or a different concept of cleanliness), or some new stock have been purchased from another farm. Such changes in the degree of animal stress or exposure to pathogens need to be considered to ensure that, as well as treating the current disease outbreak, measures are taken to prevent new ones.

The best indicator of health is body temperature. Normal calf temperatures are 39°C in the morning and 39.2°C in the evening. When the body temperature rises, close examination, and often treatment, is necessary. Body temperatures are easily taken with a thermometer in the calf's rectum for 1 min; 20 cm of string attaching the thermometer to a paper clip (which can be clamped onto the calf's hair) should prevent breakage. Electronic thermometers give a meaningful reading within 5 seconds.

Being closely managed, most calves respond whenever people enter rearing sheds. An early sign of disease is general disinterest, in that calves appear listless, apathetic, lack vigour and will not move when approached. Calves standing with the head down and ears lowered are likely to be showing early symptoms of disease. If calves do not stretch when standing after a lengthy rest, they should be carefully observed for other signs of ill health. Loss of appetite, dry and dull coat, sunken eyes, runny eyes and/or nose, fever and difficulty in breathing are obvious signs of ill health.

Occurrences of disease and deaths are generally lower on farms where owners, rather than employees, rear the calves. Furthermore, deaths are lower on farms where the farm wife rather than the farm husband cares for the calves; death rates on farms where the children rear the calves are intermediate between those of wife and husband. Correct calf rearing – one of the most arduous tasks on dairy or beef farms – requires a genuine concern for the welfare of each animal (in other words, a sense of caring) and a quick recognition of the early symptoms of the diseases described above. One common attribute of all successful calf rearers is TLC. Young calves give out many signals indicating their health and general wellbeing and recognition of these signals becomes second nature to calf rearers with TLC. These are discussed in Chapter 12.

11.8.1 Vaccinate and rest easy

Disease prevention is an investment that can return significant dividends. The corner stones of any disease control are vaccinating against commonly occurring diseases together with good management practices. Deaths and illnesses from commonly occurring diseases, which can be prevented by vaccination, can and do occur in unvaccinated herds or in herds where vaccination is not a routine procedure.

The cost of the loss of a single heifer to one of the Clostridial diseases will far outweigh the cost of the vaccine. Likewise, the cost of a human case of leptospirosis will also far outweigh the cost of annual vaccination of the entire herd.

Vaccination programs should be designed to protect against diseases that occur commonly in the district, plus any specific disease occurring on individual farms. The timing of the vaccination and the selection of the product are important considerations. There are multiple brand names, combinations of products and varying vaccination schedules. It is best to consult your veterinarian or animal health officer for specific vaccination protocols for your herd.

Vaccinations do not provide 100% protection to 100% of the animals vaccinated, but they do increase the level of herd immunity and the level of disease resistance in individual animals. They are not a substitute for otherwise poor stock management practices.

Vaccination can be used in the face of an outbreak of disease. However, the best disease control programs are those that prevent the appearance of the disease in the first instance.

A farmer who has dealt with an outbreak of *Salmonella* and is vaccinating in the face of an outbreak, is very likely to vaccinate the herd with an effective vaccine when he dries off the milking cows, to guard against a similar occurrence next season.

Most of the commonly used cattle vaccines require two initial doses: one as a primer dose, and a second about 4–6 weeks later and an annual booster. Little protection is provided by some vaccines until after the second dose is given. It is best to vaccinate according to the schedule advised by the product chosen.

Labels carry important information about expiry dates, dose rates, injection sites, recommended vaccination programs, storage and occupational health and safety. Use a refrigerator to store vaccines, particularly when the container has been opened. Many vaccines are packaged in multi-dose containers for use with automatic syringes, which must be calibrated to deliver the right dose and sterilised before use. Read the instructions carefully and follow them.

Strict sanitation can help reduce the risk of infection from poor vaccination techniques. Do not inject into areas of the animal hide that are contaminated with manure or dirt. Change needles every five to 10 injections, or any time that a needle becomes blunt, burred or has evidence of blood. Do not put a dirty needle back into the medication bottle. Avoid vaccinating stock during times of stress, including extreme heat. Avoid multiple (greater than two injections) vaccinations when possible.

Cattle diseases for which vaccines are available in most Western dairy industries include:

- *Clostridia*
- leptospirosis
- *Salmonella*
- *E. coli*
- vibriosis (or campylobacteriosis)
- pink eye (or *Moraxella*)
- pestivirus
- Mannheimia (a respiratory disease)

- anthrax
- foot and mouth disease
- Johne's disease.

11.9 How to recognise sick calves

Before rearers can recognise sick calves, they must know how healthy calves behave. This allows them to be on the alert for subtle changes in calf behaviour before clinical signs of disease become obvious. They should never be complacent about changes in calf wellbeing and behaviour.

Calves charging your knees and running around the pen are healthy. Such calves rest in a curled-up position with feet tucked under and heads back along the body. They appear relaxed with regular breathing. Some healthy calves may also rest flat on their sides.

11.9.1 Signs to look for

Each day look quickly over each pen of calves, then be more specific and check suspect calves' noses for dampness and ears for temperature. Sick calves often have dry noses and higher than normal body temperatures and a depressed attitude. Listen to their breathing, noting any 'rattles' or laboured breathing. Lift their tail and note the state of any faecal residues. Look at their feet and legs. For the first week to 10 days of age, check the navel area for signs of inflammation and swelling. This inspection should be undertaken as part of your daily routine.

Calves resting in the corner of pens, with their head turned away from pen mates should not be ignored. Get the calf up. If it stretches, it is okay. If it does not, it may require further attention. Sick calves show general disinterest, become listless and apathetic, lack vigour and often do not move when approached. They may stand with their ears lowered and head down. Chapter 12 lists many of the changes in behaviour or physical appearance that allow each calf to 'communicate' how it is feeling.

In summary, watch out for any calf:

- that is slow to get up and eat
- that does not immediately begin eating vigorously
- that lingers over the milk bucket longer than others
- with coloured or opaque nasal discharge or with loose manure
- that is coughing
- that is straining to urinate.

Calves must be kept in a stress-free environment. It is difficult to identify changes in the behaviour if calves are kept in conditions where they look miserable and hunched up because of cold stress.

11.9.2 Keep records to help identify problems

Records should be kept of changes in the intake of milk and concentrates and of fluctuations in growth rates. Body temperatures should be recorded in suspect calves to assist with disease diagnosis.

The reasons for outbreaks of scouring must be tracked down. It may simply be due to a change in feeding or management routine, in which case little further treatment is necessary. However, if scours persist, veterinary diagnosis should be sought. Only use antibiotics under instructions from your veterinarian.

11.10 What should you do with sick calves?

It is up to the calf rearer to decide whether to do nothing, to treat the animal themselves or to contact the veterinarian. The other essential step to take if the disease is infectious is to stop the spread the disease by moving the sick animal to the isolation or 'hospital' pen. For all diseases, diagnosis should be obtained and post-mortem reports should be sought for any unexplained calf deaths. Veterinarians can send samples to local veterinary laboratories for pathological examinations.

Like any professional, most veterinarians have specialised interests in their disciplines. When attending dairy farms in the US, veterinarians spend less than 5% of their time working with pre-weaned calves. It is not uncommon in intensive dairy regions, for farmers with calf-rearing problems to seek assistance from a particular clinic and a particular veterinarian because they have been happy with the way they have previously worked together. When rearers employ a veterinarian, they should not be afraid to follow him or her around the shed asking questions about the techniques used for diagnosis. When clearly explained, most of them are obvious in solving the disease problem encountered, such that in the future, rearers could undertake most of the diagnosis themselves.

When commencing a new calf-rearing operation, or reassessing an existing one, it is always a good idea, if possible, to find a veterinarian that you can work with. It is important to develop a disease prevention and management program, before any problems arise. Good calf rearers should rarely need a veterinarian. They should be able to identify the early signs of ill health then act on them before the calf requires much treatment. In my experience, the best calf rearers are women, because of their more empathetic and caring natures, and the best women calf rearers are hospital nurses, because of their training to anticipate health problems before they occur.

11.10.1 Assisting the veterinarian

There is much that farmers can do to assist veterinarians or other animal health professionals in diagnosing and treating diseases. These include:

- Examine the history – for how long has the calf been sick, how rapidly did the sickness develop, have new stock recently been introduced to the farm, have there been any recent environmental changes (such as hot weather)?
- Examine the animal – use the checklist above.
- Examine the environment – are other animals sick, could there be poisons or mineral deficiencies involved, what is the water quantity and quality, what are the physical conditions, such as lanes or yards, that cause traumatic problems?
- Clearly identify the sick animal – either by recording the ear tag or placing some identification on the calf, such as coloured string around its neck or spraying paint on

its head. This will serve two purposes, firstly ensuring the veterinarian attends to the correct animal and assisting with any follow up treatment.

- Prepare for the veterinary visit. Record the important major symptoms, have the sick animal easily accessible with suitable restraining equipment available, listen carefully and take notes for any follow up treatment.
- Once the disease has been diagnosed and its cause, symptoms and treatment identified, it is important to develop a control program to reduce its incidence in the future. Veterinarians can assist with such a control program. For the farmer, prevention is just as, and often more, important than cure.

Once the veterinarian has provided treatment, it is important to continue to nurse sick calves. Supportive care that can be provided includes:

- Provide good nutrition to treated stock, with freely available water and quality palatable forages and concentrates.
- Ensure access to water and shade and clean bedding.
- Maintain a low stress environment, with adequate housing, removal of competition from other stock, remove parasites, provide pain relief, and clean and dress any wounds.
- Take special care of stock unable to stand, provide support such as small hay bales to stop them rolling onto their side, move them to dry, warm shelter with good footing, in case they try to stand.

11.10.2 Their long-term future

Unhealthy calves are likely to grow into unhealthy cows – and unhealthy cows cost money. They have higher drug, veterinary and labour costs, and also reduced performance: that is, poorer lifetime milk yield and fewer calves born. Not only do unhealthy cows cost more money through fewer lactations in the herd, their higher culling rates increase the need to rear more replacement heifers.

What then should you do with sick calves? Our inherent nature, it to provide them with all the TLC, required veterinary assistance and drugs until they are up and about running with their pen mates. But what then? Should you keep them and grow them out or sell them at the first opportunity?

How much do sick calves cost? It is relatively easy to record the cash costs of treatment, such as veterinary visits and drugs. It is more difficult to cost out the extra time and care required during treatment and recuperation. For example, US researchers found that each sick calf required, on average, 53 min of extra care before recovery occurs. However, it is the long-term effects on heifer health and subsequent performance that are near impossible to quantify. These are much higher than the costs and labour during treatment.

Overseas studies have confirmed the concern that sick calves have poorer performance as adult cows. For example, in Canada, heifer calves that were treated for scours were two to three times more likely to be sold prior to mating and three times more likely to calve down as 30-month-, rather than 24-month-, old heifers. Furthermore, those that were treated for pneumonia during their first 3 months of

rearing were two to three times more likely to die within this 90 day period. Such problems are reflected in wastage rates, which we can describe as the proportion of live heifer calves born that are culled or die before their second calving. Overseas targets are for 20% wastage, whereas surveys in Australia have recorded wastage as high as 35%.

So, when should you decide whether to sell a calf or not? How sick should she be before you have to decide that she is never likely to be a really profitable member of your milking herd? There is no easy answer to this quandary. I suppose all we can conclude is that the more attention a sick calf requires during treatment, the less likely she will make you money as an adult cow.

Some astute farmers are adamant that every sick calf should be disposed of, either by humane slaughter or sale as a cull. The problem with selling such animals is that, unless the animal goes straight to the abattoirs, the problem of potential poor growth is just passed onto the new purchaser. However, one would expect that an astute calf rearer is unlikely to purchase a recovered calf.

How many farmers actually document which calves get sick, the degree of treatment required for their recovery, their age and reason for culling? If this record keeping became routine, farmers would then know how many lactations such animals are likely to remain in their milking herd. This could eventually provide a valuable benchmark for them to make the decision to cull recovered calves or let them join their healthier heifer calf mates. Only then can farmers make truly objective decisions as to the fate of their previously sick heifer calves.

11.10.3 Overuse of antibiotics

Antibiotics should only be used as a last resort with sick calves. Most scours can be successfully treated with a program of electrolyte fluid replacements. Because many of the scour-causing agents are not even bacteria, antibiotics will not kill them. The cautions about overuse of antibiotics were discussed earlier in this chapter in Sections 11.1.2 and 11.1.3, and also in Section 8.6.4.

Whenever antibiotics are used, dairy farmers have an obligation to ensure that they do not get into the human food chain. The most common method of antibiotics being potentially consumed by humans is through raw milk or the meat from slaughtered calves. As well as detailing the most appropriate dose rates for treating sick dairy stock, the labels of all antibiotic containers should include what is called, the withholding period. The withholding period is the minimum number of days following the last antibiotic treatment, before which milk can be sold to milk processors and treated stock can be slaughtered for human consumption. Prior to the withholding period:

- the milking cow can still be secreting antibiotics into the milk
- the calf to be slaughtered has not excreted all the antibiotics from its body.

This then requires farmers to keep good records of stock treatment and adhere to any required withholding periods. Most milk processors can test the raw milk for antibiotics, and if any are found, downgrade or discard the milk, generally at the expense of the farmer or dairy cooperative. Similarly, meat from slaughtered calves can be tested for antibiotic residues. In many Western countries, farmers are penalised if their slaughtered calves test positive for antibiotic residues.

When a need has been determined, antibiotics can play an important role in the treatment plan, but it is irresponsible and ultimately costly to administer antibiotics to all sick calves. Effective use of an antibiotic is also dependent on knowledge of the most appropriate dose, administration method and withholding periods.

Treatments for mastitis in milking cows or scours in calves are the two most common forms of antibiotics entering the human feed chain. Most farmers are aware that mastitis treatment almost always involves the use of antibiotics. Allowing such milk to be mixed with non-antibiotic milk prior to the withholding period is often a conscious decision by the farmer in an attempt to maintain farm income.

However, many farmers are unaware that some commonly used scour treatments also contain antibiotics. In many situations, such drugs are poured into smaller containers without details of the label being similarly transferred. It is the obligation of the supplier of veterinary drugs – usually a veterinarian or someone trained in animal health protocols – to ensure farmers are made fully aware of the drugs they administer together with any associated warnings of what they contain. Furthermore, treated calves should be easily identified and isolated to reduce the likelihood of cross contamination with other non-treated stock. Feeding utensils should also be thoroughly cleaned and sterilised so they do not pass on the antibiotics when used to feed other calves.

11.10.4 Probiotics

This is a term used for preparations of liquid or powder based on bacteria that normally inhabit the stomachs and intestines of healthy stock. Probiotics are being promoted as benefiting sick calves, such as scouring ones, and also as general health ‘tonics’ for healthy stock. Manufacturers claim probiotics increase the numbers of bacteria in the gut and in so doing, improve the efficiency of feed digestion.

Although theoretically it would seem to benefit calves suffering from infectious scours, by reducing the undigested feed residues used by pathogenic bacteria to grow and multiply, there are few truly independent scientific studies that support their use. There may be some benefit with improving growth and feed efficiency in healthy calves and heifers; however, it is often difficult to justify probiotics without a careful analysis of the costs and returns of their application.

11.11 Maintaining a healthy calf shed

It is important that calf sheds be maintained as disease free as possible. The main avenues for introducing new diseases are via calves purchased off farm, contamination from adult stock on farm (such as Johne’s disease) or from service providers visiting the calf shed. Biosecurity is the term used to describe the restricting of access by other livestock and personnel.

One US county has recently formed a group of concerned dairy professionals to categorise service providers into high and medium risk, based on their contact with livestock and farm equipment. This approach could be used for calf-rearing operations.

In that case, high-risk people would include veterinarians and other calf consultants, operators of mobile calf scales, drivers of feed trucks, dead stock removal personnel, visiting farmers (both local and from other areas) and sales representatives and service

personnel (with access to other calf operations). Medium risk people would include consultants, sales representatives and service personnel (without access to other calf operations) and non-farm visitors.

The committee suggested the following protocols for high-risk service providers:

- Wash and disinfect boots before and after visiting the calf shed.
- Park vehicles away from the shed.
- Use clean and disposable coveralls at all times.
- Wash and disinfect all equipment.
- Collect and deliver livestock in clean trailers and trucks.
- Pick up dead stock away from the calf shed.

Medium-risk service providers could be asked to follow the first two of these protocols. Other actions that could be taken undertaken include:

- Place signs indicating 'Biosecure area – do not enter without permission' at the calf shed and 'No visitors, sales, services people allowed without an appointment' at the front gate. This would necessitate listing a contact person and telephone number.
- Feed delivery personnel should wear plastic boots and be encouraged to use non-returnable bags.
- Place the bulk feed bins away from the calves, if possible.
- Ensure that all calves purchased off farm are shedded separately to the home calves, at least until they are 2 weeks of age.
- Control the movement of people, animals and equipment onto the farm. Some diseases are spread on clothing and boots. If equipment is borrowed from other farms, it should be cleaned prior to use. Keeping transport or service personnel away from the main herd area, especially the calf shed, or at least providing them with footwear, will also reduce the likelihood of introduced diseases.

While not all of these measures are practical on all farms, they should at least be considered, and some should be implemented to reduce the risks of introducing new diseases into the calf shed.

11.11.1 Responsible drug handling

Responsible drug handling and application are the key to any successful animal health program. Drugs should be sourced from veterinarians or registered agricultural merchants because medicines obtained from other sources may not be safe or effective. They should be stored correctly in accordance with the instructions on the label. Storage temperature is critical for some medicines, especially vaccines. Light can damage others. Make sure they are stored securely and locked where practicable. Keep out of reach of children, animals and anybody not supposed to handle them.

Keep records of:

- how much was purchased and when
- the batch number and expiry date
- when it was used and on what type of stock
- the withholding period (start and end dates) for sale of milk or for slaughter.



Veterinary drugs should be stored in a cupboard away from the sun.

Use the drugs only on animals recommended on the label. Dispose of unused medicines safely when treatment is finished. If using disposable needles and syringes, dispose of them after use in a safe container. For other reusable equipment, clean and sterilise before and after use. If using a syringe that requires filling from a bottle between doses, use one sterile needle left in the bottle during use to fill the syringe and a separate needle to inject the animal. Use a separate needle, or at least sterilise it, between animals. Make the injection site through an area of clean and dry skin.

High standards of sanitation are required at all times to prevent rapid spreads of infectious diseases in both young stock and milking cows. The most effective way of destroying disease-carrying micro-organisms is cleaning and disinfecting (sterilising or sanitising). However, the latter has little effect unless the surface is first cleaned. The best cleaner and disinfectant depends on the type of surface.

11.11.2 Biosecurity when purchasing new stock

Most dairy farmers purchase new stock, so it is important to plan their introduction to minimise the risk that they will introduce infectious diseases. Three factors are important in reducing this risk:

1. Protecting the herd with proper vaccination.
2. The source of purchased stock, including how they are transported to the farm.
3. The method to introduce the new stock to the rest of the herd.

When purchasing new stock, whether they be cows, heifers or newly weaned calves:

1. Ensure their health status is known.
2. Where possible, ensure details of their vaccination program is known.
3. Avoid purchasing stock from unknown sources or stock that have mixed with other cattle before sale, such as from cattle markets.
4. Purchase heifers because they can be more easily quarantined and are less likely to have mastitis.
5. Calves purchased should be kept separate for at least a week with no signs of disease.
6. Transport purchased cattle preferably in the farmer's vehicle, in a clean truck or trailer.

Other steps that can be taken with newly purchased stock include quarantining them in an area separate from other cattle on the farm, using a medicated foot bath before allowing them to enter the herd, and vaccinating them during the quarantine period to make sure they are integrated into the farm vaccination program.

Other biosecurity measures that should be considered include controlling the movement of people, animals and equipment onto the farm. Some diseases are spread on clothing and boots. We all know how much calves love to suck on every part of you they can reach. Clean overalls for all employees, for use only in the calf shed, will reduce any disease spread. Disposable gloves could be used when closely examining any sick calf. If equipment is borrowed from other farms, it should be cleaned prior to use. Keeping transport or service personnel away from the main herd area, especially the calf shed, or at least providing them with footwear, will also reduce the likelihood of introduced diseases. Some disease conscious calf-rearing operations even insist that all employees and visitors walk through a sanitising footbath as they enter the calf shed.

11.11.3 Animal and human health

Government veterinary services must maintain surveillance of infectious or notifiable diseases, such as rinderpest, foot and mouth disease and contagious pneumonia, through vaccination and quarantine measures. However, as farms become more intensively managed, non-infectious diseases play a more important role in limiting cow performance. These could be called disease-causing risk factors such as undernutrition, poor hygiene and other management factors affecting herd productivity.

Farmers are only interested in herd health programs when the link with production is clear, such as declining milk yields, increasing mortality and poor reproduction. Mastitis, for example, is hard to manage because the sub-clinical form is very prevalent, difficult to detect and causes higher milk losses per affected cow. It is often difficult to incorporate economic parameters in such programs because of the small number of stock, and hence the influential impact of the performance of each animal.

There are many diseases that can be transferred from intensively managed livestock to humans. These include *Salmonella* (and other calf scour-causing micro-organisms), ringworm, mange (and other skin diseases) and leptospirosis. Children are particularly susceptible because of their affinity to young calves, and their poor understanding of human hygiene. Another potential hazard for young children are veterinary drugs and chemicals used for cleaning or sanitation. These should be stored in a secure place.