Improving Calf Survival
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It is estimated that up to 6% of calves born die before they reach six months of age, at a cost to the industry of about £60 million per annum.

Calf neonatal mortality and disease have both welfare and economic consequences. Most of these losses are in the first month of life, with scouring (diarrhoea) being the main cause of death. Respiratory infections are particularly common in calves between 8 and 20 weeks of age.

The advice in this booklet should be read in conjunction with the Code of Recommendations on the Welfare of Livestock: Cattle (see back of booklet.)
Introduction

If you rear calves you must comply with the requirements of The Welfare of Farmed Animals (England) Regulations 2000 (S.I. 2000 No.1870). Some of the requirements are subject to transitional arrangements. Different legislation is in force in both Scotland and Wales.

Caring for calves, particularly when you buy calves from a number of sources, should be part of your written health and welfare plan. Where there are particular health concerns, such as Johne’s disease, specific measures to limit disease spread should be included in your plan.

Good husbandry is the key to successful calf rearing. Important factors are:

- Good stockmanship – successful calf rearing requires skill and dedication;
- Good cow nutrition in late pregnancy;
- Cleanliness and care at birth;
- Early and adequate intake of colostrum;
- Correct, regular feeding, particularly during the first few days;
- Well ventilated, draught-free, easily cleaned accommodation with plenty of clean dry bedding; and
- Consistency – ideally the same person should be responsible for calf rearing on a day to day basis.

You should seek early advice from a veterinary surgeon where a disease outbreak occurs, so that the cause can be determined and the appropriate action taken.
Main Causes of Death and Ill Health

Scouring

Scouring is the commonest disease in young calves and the greatest single cause of death. Calves are most susceptible to scours during the first few weeks of life and it may affect up to 20% of all calves. Scouring can be caused by infectious agents, the most likely to affect calf health within the first four weeks are:

- Rotavirus
- Cryptosporidium
- Salmonella
- Coronavirus
- E. coli

Management factors play a very important role in the development of disease and factors involved include inadequate colostrum intake; poor housing or incorrect feeding. Continued scouring leads to dehydration with the calf showing sunken, dull eyes, harsh coat, a tight skin and coldness to touch.

It is well recognised that the calf which has received adequate colostrum and is correctly fed and housed is more able to resist disease. Studies have shown that calves fed within their first twelve hours, with 2 litres of colostrum from cows vaccinated against Rotavirus, can be protected from infection for two weeks.

A veterinary surgeon must be consulted for advice on vaccination programmes.
Scouring can also be a result of excessive milk intake, which causes milk to pass into the undeveloped rumen. It can also be caused by irregular feeding; incorrect mixing of milk substitute; inadequate cleaning of utensils; variable milk temperature; rapid diet changes and poor environment.

You should, where practicable, isolate calves with diarrhoea and treat them as follows:

- discontinue milk or milk substitute feeding for one or two feeds and offer warm water containing a proprietary balanced electrolyte to combat dehydration; and
- re-introduce milk or milk substitute at half strength for one or two feeds.

You should try to prevent the spread of disease by thoroughly cleaning utensils used for feeding sick calves and disinfecting your boots after entering pens with sick animals.

**Respiratory Disease**

Pneumonia is the most common disease of weaned calves, caused by a wide variety of infectious agents (i.e. viruses, mycoplasmas and bacteria) which infect the respiratory tract. Symptoms of pneumonia include coughing, rapid breathing, high temperatures and feed refusal. Respiratory disease can usually be avoided if you pay proper attention to preventing overcrowding and mixing of age groups and providing adequate ventilation and air movement.
Homebred Calves
Management of the Cow

In order to produce strong healthy calves, correct feeding of the in-calf cow is essential, particularly during the last three months of gestation, when the foetus makes most rapid growth. Cows should be fit but not fat at calving (condition score 2.5 – 3.5). Gross overfeeding may lead to calving difficulties and underfeeding can affect the viability of the cow and the calf.

It is important that the vitamin and mineral status of the cow is maintained if problems such as abortion or abnormal, or weak calves are to be avoided. This is particularly important for cows calving in February, March and April.

You should always provide adequate supervision at calving, whilst ensuring that calving cows are not disturbed, unless there are indications that the birth process is not proceeding normally.

Hygiene at Calving

A calf can be infected within minutes of birth by virulent organisms and septicaemia can occur before adequate protection from colostrum is achieved. When calving indoors, you should ensure yards and calving boxes are dry and well bedded and you should cleanse and disinfect after each individual calving.

Calving outside in clean, dry conditions is preferable to calving indoors, but it is important to ensure that there is a rotation of calving paddocks to prevent a build-up of disease. You should fence off any muddy or poached areas.
Management of the Newborn Calf

Immediately after birth, you should take care to ensure that the mouth and nostrils are clear of the foetal membrane and mucus so that the calf can breathe.

Calf navels should be dressed with an antiseptic as soon after birth as possible, particularly when calves are born inside. Both navel ill and joint ill can result from navel infections.

For information on the requirements regarding cattle identification and cattle movements you should contact the the British Cattle Movement Service (see the back of the booklet for contact details).

Colostrum

Colostrum contains vital antibodies as well as nutrients and vitamins. An adequate intake of colostrum as soon after birth as possible is essential to combat disease. However, colostrum only contains antibodies against those diseases to which the dam has been exposed. The level of absorption and protection achieved from colostrum is greatly affected by the way in which the young calf is managed.

a) The Time of First Feed

The Welfare of Farmed Animals (England) Regulations 2000 require that each calf must receive bovine colostrum within the first 6 hours of life. The efficiency of antibody absorption decreases gradually from birth. It is very important that calves receive colostrum within the first
three to four hours of life. The level of antibody absorption from colostrum is likely to be minimal once the calf is 18 hours old. However, continuing protection is provided by local antibodies on the lining of the gut wall even after the first 18-24 hours, when antibodies are no longer absorbed into the blood stream.

b) Quantity Consumed Within The First 24 Hours

The more colostrum a calf drinks within the first 24 hours the better the protection against disease. If the calf is removed from the cow before it is 24 hours old, bovine colostrum should be provided. Care needs to be taken not to overfill the calf’s stomach. A maximum of 1.5 litres should be given via a plastic teat or teat-bucket, as soon after birth as possible. This should be followed by at least two and preferably three additional feeds of the same amount in the first 24 hours.

c) Presence of the Dam

Maximum absorption of antibodies at the same level of colostrum intake takes place when the calf is left in the presence of its mother. Ideally calves should be left with their dams for at least 12 and preferable 24 hours after birth.

Many calves, if left unattended, will fail to suck within the first few hours and will need patient assistance. About 20 minutes is needed for a calf to have satisfied it’s intake.

d) Heifers

In-calf heifers should join the pre-calver group at least four weeks before calving, so they acquire specific immunity to the bacteria present. First lactation heifers tend to be more nervous and lack the mothering instinct of older cows, which may lead to reduced colostrum intake. Calving heifers early in the season, reduces the risk that their relatively susceptible calves will be infected by the calves of
older cows. You should supervise suckling carefully and ensure that the udder is clean before the calf sucks.

Orphan Calves

If the dam’s colostrum is not available, colostrum from other cows can be fed fresh or can be stored, at -18°C to -25°C, for up to 6 months. It is also possible to store colostrum that has been fermented. It is important to remember that:

- fresh colostrum should not be mixed with stored colostrum;
- fresh colostrum should not be diluted with water as this reduces the feed value;
- colostrum should not be heated above 50°C as this destroys the antibodies and denatures the whey protein; and
- frozen colostrum should not be thawed using a microwave, as this also destroys the antibodies.

Note: In some circumstances, such as in the control of Johne’s disease, the use of pooled colostrum may promote the transfer of infection. In such cases, to prevent the risk of the spread of infection in the herd, you should ensure that each calf receives colostrum only from a single animal.

Feeding Stored Colostrum

Trials have shown that good growth rates can be achieved by feeding stored (or fermented) colostrum which significantly reduces the cost of calf rearing. The colostrum can be stored in non-refrigerated bulk tanks for up to eight weeks, but it must be stirred twice daily to prevent it deteriorating. Tanks used must be secure to prevent flies entering. The colostrum thickens when stored for prolonged periods and can be diluted by 50% with warm water.
Purchased Calves

Replacement Calves

Replacement calves from other farms can be the main source of infection in a new outbreak of disease. They can be carriers of disease organisms to which homebred calves have acquired no resistance via their dam’s colostrum. Where practicable, you should isolate purchased calves for a period to check for signs of disease.

If possible, you should purchase calves directly from the farm of origin, which minimises stress and reduces the risk of cross-infection between calves from different environments. You should make every effort to investigate the disease status of the farm prior to purchase. However, many purchased calves are obtained either from livestock markets or via calf purchasing groups. Under these circumstances, it is inevitable that there will have been mixing of animals before they reach the rearing farm.

When purchasing ensure that:

- all calves are at least one week old and are likely to have had an adequate intake of colostrum;
- calves are inspected thoroughly – healthy calves have a shining coat, a supple skin, a clean damp nose and bright eyes; and
- reject calves that:
  - are dull and listless;
  - show signs of diarrhoea;
• have wet or thickened navels (it is illegal to transport calves in which the navel has not completely healed);
• have discharges from the eyes, nose or mouth;
• show signs of heavy breathing; or
• have physical defects.

Management on Arrival

You should put calves into clean, dry, well-bedded pens and rest for a few hours before feeding. The ability of the calf to digest milk substitute at this time may be impaired by stress. Supplementary heating may be required by weaker calves.

Artificial Milk Feeding Systems

The main artificial milk feeding systems are based on feeding either restricted or unrestricted quantities of whole milk or milk substitute which can be fed warm or cold. However, calves are very sensitive to changes in the temperature of the milk substitute when it is fed at blood heat, and day to day variations in the order of only 2 – 3°C can increase the risk of stomach upsets. It is vital that the temperature is measured using a thermometer rather than your hand. Where fed cool the variation is less critical, and feeding milk from 10 – 25°C can be done without problems.

You should not offer milk from cows on antibiotics nor should mastitic milk be fed to calves. Studies indicate that heifer calves offered mastitic milk have the bacteria which cause mastitis lying latent in the developing udder.
Restricted Feeding

This method is usually used where calves are housed singly and are fed from individual buckets.

The Welfare of Farmed Animals (England) Regulations 2000 states that calves must be fed at least twice daily. One feed can be a milk feed where the other is a solid feed. Milk powder is now available which is designed for once a day feeding.

- You should mix milk substitute properly (with a whisk) according to the makers’ instructions. The rate of reconstitution will vary according to the frequency of feeding.
- You should thoroughly disinfect buckets and all mixing equipment after every feed.

You should avoid overfeeding milk substitute as this can lead to scouring. Ensure that the correct amount of milk substitute is fed according to calf size.

Ad libitum (Unrestricted) Feeding

This method is usually used where calves are group housed. They are fed milk substitute via teats. There are 2 main methods of feeding:

a) from a machine that reconstitutes warm milk substitute which can feed up to 40 calves at a time.

b) from plastic containers containing cold acidified milk substitute.

When carrying out this method of feeding:

- allow 6-8 calves per teat;
- you may need to train calves to use the teats, so you will need to observe them carefully to ensure that they are feeding properly;
• teat height is important – it should be 66-70cm above the effective floor;

• you should make concentrate feed and fresh water available close to the teat at all times. Calves will eat concentrates while they are waiting to drink milk; and

• calves tend to urinate soon after drinking. Effective drainage of the area around the machine is essential.

It is vital to prevent bacterial build up in the feeding equipment. You must clean machines daily and disinfect the plastic containers every two or three days.

Liveweight gains to weaning are usually well above those obtained in restricted feeding systems, but over twice as much milk substitute is consumed. The liveweight advantage can be easily lost at weaning time, especially if calves are not consuming sufficient concentrates at weaning time. To prevent this, two weeks prior to weaning the teats should be removed for an increasing period of time until they are only available during the morning.

Concentrates, Water and Roughage

The Welfare of Farmed Animals (England) Regulations 2000 require a minimum daily ration of fibrous food to be provided for each calf over 2 weeks old (a minimum of 100g per day at 2 weeks increasing to a minimum of 250g per day at 20 weeks). The Regulations also state that calves should be given a sufficient quantity of fresh drinking water each day. Clean, bright palatable straw or good quality hay should be freely available to calves prior to weaning.
Weaning

Weaning should normally take place abruptly when calves are eating about 0.75-1.0kg/head/day of early weaning compound for three consecutive days, usually at around 5-6 weeks of age. Calves weaned before 5 weeks of age tend to be less resistant to disease. Where calves are reared on surplus milk, prolonged feeding of milk after 8 weeks is not recommended as it can impair rumen development.

Environmental Factors

Housed calves require a dry, well-bedded, non-crowded, adequately ventilated and draught free environment. Failure to provide these conditions is likely to predispose the animals to disease, the most serious of which is respiratory disease.

Air temperature ranges experienced in England do not present a threat to the health of a strong, well fed calf given a dry bed and draught-free conditions. However good ventilation (a constant supply of fresh air) is essential in preventing respiratory disease, as it removes stale air and moisture vapour from exhaled air, bedding and water spillages. Ventilation should never be restricted in an attempt to raise air temperature. If the required ventilation cannot be achieved then you should use fan ventilation set by manual control (not thermostatic control).

Building Requirements

- individual pens or stalls must allow calves to stand up, turn around, lie down, rest and groom themselves without hindrance and must meet the minimum dimensions specified in the Welfare of Farmed Animals (England) Regulations 2000. Calves may be housed individually to eight weeks of age after which they must be group housed (unless on the recommendation of a veterinary surgeon for treatment purposes);
for group housed calves, the Welfare of Farmed Animals (England) Regulations 2000 require a minimum of 1.5m\(^2\) of unobstructed floor space to be available to each calf under 150kg. Calves of 150kg and over but under 200kg must have at least 2m\(^2\) and calves of 200kg and over at least 3m\(^2\). In practice, these space allowances are readily exceeded;

- air space should be 6m\(^3\) for the baby calf rising to 10m\(^3\) for a 12 week old animal;

- air inlets should be above calf height and baffled by space boarding or other windbreak material. Air outlets should ideally be an open ridge, although slotted or ‘breathing’ roofs can be used in appropriate circumstances. The inlet and outlet areas should be about 0.05m\(^2\) and 0.04m\(^2\) per calf respectively. The outlet should be at least 1.5m above the ventilation inlet;

- pen frontages for controlled feeding should be no less than 300mm/calf;

- wall surfaces should be smooth, impervious and easily cleaned. The Welfare of Farmed Animals (England) Regulations 2000 states that individual stalls or pens (except those isolating sick animals) must have perforated walls to allow calves to have direct visual and tactile contact.

- The Welfare of Farmed Animals (England) Regulations 2000 requires calves to have access to a clean, comfortable lying area which is well drained and well maintained with dry bedding.

- floor falls in pens should be at least 1 in 20 and 1 in 10 below ad libitum milk feeding areas;

- a completely separate area close to the calf house should be provided for feed preparation; and

- the calf house should be cleaned, disinfected and dried between batches.
Calf hutches provide suitable housing for individual calves. Larger hutches can accommodate up to 5 calves, but tethering is prohibited and you should provide an outside run. The hutches should be situated on either free draining concrete or on a porous (e.g. chalk) base ensuring that any effluent goes to a suitable site for disposal. You should provide plenty of clean, dry straw as bedding, which should be disposed of after each batch of calves.

**Grouping**

The greater the number of calves in a single air space, the greater is the risk to health. A calf with respiratory disease can shed millions of infectious organisms from its lungs into the atmosphere. The following guidelines should be adhered to:

- restrict group size to 12 calves. Sick calves can be more easily identified and treated when they are in small groups;
- limit the number of calves in a single air space to 30;
- batch calves according to age and size, except when calves are sucking their dams;
- cattle under six months old should not share the same air space with older animals. Failure to separate age groups increases the risk to vulnerable animals;
- an ‘all in all out’ policy should be practised for purchased calves wherever possible; and
- provide isolated bedded pens for any sick calves.
Management Procedures

Procedures on farm animals must be carried out by trained and competent stock-keepers. Stressful conditions may precipitate outbreaks of disease. The stress of castration, disbudding and removal of excess teats can reduce disease resistance and should not be carried out routinely. If these procedures are necessary, then they should be done when calves are small, healthy, easy to handle and still possess good colostral immunity.

Summary

• calf neonatal mortality and disease has very important welfare implications and is the cause of very substantial economic loss to the agricultural industry;
• calves must be inspected regularly to detect early signs of disease or ill health;
• scouring and respiratory disease are the main reasons for the suffering and loss;
• the correct nutrition of the cow in late pregnancy and good hygiene around calving time are very important;
• the importance of an adequate and timely intake of colostrum cannot be overstated;
• purchased calves should be at least 1 week old when they are brought onto the farm. Only healthy calves should be procured;
• artificial milk feeding systems demand attention to detail. They should only be undertaken by experienced operators;
• weaning is a very stressful time and success depends on calves consistently consuming sufficient amounts of a palatable high quality concentrate feed at this time;
Improving calf survival

- calves should be housed in a dry, well-bedded, spacious, adequately ventilated and draught-free environment;

- calf group size should be restricted to 12 in a pen and 30 in a single air space;

- cattle under 6 months of age should not share the same air space with older animals; and

- castration and disbudding should be carried out by trained and competent stock-keepers and should not be done routinely.
For further advice and information on farm animal welfare

For advice on calf welfare and on any outbreak of disease – consult your veterinary surgeon or your local Animal Health Divisional Office – address and telephone number in your local telephone directory.

General welfare advice on calf welfare may also be obtained from:

- The State Veterinary Service (local Animal Health Divisional Office)
- Specialist consultants

If you would like any further information or advice relating to animal welfare please contact Defra’s Animal Welfare Division on tel. 020 7904 6521.
Other publications available from Defra relating to calf welfare that may be of interest:

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The Welfare of Farmed Animals (England) Regulations 2000 (S.I.2000 No.1870) can be viewed on-line at
or printed copies can be obtained from the Stationery Office at:

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