

BLUEPRINT FOR REARING DAIRY ORIGIN CALVES



CONTENTS

1. Introduction	3
2. Objectives and targets	4
3. Calf procurement	5
4. Nutritional regimes	
4.1. Selection of a milk replacer	8
4.2. Milk feeding systems	11
4.3. Concentrate supplementation	15
4.4. Forage supplementation	17
5. Housing systems	18
6. Health issues	22
7. General management	26
APPENDIX 1	27
References	28
Contributors	29

1 Introduction

Successful calf rearing is critical for profitable dairy beef production. Provision of adequate levels of nutrition and suitable housing are fundamental to ensuring that animal health and welfare are optimised. In addition, with the increase in the proportion of farmers gaining income from off-farm enterprises, increased labour efficiency will be an important factor in all livestock systems. Calf rearing is labour intensive with reports of up to three hours spent per day on calf care on dairy farms in the Republic of Ireland. This constraint on availability of time or labour could have implications for calf health and immunity, as less time is available for individual calf care. The objective of this report is to identify the optimum rearing system for dairy origin calves from purchase at one to two weeks of age through to 15 weeks of age.

2 Objectives and targets

Research evidence has demonstrated that a moderate rate of gain (0.7 kg per day) during the first 12 weeks of life will give a similar lifetime growth rate to a high rate of gain (0.9 kg per day) in this period and at lower cost, due to savings in milk powder and concentrates. Therefore, target growth rates of 0.7 kg per day are recommended for the first 12 weeks of life. In the period from 12 to 15 weeks a target growth rate of 0.8 kg per day is recommended to ensure optimum overall lifetime performance. These targets suit Holstein and continental cross Holstein steers, intact bulls and heifers.

Table 1. Target live weights for Aberdeen Angus/Hereford, Holstein and Continental bull calves sourced from the dairy herd from purchase at one week of age to 15 weeks of age

Age (weeks)	Target live weight (kg)			Live weight gain (kg/day)
	AA/Hereford	Holstein	Continental	
1 week (purchase)	45	48	50	
6 weeks (weaning)	70	73	75	0.7
12 weeks	100	102	105	0.7
15 weeks	117	119	122	0.8

Dawson (2006); Keane (2003)

Summary

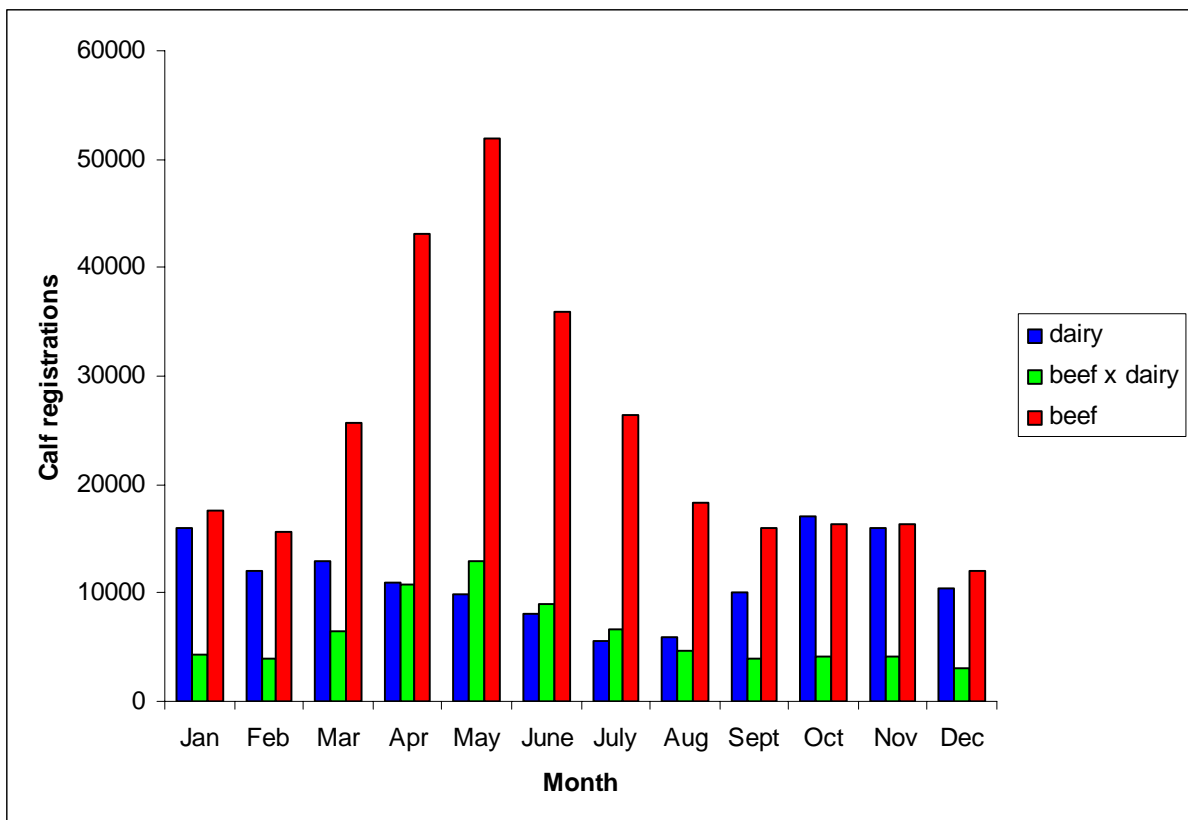
- A target growth rate of 0.7 kg per day is recommended for the first 12 weeks of life.
- A target growth rate of 0.8 kg per day is recommended from 12 weeks of age to 15 weeks of age.

3 Calf procurement

Seasonality of supply

As highlighted in Figure 1, dairy calves (Holstein heifers and bulls) are in greatest supply from October to January with limited availability during the summer months. Beef calves are in greatest supply in April, May and June, although it should be noted that only 20% of the total supply includes beef x dairy calves, the remainder (80%) being suckler beef calves. Overall Figure 1 demonstrates that there will be a plentiful supply of dairy bred calves in the winter months with lower availability at other times of the year.

Figure 1. Seasonality of calf registrations from APHIS



Method of purchase

Calves may be purchased at marts or direct from farms and there are advantages and disadvantages with both methods as outlined in Table 2.

Table 2. Advantages and disadvantages of purchasing calves from marts or farms

	Mart	Farm
Health status	Usually unknown	May be known
Numbers in a batch	Large numbers with plenty of choice	Often low numbers and limited choice
Possibility of purchasing multiple diseases	Moderate to high	Risk significantly reduced
Genetic merit of sire	Usually unknown	May be known
Vaccination policy	Usually unknown	May be known
Colostrum supply	Usually unknown	May be known

Knowledge of farm of origin. Where possible background information on disease status, adequacy of colostrum supply, feeding regime adopted prior to purchase and health measures already taken will be beneficial in ensuring calves are of optimum health status at purchase. A flow chart is included in Appendix I to assist in the evaluation of health status of calves purchased directly from farms. The flow chart indicates that calves should preferably be purchased from farms which are free from or have control programmes in place against economically important diseases e.g. calf scour, BVD or IBR. Herds which are members of the AFBI Cattle Health Scheme or any other health schemes (especially for BVD and IBR) should be considered.

Other considerations

- Irrespective of where the calves are sourced it is essential that all calves have received a minimum of 2 litres of colostrum within the first 6 hours of life and a further 2 litres within 12 hours. This will require 20 minutes of continuous suckling to consume sufficient colostrum from the cow. However it is very difficult to evaluate whether calves have received adequate colostrum from visual appearance. A simple test is available through the veterinary laboratories which involves the veterinary surgeon taking a blood sample from the calves and measuring the amount of immunoglobulins in the blood. However, for this test to be effective it must be undertaken within seven days of birth. For further details see Chapter 6.

- Age at purchase. Calves should not be moved from the farm of origin until they are at least seven days of age and the navel is completely healed. Consistent batches of calves of similar age from one source would be the ideal purchasing method.
- AA and Hereford calves may obtain a bonus payment at slaughter provided certain conditions are met. It is advisable to check requirements with the processor before calves are sourced.
- When purchased calves arrive at the home farm they should be inspected individually for signs of ill-health. Only healthy calves that have a shining coat, bright eyes and a clean moist nose should be purchased. Calves should be rejected if they are dull and listless, show signs of diarrhoea, have wet or thickened navels, are breathing heavily or if they have discharges from the eyes, nose or mouth. Purchased calves should be housed in clean, dry, well bedded, well ventilated pens and adequate clean fresh water should be made available.
- After arrival each calf should be offered a warm drink of electrolyte solution in 2 litres of water. Milk is best withheld until the following day.

Summary

- Calf availability will be significantly lower during the summer months
- Ideally calves should be sourced directly from farms of known health status
- At purchase calves must be at least seven days of age and the navel must be completely healed
- Only healthy looking calves should be purchased
- If a breed specific market outlet is intended, check requirements promptly with processor as scheme requirements may vary

4 Nutritional regimes

4.1 Selection of a milk replacer

Due to cost, availability and ease of management milk replacer will be the choice of the majority of calf rearers focused on beef from the dairy herd. The choice of milk replacer for many will ultimately come down to price but there are other important factors to consider when choosing a milk replacer.

Skim versus whey

Good quality skim based milk replacers contain between 40-60% skimmed milk powders and are suited to both once and twice per day feeding. Whey-based milk replacers can perform equally as well as skim-based milk replacers but are best suited to twice per day feeding particularly in the first two to three weeks of life. Purchase of an acidified milk replacer has been shown to reduce the incidence of scour.

Protein/Fat Content

The industry norm of 20-23% protein in milk replacer is adequate to sustain optimum growth of dairy bred calves with research carried out at AFBI Hillsborough showing no benefit of increasing protein levels beyond 23%. Protein concentration below 20% will reduce live weight gain and impact on the composition of weight gain.

Protein quality can be an issue particularly in the first three weeks of life, so use a milk replacer containing mainly milk derived protein during this period. After two to three weeks of life milk replacers containing increased levels of plant derived protein such as wheat gluten are adequate.

Fat content generally reflects the energy content of the milk replacer and therefore the higher the percentage, the higher the energy content and the greater the performance of calves. Generally milk replacer fat/oil levels range between 16-22%. There is some evidence to suggest that higher fat milk replacers may delay concentrate consumption and therefore weaning so a balance is needed to allow for early weaning.

Additional ingredients in milk replacers

Many modern milk replacers claim to have products designed to promote calf well being through reduced scour, increased appetite and increased rumen development. However for many of these products, conclusive experimental evidence to reinforce these claims is limited with some studies showing positive results and other showing no effect. In general, none of these commonly used products have been detrimental in term of calf health and performance so should not be a criterion used to disregard any particular milk replacer.

Milk replacer feeding levels

The quantity of milk replacer and concentrate offered to calves will determine calf growth rate in the period until weaning. Higher milk replacer feed levels will encourage higher growth rates during the milk feeding period but will reduce concentrate consumption potentially causing a greater post weaning reduction in calf growth rate. With current high costs of milk replacer an early weaning approach is desirable therefore typical milk replacer intakes for calves purchased at 2 weeks of age until weaning at six weeks of age should be between 13 to 16 kg. This system is designed to feed a low amount of milk replacer and promote solid food intake but it is critical that high levels of animal husbandry are maintained and calves are consuming 0.7 kg of concentrate per day prior to weaning.

Milk replacer manufacturers usually provide guidelines for mixing, feeding temperatures and preparing milk replacers. However Table 3 gives a basic feeding guide assuming calves are purchased at an average age of one to two weeks, weaned at six weeks of age and offered milk replacer once per day from week one after arrival.

Table 3 Basic feeding guide for calves purchased at an average age of two weeks of age until weaning at six weeks of age.

	Time period	
	Arrival @ 2 weeks of age to 3 weeks of age	Three weeks to weaning @ 6 weeks of age
Mixing rate (g/l)	125	167
Amount fed per calf per day (l)	4	3
Frequency of feeding	Twice per day	Once per day
Total milk replacer fed per calf (kg)		14-18
Total concentrate fed (kg)		20-30

Summary

- An acidified milk replacer containing 20 to 23% protein and 18 to 20% fat should be purchased.
- Calves should be offered 13 to 16 kg of milk replacer from purchase at 2 weeks of age until six weeks of age.
- Calves should only be weaned when they are consuming at least 0.7 kg concentrate per day for two consecutive days.

4.2 Milk feeding systems

Good management is integral to all calf rearing systems irrespective of which feeding system is adopted. Fresh water and forage should be freely available and calves should have access to a starter concentrate.

Individual feeding systems

Individual feeding systems allow greater individual calf care, but are labour intensive. Generally individually reared calves have less incidence of disease such as pneumonia. This has been attributed to the fact that with group-fed calves, the common teat is a source of cross infection in addition to the ability of the disease to spread rapidly in group-housed systems.

(1) *Bucket reared.*

In this system calves are housed individually or housed in a group of 3 to 4 calves and fed individually via a bucket system. The milk replacer can be offered once per day – 500 g milk replacer in 4 litres of water or twice per day – 250 g milk replacer in 2 litres of water at each feed.

(2) *Teated buckets.*

Teated buckets allow calves to perform natural sucking behaviour so that they are less likely to spend time sucking on other objects in the pen or each other. The use of a teated bucket also ensures that the oesophageal groove is closed when drinking and milk passes to the abomasum rather than the rumen which can happen in bucket fed calves. The principle of this system is the same as a bucket rearing system, i.e., individually fed once or twice per day.

Group feeding systems

Individually feeding calves using a bucket or a teated bucket system is suited to systems rearing small numbers of calves. As group size increases the use of group-feeders should be considered. Group-feeders range in complexity from a simple bucket-type feeder fitted with 3 to 10 teats to computer-controlled automatic feeders. Group-feeding systems have been shown to encourage calves to start eating concentrate at an earlier age than calves in individual pens which assists in minimising the post-weaning growth check. The main factor influencing choice of

group feeding system is cost and potential labour savings as there is little evidence to indicate major differences in calf performance between systems.

(1) *Bucket-type group feeders.* These allow calves to be fed in groups and range from 3-teat feeders to 10-teat feeders. This system is suitable to rearing smaller groups of calves i.e., from three up to 20. The feeders are supplied with or without separate compartments. The advantage of the compartmentalised feeders is that they ensure that each calf receives the allocated amount of milk replacer. As for bucket reared and teated buckets, the milk replacer can be fed once or twice per day with this system.

(2) *Mobile group feeders.* These feeders consist of a barrel type container which is filled with milk replacer and fitted with up to 30 teats. This works on the same principle as bucket-type group feeders but allows larger group sizes to be fed. These feeders can be purchased relatively cheaply and do not require modification of existing buildings. Research at AFBI, Hillsborough has demonstrated a two thirds reduction in labour input associated with feeding calves once per day via a mobile group feeder designed to feed 30 calves relative to a twice per day, bucket-fed system.

(3) *Computer-controlled automatic feeders*

In this system calves can be kept in groups of up to 30. These feeders offer restricted amounts of milk replacer at various times throughout the day with a transponder on the calf used to initiate feeding. The main advantage of this system is the reduction in labour inputs, with estimates of time spent on calf care reduced to one minute per calf. However, these feeders have very high initial capital investment and there is no scientific evidence to indicate any significant effect on calf performance relative to bucket-fed systems or mobile group feeders.

(4) *Ad libitum group feeders.*

Ad libitum group feeders offer calves free-access to milk, 24 hours a day and intakes can be as high as 16-18 litres milk replacer per calf per day. However, calf performance can be very variable as strong calves tend to obtain more milk and as concentrate intakes are lower during the pre-weaning period there tends to be a post-wean lag in growth.

Once versus twice a day feeding

Research evidence indicates that calves fed milk replacer once per day, at the same time each day, have similar performance to those fed twice per day and labour inputs can be reduced by up to 25%. It is important however not to compromise on calf health inspection and calves should be checked at least twice per day for signs of ill-health. There is no evidence of increased incidence of scour with once a day feeding provided the calves are not offered large quantities of liquid, i.e., more than 4 litres.

Feeding systems to reduce labour requirements

Group feeding once per day

Results presented in Table 4 indicate that a Low Labour Feeding System which includes group feeding calves once per day through a mobile group feeder can reduce labour input costs by up to 60% without significant negative effects on animal performance relative to a Standard Feeding System which involves individually feeding calves twice per day using buckets.

Table 4. Comparison of once per day group-feeding through a mobile group feeder with twice per day individual-feeding using buckets

	Low labour	Standard	Diff Low Labour vs Standard
	Once per day group feeding through mobile group feeder	Twice per day individual feeding using buckets	
Live weight (kg) at 11.5 months of age	310	321	-11
Live weight gain (kg/day) start to 11.5 months of age	0.78	0.82	-0.04
Labour input (hours/week/50 calves)	12	33	-21
Labour costs (£)*	864	2376	-1512
Value of calves at 11.5 months (£) †	12,800	13,350	-550

Dawson (2008)

* assume labour cost of £12/hour (DARD Farm Business Data, 2006), 6 week rearing period, rearing 50 calves. † assume value of calf equal to £1/kg, 50 calves

Weaning criteria

Age at weaning

The main criterion to be considered when deciding at what age to wean is stage of rumen development. The calf must be able to obtain sufficient nutrients from the dry feed it consumes after weaning. As a general rule, the calf should be consuming approximately 0.7 kg concentrate per day by six weeks of age to minimise a post-weaning check on growth. Calves which are not consuming 0.7 kg of concentrates/head/day at weaning should be given milk replacer for a further week. Weaning calves as early as four to five weeks saves labour and feed costs. However, calves weaned at four weeks of age require more individual attention relative to weaning at six weeks of age.

Abrupt versus gradual weaning

Provided the rumen has developed sufficiently prior to removal of milk feeding, there is limited evidence to indicate any difference between abrupt weaning and gradual reduction in milk intake. However, gradual weaning can reduce the stress of weaning particularly at feeding time as the calf is expecting milk to be fed.

Summary and recommendations

- For rearing small groups of calves (up to 20 calves) a bucket-type group feeder is recommended for example, two, 10-teated group feeders.
- As group size increases above 20, mobile group feeders facilitate feeding of calves and have the advantage of significantly reducing labour inputs with minimal capital outlay and produce similar performance to other feeding systems.
- Computer-controlled automatic feeders can also significantly reduce labour inputs particularly for larger groups of calves. However, careful consideration should be given in view of the high initial capital investment of these feeders.
- Once a day group-feeding, through mobile group feeders significantly reduces labour inputs and animal performance is similar to calves fed individually twice per day using buckets
- Calves should be weaned abruptly at six weeks of age and should be consuming approximately 0.7 kg concentrate per day.

4.3 Concentrate supplementation

In early life the calf is predominantly a monogastric, but as time passes the rumen and its functionality develops for the animal to become a ruminant. Solid foods are required to aid and speed up this transition and this is primarily facilitated through calf starter concentrates. From two to three weeks of age solid food intake will begin to increase and by six weeks of age all calves should be consuming a minimum of 0.7 kg of starter per day. This level of intake indicates adequate rumen development allowing the calf to be weaned off milk.

There are a wide range of calf starter concentrates available on the market, but Table 4 shows the typical nutrient composition of a high quality starter concentrate.

Table 5. Typical Calf Starter Nutrient composition

Chemical property	Percentage on fresh basis
Protein	18.2
Ash	6.0
Starch	25.0
Metabolisable energy	11.0 MJ/kg

The starch component of cereal based starter rations ferments in the rumen to provide the main drivers for rumen development. These drivers in combination with a forage source such as hay or straw facilitate optimum rumen development in preparation for the ruminant diet.

Not only is solid food intake needed to stimulate rumen development but water is a requirement that should be available at all times from birth. Water contained in milk is not enough as this will bypass the rumen not supplying the materials needed for the bacteria to grow therefore slowing rumen development.

The choice of starter for many will come down to price but there are two main types that are commonly used with calves:

- Coarse mixes
- Pelleted starters

Historical opinion was that coarse rations with visible flaked maize inclusion were a necessity in calf rearing. Trial work has shown although intakes can be slightly higher with coarse rations, animal growth is similar with a pelleted ration therefore feed intake to weight gain efficiency is greater with pellets. Additional benefits with the pelleted ration are reduced dust, consistent consumption of feed ingredients and an increase in free flow properties that suits both bulk storage and automated feeding systems.

Palatability is an important factor when choosing a starter as the intake by the calf determines at what stage weaning can occur and therefore impacting on the cost of production. Molasses inclusion boosts palatability with the added benefit of controlling dust so an inclusion level of approximately 5% is recommended. Finally feeding meal, as opposed to coarse rations or pellets, or high level of fines in the starter will impact on palatability and delay rumen development and therefore should be avoided.

Summary

- Calf starter should be offered from 3 days of age along with water
- A key issue with the starter is to ensure it is clean, dry and available
- An intake of 0.7 kg per calf per day should be achieved by six weeks of age
- Pelleted starter or coarse mixes can be used resulting in similar performance

4.4 Forage supplementation

While forage consumption by calves in the pre-weaning period is low, fibrous material is required to encourage rumen development. Good quality hay or straw should preferably be fed from a rack rather than relying on calves picking up straw from the bedding. Access to too much hay may lead to some calves becoming pot-bellied, consideration should be given to feeding barley or oat straw instead.

After weaning, at six weeks of age, calves should be offered high quality grass silage (D-value 700 g/kg, ME 11.5 MJ/kg DM) *ad libitum* plus concentrates *ad libitum* until a target intake of 2 to 2.5 kg/day is achieved depending on silage quality and target growth rate.

Summary

- For pre-weaned calves straw or hay is best fed from a rack.
- Post-weaning, calves should be provided with *ad libitum* access to high quality grass silage

5 Housing systems

Irrespective of house design, calf accommodation should be clean and comfortable. Animal Welfare Regulations (see list given in References) state that

- Calves must have access to a clean comfortable lying area which has a facility to collect potential runoff or washings.
- Wall surfaces should be smooth, impervious and easily cleaned.
- Pens (except those isolating sick animals) must have perforated walls to allow visual and tactile contact.
- Provision must be made for isolated bedded pens for any sick calves. These must have their own air space and it is best if these pens are in a separate house.
- Infections may be minimised by using an all-in / all-out policy and cleansing and disinfecting between batches using an approved disinfectant. Pens are best left empty for at least two weeks before restocking.

Individual pen size for calves

Calves should not be housed in individual pens after eight weeks of age. In individual pens the calf must be able to stand up, lie down, turn around and groom itself without difficulty. The sides of the pen should be designed to allow calves direct visual and physical contact with at least one other calf. Table 5 outlines pen size requirements for calves housed in individual pens.

Table 6. Pen size for calves housed in individual pens

Calf live weight (kg)	Width (mm)	Length (mm)
Up to 60	1000	1500
Over 60kg and up to 80kg	1000	1800

BS 5502

Grouping housing

Group housed calves up to 150kg require an individual space allowance of at least 1.5 m². Pens should be dry with good drainage and a back to front slope of at least 1 in 20 and 1 in 10 below milk feeding areas. Young stock should not be housed in the

same airspace as older stock to prevent disease spread. Table 6 indicates the recommended bedded area allowance for group-housed calves.

Table 7. Recommended bedded area for loose calves

Calf live weight (kg)	Area per head (m ²)
60	1.5
85	1.8
140	2.4

BS 5502

There is a recommendation that calves under 8 weeks old should be kept in groups of 12 or fewer animals. Calves ages 8 weeks to 6 months old should be kept in groups of no more than 20 animals. Also no more than 40 calves should be sharing the same airspace. Smaller groups aid identification of sick animals and help ensure equal diet consumption by individual calves.

Lighting

Ideally the calf house should have natural lighting with a source of artificial light when required. If artificial lighting only is available then The Welfare of Farmed Animals Regulations (Northern Ireland) 2000 states that artificial lighting should be provided for a period at least equivalent to the period of natural light normally available between 9.00 am and 5.00 pm.

Ventilation

Calves require good ventilation without drafts to reduce the spread of airborne pathogens from calf to calf and assist in the removal of noxious odours. Two main methods of ventilation exist – natural ventilation provided by the building design such as air inlets/outlets, doors and roof height and artificial ventilation provided by fans, or air ducts . Table 7 indicates the recommended minimum air space per calf with either natural or fan ventilation.

Table 8. Minimum air space for housed calves

Calf live weight (kg)	Cubic Capacity per head (m ³)
60	6
61-85	10
86-140	13

BS 5502

Air inlets should be above calf height and baffled by space boarding or slotted material to prevent drafts at calf level. Air outlets should be a ventilated ridge design. Roof material should be “breathable” ideally concrete fibre and not tin. The inlet and outlet areas should be 0.05 m²/calf and 0.04m² per calf respectively. The outlet should be at least 1.5m above the ventilation inlet.

There is a recommended optimum temperature range for calves under 8 weeks of 7°C to 30 °C. Optimum ventilation rates are stated for calves under 12 weeks old as 40m³/hour/calf in the winter and 100m³/hour/calf in the summer.

Rearing calves outdoors

Relative to rearing calves indoors, rearing spring-born calves outdoors reduces labour requirements, reduces the risk of respiratory disease and produces a similar performance. Prior to turnout to a dry sheltered paddock calves should be reared indoors on a teat for the first 10 to 14 days. Once outdoors, calves should be fed once a day from a barrel with a number of teats, a nipple bar or a steel trough. For the first 7-14 days outdoors, calves should have access back to a loose house (for shelter from worst of the weather). At 3-4 weeks of age, calves should be moved onto another sheltered paddock with a sward height of seven to ten cm. Fresh grass should be provided at least once per week and clean straw or hay must be provided for the calves.

Summary

- Calf accommodation should be clean and comfortable at all times
- Calves should not be housed in individual pens after eight weeks of age

- Group-housed calves up to 150 kg live weight require an individual space allowance of at least 1.5 m²
- Good ventilation without drafts is required to prevent spread of disease
- If natural lighting is not available during daylight hours, artificial lighting should be provided.
- Calves reared outdoors in dry sheltered paddocks reduce labour requirements and incidence of respiratory disease.

References

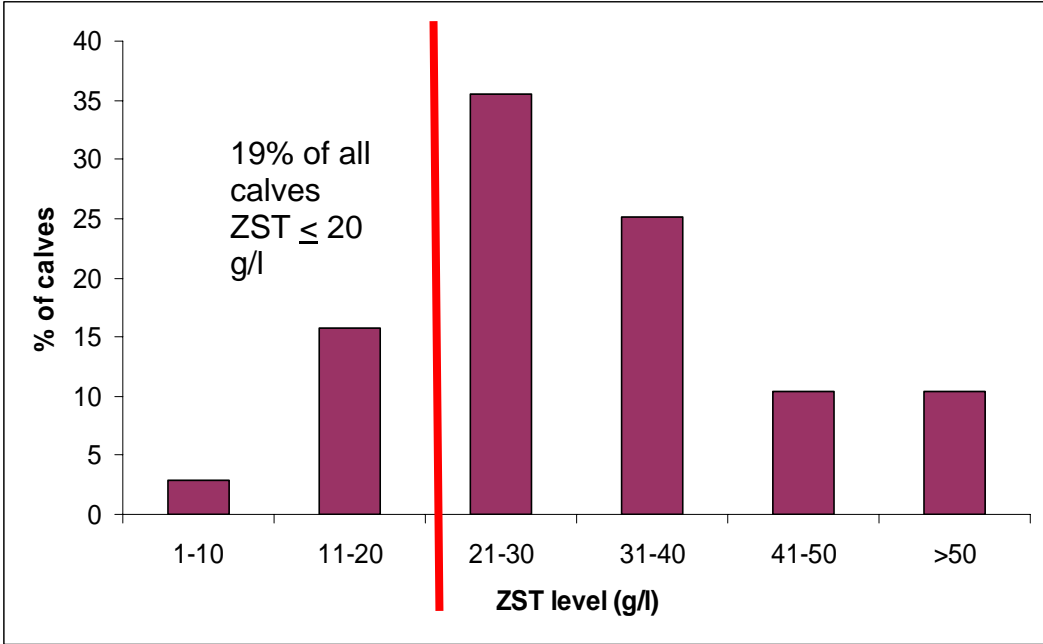
British Standard 5502 Buildings and structures for agriculture Part 40:2005 Code of practice for design and construction of cattle buildings.

<http://www.dardni.gov.uk/cattle-welfare-code.pdf>

6 Health issues

The consumption of an adequate quantity of colostrum is vital to calves obtaining the best possible start to life and in providing calves with the resistance to fight off infections. This is especially important for calves transferred from farm to farm for rearing either directly or via markets (where exposure to infectious agents is greater). Thus if possible calves should be bought from those farms where one can be confident they have received adequate colostrum. The colostrum intake of calves can be assessed by undertaking a ZST (zinc sulphate turbidity) test on a blood sample taken from the calf within 10 days of birth. Ideally calves should have a ZST greater than 20 g/l indicating adequate absorption of colostral antibodies helping to ensure optimum calf health and survival. It should be remembered however that colostrum only contains antibodies to those diseases to which the dam has been exposed. Research undertaken at AFBI, Hillsborough has demonstrated up to 19% of calves sourced from dairy farms in Northern Ireland have received inadequate levels of colostrum as indicated from an analysis of their immune status (Figure 2).

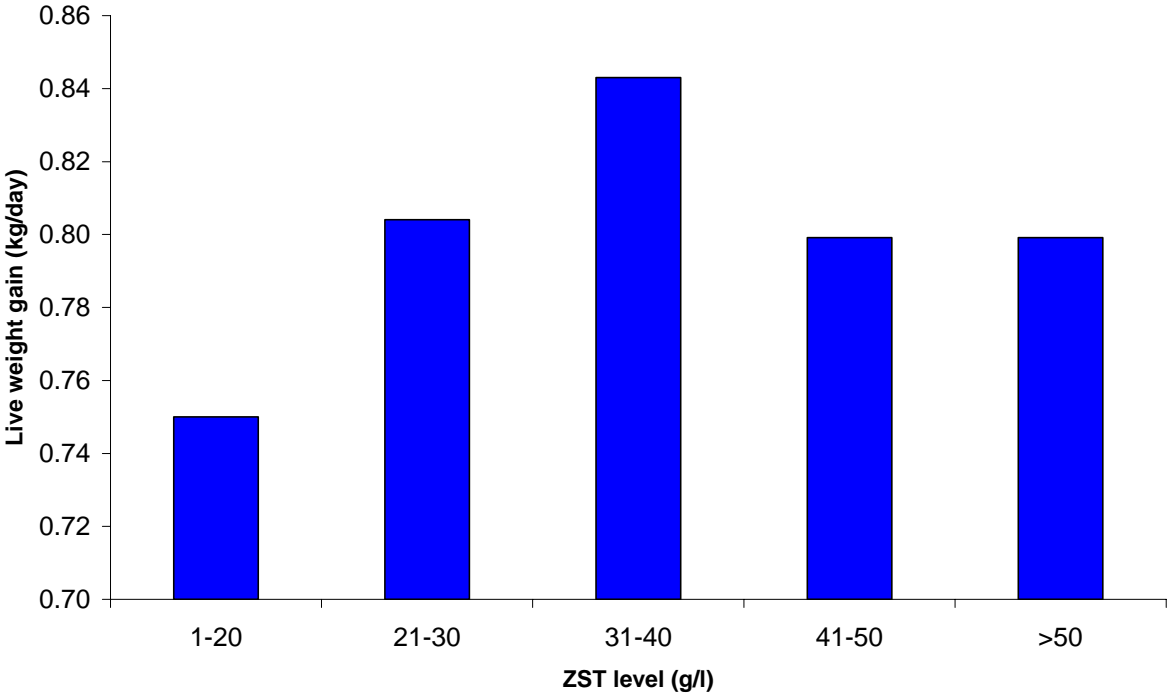
Figure 2. Immune status of spring-born Holstein and beef x Holstein bull calves sourced from dairy farms in Northern Ireland



(Source: Dawson and Morrison 2008)

Evaluation of the performance of the calves also indicated that those calves with poor immune status had lower live weight gains relative to those which had received adequate colostrum (Figure 3).

Figure 3. Relationship between calf immune status and performance up to 9 months of age



(Source: Dawson and Morrison 2008)

Stress at purchase time also increases the risk of disease. The levels of stress are often greater in calves bought from markets than in calves bought directly from farm. Shorter journey times, less mixing of calves and prevention of hunger / thirst on purchase day will also reduce the stress levels of calves.

Calf mortality should not exceed 3% in the period before weaning. The commonest causes of mortality are diarrhoea and pneumonia. Frequent observation of calves including at feeding time is vital to detect early signs of these and other diseases.

Calf diarrhoea

Calf diarrhoea is the commonest cause of calf mortality prior to weaning. Diarrhoea may occur due to nutritional reasons or it may be caused by infectious organisms.

Nutritional scours are often caused by management factors such as overfeeding, variable feed volume, variable milk temperature, variable feeding times or the incorrect mixing of milk replacer. To minimise the risk of nutritional scour it is important that feeding times each day do not vary and that recommendations regarding the mixing of milk replacers are followed rigidly.

Common infectious causes of diarrhoea include *E. coli*, *Salmonella*, rotavirus, coronavirus and cryptosporidium. Inadequate colostrum intake, stress and poor hygiene contribute to the severity of scour outbreaks. Pathogenic *E. coli* infections usually cause watery diarrhoea in very young calves from about 15 hours to three days of age. Therefore due to the greater age of calves purchased for rearing, pathogenic *E. coli* infections are less of a problem. Rotavirus is a common cause of diarrhoea in both dairy and beef suckler herds and it usually affects calves from about 4 days to 2 weeks. It should be noted that the transit of calves through markets increases the likelihood of exposure to *Salmonella*. Scouring calves should initially be taken off milk and fed with electrolyte solution. If the diarrhoea has not stopped within 24 hours or in cases where the calf is severely dehydrated veterinary advice should be sought. Where *Salmonella* or *Cryptosporidium* is suspected veterinary advice should be sought immediately. The submission of faecal samples from scouring calves to the veterinary laboratory will allow an accurate diagnosis to be made.

Coccidiosis is a common cause of diarrhoea in older calves from one month to one year old although infection may be seen in calves as young as two weeks. Infection may occur in contaminated conditions such as damp, dirty straw bedding indoors or around feeding and drinking troughs contaminated with faeces outdoors. Diarrhoea is sometimes accompanied by straining and blood may frequently be observed in the faeces. Veterinary advice on treatment should be sought and attention should be paid to the hygiene of calf pens and the cleanliness and positioning of feeding troughs.

Calf pneumonia

Calf pneumonia is an important cause of mortality or poor growth rates. Pneumonia can occur under any climatic conditions but it occurs most frequently in still, clammy

weather. Outbreaks of pneumonia occur more frequently when calves are housed in poorly designed, poorly ventilated houses, with high stocking rates and where young calves are housed in the same airspace as older cattle. Reducing stress is an important factor in minimising the possibility of a pneumonia outbreak. Early signs of pneumonia include dullness, loss of appetite, a runny nose, coughing and rapid breathing. Veterinary advice should be sought immediately.

A pneumonia vaccination programme should be considered on farms with a history of pneumonia. There are a range of vaccines which can be used depending on the viruses which are present on farm. A vaccination programme can be designed in consultation with your veterinary surgeon.

Summary

- The consumption of an adequate quantity of colostrum is vital to calves obtaining the best possible start to life. The colostrum intake of calves can be assessed by undertaking a ZST test on a blood sample taken from the calf within 10 days of birth.
- Calf diarrhoea is the commonest cause of calf mortality prior to weaning.
- Early cases of diarrhoea require treatment with electrolyte solution but veterinary advice should be sought for more severe cases.
- Where problems persist, diarrhoea samples from calves pre-treatment should be submitted to a veterinary laboratory to obtain an accurate diagnosis.
- Veterinary advice should be sought on calf treatment and vaccination programmes where calf pneumonia is a problem. Attention should also be paid to calf housing and stocking rates.

7 General management

Routine husbandry procedures such as disbudding and castration should only be carried out by skilled stockmen. These operations should be carried out on young easily-handled calves to reduce stress.

Dehorning/Disbudding

Disbudding should only be carried out by a trained and competent stock keeper. The preferred method of disbudding is the use of a hot disbudding iron. Disbudding should be performed before calves are 4-6 weeks old. Local anaesthetic should be given 5 to 15 minutes before disbudding.

Castration

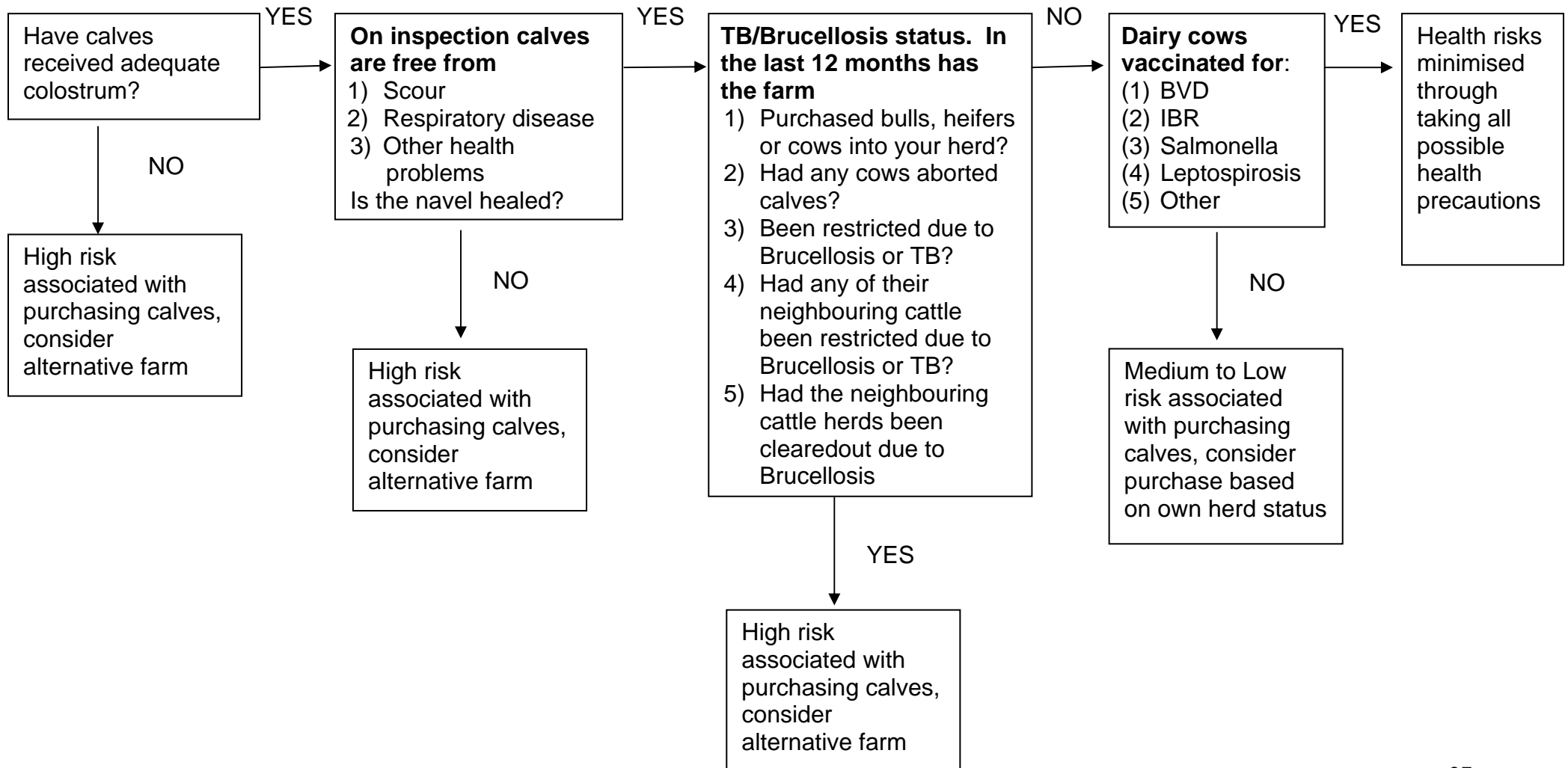
Young calves may be castrated by rubber rings or by using the burdizzo bloodless castrator. A rubber ring may only be used during the first week of life. Calves may be castrated by burdizzo without anaesthetic up to two months of age. It is important that the burdizzo is in good working order and is properly applied. Older calves may be surgically castrated by a veterinary surgeon.

Summary

- Routine husbandry procedures such as disbudding and castration should be carried out early in life and only be performed by trained and competent stockpersons

APPENDIX 1

HEALTH RISK STATUS ASSOCIATED WITH PROCUREMENT OF DAIRY BRED CALVES DIRECTLY FROM FARMS



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