



## agriculture & rural development

Department:  
agriculture  
& rural development  
**PROVINCE OF KWAZULU-NATAL**

# DAIRYING IN KWAZULU-NATAL

## Calf Rearing

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Webster (1984) described the lot of the dairy calf as being routinely submitted to more insults to normal development than is any other farm animal. It is taken from the mother in the first four days of its life. It is deprived of its natural first food, whole cow's milk, and fed one of a variety of cheaper liquid substitutes for milk. However, since milk replacers are still very expensive as compared with solid foods in which the energy comes principally from carbohydrate, the calf is usually weaned onto these solid feeds as quickly as possible. In view of all these insults, it is obvious that the first essential of good calf husbandry is to keep the dairy calf alive and fit enough to perform well later on.

Many systems have been developed to rear calves. There is no "best way". Many combinations of feeding, housing and management can be successful in the right hands and on the right farm. For any rearing programme to be successful, certain basic principles, which are outlined in this chapter, must be applied. For the purposes of this leaflet, 'calf rearing' refers to milk-fed calves. 'Heifer rearing' refers to replacement stock weaned from milk.

### **CALVING**

Dairy cows should calve in small sheltered paddocks separate from other livestock. Use of these paddocks should be rotated to avoid an excessive bacterial build-up. Alternatively, where there is a disease problem, or when there is adverse weather, dairy cows should calve in maternity boxes (3,6 x 3,6m) which must be disinfected after each calving. Ensure there are no sharp objects, on which the calf or the cow, can injure itself, in the maternity box. Supply fresh bedding, which must be burned after use, for each calving.

The cow's first act after calving is to lick the calf dry. This not only establishes a bond between mother and her offspring, but also reduces the risk of the calf becoming severely chilled through excessive heat loss from the evaporation of the foetal fluids. The stockman should be prepared to give the calf a good rub down, especially in cold weather, if the cow is unable to lick the calf dry. Once the calf is dry, and has had its first feed, it's ability to resist cold becomes very impressive, provided that the calf does not become saturated again. The stockman should clean the foetal membrane from the calf's nose and mouth, rub the calf dry, and then disinfect the navel with a 20% iodine solution.

## COLOSTRUM FEEDING

The importance of colostrum to the calf cannot be too highly emphasized. Its high nutritive value ensures that the calf has the best possible start to life. Colostrum is also the calf's sole source of protection against the bacterial diseases which it is likely to encounter in early life.

Research has shown that the rate of absorption of the protein antibodies, which confer immunity, and are obtained from the mothers milk, is greatest during the first six hours after birth. The calf should suckle its dam for at least the first 24 hours of its life. The suckling of colostrum from, or in the presence of, the dam has been found to be most effective for the absorption of antibodies. The stockman should ensure that the calf has a good feed of colostrum within the first eight hours. Apart from containing antibodies, colostrum also has the following properties:

- It is rich in energy, having a high oil content, and energy is more important to the calf than is protein at this stage of life.
- It is rich in vitamins, particularly vitamin A, which is essential for the efficient development of the lymphatic system and epithelium tissue, which are vital for the animal to resist disease.
- It has a laxative effect, which is essential to clear out the calf's digestive tract in the first few days of life.

Colostrum intake has been shown to be the single most important factor in calf rearing, because calves that receive inadequate colostrum are liable to excessive disease. In excess of 40 % of calves left with their dams have been found to receive inadequate antibody protection, due to poor colostrum intakes soon after birth. This results in high calf losses. The effect of the colostrum status of calves on disease is shown in Table 1, emphasising the importance of colostrum to the newly born calf.

**Table 1. Typical colostrum status of purchased calves with related health and mortality data (for 2206 calves) (Wilson & Brigstocke, 1981)**

Colostrum test results	Calves %	Mortality %	Scours %	Pneumonia %
Little or none	20,4	7,9	42,2	5,2
Some, but inadequate	37,0	3,0	24,2	3,2
Adequate	42,6	1,3	5,4	2,4

Webster (1984) thought that one of the reasons for poor suckling behaviour is that the modern Holstein-Friesland cow's udder is altogether the wrong shape, so that the newborn calf often has extreme difficulty in finding a teat, since teats tend to be much closer to the ground than the calf instinctively expects it to be. It is therefore essential to ensure that the calf receives adequate colostrum within the first eight hours after birth. Bottle feed or stomach tube all calves, if necessary, to be safe. Administer 1,0 litre of colostrum, at a temperature of 37° C, four times in the first 18 to 24 hours of life. It is important to remember that in a newborn Holstein-Friesland calf, the capacity of the abomasum is about 1,5 litres and that of the reticulo-rumen about 1 litre.

This means that feeding more than 1,5 litres will cause milk to overflow into the undeveloped rumen and will cause scours.

Colostrum is not only a source of antibodies, but is also food for the young calf. If no colostrum is available from the dam or another cow, the following mixture may be substituted:

One whipped egg

0,3 litre water

0,6 litre whole milk

0,25 ml castor oil

Feed this mixture 3 times daily for the first 4 days of the calf's life, and in addition, administer an injection of vitamin A. In addition, a daily injection of a tetracycline antibiotic has been found to be successful in reducing calf losses when no colostrum is available. Ideally, a quantity of frozen colostrum should be available on the farm. Freeze in plastic packets, each sufficient for a single feed.

#### **LIQUID FEEDING PERIOD**

The amount of milk to be fed depends on the size of the calf, and is usually 8 to 10% of its birth mass. Do not overfeed because this may result in digestive upsets and scours. The volumes of milk required for different growth rates are given in Table 2.

When restricted levels of milk are fed, or "high dry matter" milk replacers are used, the calf will get insufficient liquid in its feed for its daily requirements, and water must be freely available. Remove the concentrates and water for half an hour during and after feeding milk (or milk substitute), otherwise calves may engorge themselves on these, resulting in bloat.

#### **whole milk feeding**

Care must be taken not to overfeed calves, especially during the first three weeks of life, otherwise diarrhoea may result. The number of feeds per day will depend upon the volume fed, the maximum permissible volume per feed being 2 litres for Holstein-Friesland calves and proportionately less for other breeds. The total volume of milk fed per day will depend upon the growth rate desired for the calves (Table 2), and the amount of milk the farmer is prepared to allocate to the calves. The potential income from the sale of milk fed to calves has led to a system of early weaning with the objective of weaning the calf onto solid foods by six weeks of age, thereby saving on milk, when compared with an 8 to 12 week conventional system.

Ideally milk should be fed at body temperature, 37° C, or, if this is not possible, at a consistent temperature, and at the same time every day.

The use of teat feeding compared with bucket feeding is a hotly-debated topic. Physiologically, teat feeding should be better, but this has not always been shown in practice. Buckets have the advantage of being far easier to clean and to disinfect, reducing the incidence of scours. It must be remembered that calves have to be taught how to drink from

buckets. This is done by gently guiding the head of the calf into the milk by allowing it to suck one's fingers, previously dipped into the milk.

To ensure early weaning it is necessary for the calves to start eating concentrates at an early age. The calf can be encouraged to eat by rubbing a little of the concentrate mixture on to its muzzle, or by putting a small amount into the bucket just before the calf has finished drinking its milk.

**Table 2. Milk requirements, in litres, for different growth rates (after Roy, 1980)**

Livemass (kg)	Maximum voluntary intake		Maintenance only (l/day)	Maintenance + gain (kg/day)		
	Dry matter	Liquid		0,25	0,50	1,0
20	0,65	5,1	1,5	2,7	3,8	-
30	0,90	7,1	2,1	3,2	4,4	6,9
40	1,10	8,7	2,5	3,7	4,8	7,6
50	1,30	10,2	3,0	4,2	5,3	8,3
60	1,50	11,8	3,4	4,6	5,7	9,0
70	1,65	13,0	3,9	5,0	6,2	9,6
80	1,80	14,2	4,3	5,5	6,6	10,2
90	1,90	15,0	4,7	5,9	7,0	10,9
100	2,00	15,8	5,5	6,3	7,4	11,5

### **Eight week weaning (Conventional system)**

Feed the calf whole milk at 8 to 10% of its birth mass per day (Table 3) for 8 weeks. The quantity of milk fed can be reduced gradually from the fourth week of age, depending upon the desired growth rate.

Calf starter meal (19% CP; 12,6 MJ/kg DM), good quality hay and water must be available after the first week.

**Table 3. Liquid feeding levels for eight week weaning**

Breed	Quantity (l/day)
Holstein-Friesland	4,0 to 4,5
Ayrshire or Guernsey	3,0 to 3,5
Jersey	2,0 to 2,5

**Five week weaning (Early weaning)**

Milk feeding is restricted to 6 to 7% of birth mass (Table 4) or to that amount required for maintenance (Table 2). The lower milk intakes encourage the consumption of dry feed. Calf starter meal (highly palatable), fed fresh daily to ensure a good consumption, hay and water must be on offer by the time the calf is one week of age. Owing to the low volumes of milk fed, a once a day feeding system can be adopted. In cold weather the chill should be taken off the water, otherwise the consumption of concentrates will be reduced, owing to poor water intake. The milk should be completely replaced by concentrates between the third and fifth week, but only after the calf is consuming 0,5 kg calf starter meal per day. The majority of calves can be weaned at 5 weeks of age, the main exceptions being those which have suffered a severe setback from diarrhoea. This system is not recommended for calves of the smaller breeds, *e.g.* Jerseys.

**Table 4. Liquid feeding levels for five week weaning**

Breed	Quantity (l/day)
Holstein-Friesland	2,8 to 3,0
Ayrshire or Guernsey	2,3 to 2,5
Jersey	1,7 to 2,0

**Milk replacers**

When feeding milk-replacers, follow the manufacturers' directions. Replacers low in fibre are preferable because these contain the least amount of vegetable protein. The most suitable milk replacers consist almost entirely of milk by-products. In colder areas, or during winter, use a milk substitute with a high fat content (15 to 18%), otherwise all of the energy available to the calf will be used by the calf to keep warm by shivering, rather than for growth. Some milk replacers

have a high DM content, necessitating that a supply of clean water always be available to calves on these feeds.

### Fresh skim milk

This is an excellent feed for calves. It can be substituted for whole milk when calves are two weeks old. The change can be made abruptly, or gradually over 3 days. When calves are about 4 weeks old, gradually increase the quantities to double those for whole milk (Table 3). Continue to feed skim milk until the calves are 4 to 5 months old. Make the transition to dry feeding gradually, regardless of age.

Skim milk is low in vitamins A & D, so supplements must be given (7000 i.u. vitamin A and 1750 i.u. vitamin D), either in the calf starter, or by injection.

Supplementary calf starter (12% CP; 12,6 MJ/kg DM), hay and water must be available to the calf from 4 weeks of age.

### Surplus colostrum

Sufficient surplus colostrum is produced in most dairy herds to feed all heifer calves from birth to weaning at 5 weeks of age. Diluted or fermented colostrum should not be fed to calves less than 3 days of age because it lacks viable antibodies.

Surplus colostrum can be preserved by freezing, fermentation or by chemical means. Freezing is the best method of preservation, resulting in negligible nutrient losses, and in retained palatability. Colostrum can be preserved, by freezing, in the amounts required for use. Bloody colostrum freezes well, but cannot be fermented.

Colostrum can be preserved by natural fermentation at ambient temperatures below 25° C. At temperatures above 25° C putrefactive fermentation occurs, necessitating the addition of a chemical preservative. The chemical must be incorporated at the rate given in Table 5.

**Table 5. Incorporation rates of the additives for preserved colostrum**

<b>Chemical additive</b>	<b>Incorporation rate</b>
Acetic acid	0,7 to 0,8%
Propionic acid	1,0%
Formalin	0,1% *
Formic acid	0,3% *

\* May cause palatability problems

When preserving colostrum by fermentation or by incorporating chemicals, the following rules apply:-

- Do not ferment bloody colostrum (but it may be frozen).
- Stir daily to prevent layering.
- Stir just prior to feeding for a uniform feed.
- Incorporate chemical preservatives before placing in storage containers.
- Do not keep longer than 4 weeks. (Protein degrades with age to non-protein nitrogen).
- Use rubber or plastic lined containers with lids (*e.g.* rubber rubbish bins as the acid corrodes other containers).
- Handle hygienically.

Colostrum which has a higher content of solids than does whole milk is fed at reduced rates (6 to 7% of body mass) as shown in Table 6. It is commonly fed diluted with water in the ratio of 3 parts colostrum to 1 part water. Calves fed undiluted colostrum may have a tendency to scour.

**Table 6. Feeding rates for surplus colostrum**

Breed	Colostrum (l)	Water (l)
Holstein-Friesland	2,5 - 2,8	1,4
Ayrshire or Guernsey	2,8 - 2,1	1,0
Jersey	1,5 - 1,7	0,8

### Feeding mastitic milk or milk from antibiotic-treated cows

Mastitic milk, and milk from antibiotic-treated cows, can be successfully fed to calves, replacing whole milk or extending surplus colostrum supplies. Heifers fed mastitic milk must be fed and housed individually in pens, or hutches, to prevent contact between these calves. Bacteria can survive in the mouth for more than 24 hours. If calves fed this milk suckle each other, it can cause infection of mammary tissue, causing heifers to calve down with mastitis.

Mastitic milk should not be fed to calves younger than 4 days of age. The milk from antibiotic-treated cows should not be incorporated with the colostrum for fermentation because the antibiotic residues will inhibit the fermentation process.

### SCOURS IN CALVES

Scours can be the symptom of a disease, or the result of poor nutrition. Nutritional scours usually results from an excessive level of carbohydrate in the diet, or from overfeeding.

Scours can be prevented in the following ways:

- Calves must get adequate amounts of colostrum as soon as possible (see Table 1).
- Do not overfeed calves.
- Use good quality milk replacers.
- Feed milk at body (37° C) temperature if possible, otherwise feed at a constant temperature.
- Feeding should be done at regular times.
- The utensils should be scrubbed and sterilized after each feed.

Should scours occur, it should be treated as follows:

- Do not feed for 24 hours, but allow free access to water.
- Re-introduce the milk ration at maintenance level (Table 2) after 24 hours, and, as soon as the dung is normal, feed as usual.
- Scours caused by disease organisms will require a prescribed antibiotic treatment.
- An electrolyte solution should be administered to combat dehydration. If a commercial product is not available, the following solution, fed three times daily, can be used:

1 teaspoon salt

1 teaspoon bicarbonate of soda

1 teaspoon potassium chloride

2 tablespoons glucose

1 litre water.

- Isolate sick calves.

## **BLOAT**

Bloat occurs as a result of excessive gas production in the reticulo-rumen of calves. Excessive consumption of highly-fermentable feeds is likely to cause bloat. The consumption of large volumes of fluid also can cause bloat. Therefore it is recommended that water and calf starters be removed prior to feeding milk and only returned half an hour after feeding milk. The inclusion of 10% hay in the diet is very effective in reducing the incidence of bloat.

## **WEANING**

Milk feeding can be stopped abruptly, or gradually by decreasing the milk supply daily over a week. Weaning should not occur before the calf has consumed 0,5 kg calf starter meal per day for three consecutive days. Abrupt weaning is not advocated for calves receiving large volumes of milk daily.

Do not place undue stress on the calves at weaning, for example by moving pens, castrating and dehorning. Move calves to new pens 7 to 10 days after weaning. Dehorning and the removal of extra teats should have been done by one month of age.



## **PERMANENT IDENTIFICATION**

The ability to identify animals is essential for good record keeping and for efficient management. At birth, some form of permanent identification such as ear notches or tattoos, is essential. Later, for convenience and to facilitate identification, ear tags (which however, may fall out) are useful. For dairy cows, freeze brands on the rump are useful for identification in the parlour. Freeze branding can be done successfully when heifers are first mated, or after they have been confirmed as being pregnant.

## **DOSING AND INOCULATION**

A comprehensive dosing and inoculation programme is essential for healthy calves. A specimen programme for dosing and inoculation is given in Table 7, but consult your local veterinarian about specific requirements for your area.

## **CALF'S ENVIRONMENT**

When calves are artificially reared from soon after birth, some form of housing is required. Research data indicate that it is best to keep calves individually penned until they are at least one month old or, if maximum weight gains are required, until three months of age. The main advantage of individual housing is that the incidence of cross-infection is reduced.

An important factor to consider when rearing calves on an early weaning system, where milk feeding is restricted, is that the young calf cannot adequately control its body temperature. It must therefore resort either to eating more to increase heat production gained through the digestive process, or to shivering in order to gain heat from muscular activity. Either of these will lead to a decreased food conversion efficiency. Calves on restricted milk diets (maintenance levels) will require more milk to maintain body heat production in cold weather than in hot weather.

Research has shown that temperatures above 13° C are optimal for calves, and if possible that they should not be exposed to lower temperatures, especially if there is air movement. In either cold or hot areas, good insulation of the calf house will help to keep the temperature within moderate limits, although calves will tolerate temperatures of 5° C or lower, provided that adequate shelter, bedding and feed are available.

Ventilation in calf houses is important, but at the same time, draughts must be avoided. Without good ventilation, the air becomes warmer and more humid, causing an increased concentration of ammonia, other gases and harmful bacteria, resulting in respiratory problems in the calves. The calf house, in addition to being well-ventilated, should allow plenty of sunlight to enter.

Specialized isolation pens, with infra-red lamps to provide localized heat in cold weather, are desirable for sick calves, or for weak calves that were removed from their dams at birth. These pens should be easy to disinfect.

**Table 7. Suggested dosing and inoculation programme for some common diseases and parasites in Natal (G L Liebenburg)**

<b>DISEASE OR PARASITE</b>	<b>TREATMENT PROGRAMME</b>	<b>REMARKS</b>
<b>Bacterial diseases</b>		
ANTHRAX	4 to 6 months	Annually
CONTAGIOUS ABORTION	3 to 10 months	Once only to heifers
PARATYPHOID	7 to 14 days	Once only if a problem
WHITE SCOURS (Collibacillosis)	8 to 10 weeks prior to calving	Annually, 4 weeks before calving, if a problem
QUARTER EVIL	then 6 weeks later 3 to 6 months then 1 mth later	Annually thereafter
<b>Viral diseases</b>		
LUMPY SKIN	6 to 9 months	Annually thereafter
STIFFSICKNESS	6 months or older,	Annually, preferably before spring
RABIES	3 months. Any age	2 injections 30 days apart, then annually
<b>Internal parasites</b>		
ROUNDWORMS	2, 4, 6, 9 & 12 months	Strategic dosing thereafter
FLUKES	Start in Sept, then again in Mid-March	Annually in March from second year
TAPE WORMS	1,2, & 5 months	

**NB**

**: Please read all labels of vaccine and dosing remedies carefully before use.: Please read all labels of vaccine and dosing remedies carefully before use.: Please read all labels of vaccine and dosing remedies carefully before use.**

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Calves should be housed in well-ventilated but draught-free housing. Individual housing in crates (0,9 m wide x 1,4 m long) or hutches (1,2 m wide x 2,4 m long x 1,2 m high) is considered the method of choice. It is important that calves should be able to see each other. Never place a wet calf in a hutch.

Group housing of approximately 5 calves of the same age and size is another possibility. Allocate 1,4 to 1,8 m<sup>2</sup> per calf, with 350 mm trough space per calf younger than 3 months. To avoid calves suckling each other, tie them up for 20 to 30 minutes after feeding milk. For detailed plans on calf housing see KwaZulu-Natal Dairy Leaflet 7.1.

### **Cleansing and disinfection**

Milk-feeding utensils should be cleaned thoroughly after use by rinsing in cold, or luke warm water and then by washing them in warm water containing both a detergent and a disinfectant. After washing, they should be rinsed in cold water and set out to dry (do not use a drying cloth which may be "dirty", rather drain and allow to air dry).

Cleanliness is essential in calf houses. Calf pens must be cleaned and then disinfected between the removal of older calves and the entry of younger calves. The process consists of two distinct operations:

- the removal of all dirt such as dust, dung, cobwebs (cleansing).
- the application of a disinfectant to the cleaned surface to kill micro-organisms.

Cleaning should be done on a daily basis. Beware of leaving the calf house damp and humid. This may result in respiratory disease in the calves. Cleaning can be done using power hoses (not when calves are present) or scrubbing brushes. A washing soda solution (4%) can be used.

When disinfecting while calves are in the house, care must be taken with the kind of disinfectant used. The spreading of lime (to change the pH) or chlorinated lime (bleaching powder) on the floor will be beneficial.

Wooden partitions, or walls, can be either creosoted or whitewashed as a disinfectant measure.

Sunshine is a good disinfectant, therefore allow equipment to dry in the sun.

Commercial disinfectants containing sodium hypochlorite or iodophors can be used for disinfecting. Care must be taken to ensure that the surface to be disinfected is thoroughly cleaned because these substances do not work well when organic material is present. Alternatively, a solution of 4 to 5% formalin can be used as a

disinfectant. Formalin is efficient in killing bacterial spores and viruses even in the presence of organic matter.

It should be noted that disinfectants do not act instantaneously. In general they require at least half an hour to act effectively, then they should be rinsed off after use, especially on metal surfaces.

### **WEANING TO 6 MONTHS**

Do not disturb calves for a week after weaning. Move to new housing after this period. Calves can be housed in groups of 5 to 10 animals of similar size and age. Allow access to shelter at all times. Supply good quality grazing or good quality hay plus concentrates, or a complete calf ration, at all times. Rotate pastures to avoid a parasite build-up. Use a deworming programme. Silage may be introduced into the diet at this stage, but only in small quantities because of its bulk. Note that silage will require supplementation with protein and minerals to avoid deficiencies. Do not feed urea or chicken litter on pastures at this stage, because they contain insufficient undegradable protein to meet the calf's requirements.

Calf growth meal, or dairy meal (16% C.P.), may be fed to a maximum of 2 kg per animal per day.

### **FURTHER READING**

WEBSTER, J., 1984. *Calf husbandry, health and welfare*. London: Granada.

WILSON, P.N. & BRIGSTOCKE, T.D.A., 1981. *Improved feeding of cattle and sheep*. London: Granada.

ROY, J.H.B., 1980. *The calf*. 4th ed. London: Butterworth.