THE POTENTIAL production of the future dairy herd is determined by the inherited quality of the successive crops of heifers that enter it. But the **actual** production is greatly influenced by the feeding and general management of the young animals from birth to calving. No matter how good the sire and the dam may be, a heifer will not express her full inherited capacity for production if during rearing she has been subject to checks which have interfered with development. Making a good job of rearing the calves is therefore of the utmost importance on a dairy farm. In this discussion on calf rearing, the general principles of rearing calves on skim milk, whole milk, whey, and restricted milk supplies are given.

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THE FIRST MONTH OF REARING

A calf newly taken away from its mother requires shelter. The ideal calf house should be draught-proof with a concrete floor (to facilitate cleaning), covered with clean straw or hay, or with a movable grating. The open part of the shed should face the sun and away from prevailing winds. Divisions in the calf house should be provided to segregate the animals according to size. If, at least, the very young calves are separated from the more sophisticated, feeding will be made much easier.

A grass run-out should be provided to be used by the young calves on fine days.

Whether a calf is left with its mother or not for the first day, it is advisable to let it have its first drink from the mother; leaving it longer than a day may increase the difficulty of teaching it to drink, while if it is taken away from the cow soon after calving the cow settles down to regular milking and feeding more quickly. For the first three or four days, it should receive colostrum milk (i.e., the first milk secreted by newly calved cows). Colostrum has a medicinal effect in that it starts the digestive system and bowels functioning properly. In

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addition to this, colostrum milk contains chemical substances transmitted from the mother to give the calf immunity against white scours and the effects of harmful bacteria, until such time as the calf is able to develop these protective substances for itself. Since it is difficult to rear calves which have not received colostrum, the following formula is useful if for any reason colostrum is not available: Beat up a half teaspoonful of castor oil and an egg in half a pint of warm water and add a pint of warm milk. This should be fed thrice daily for the first three days.

The amount of milk to be fed varies according to the weight of a calf. Approximately 10 per cent of the calf's body weight in milk is the right amount. This means that with a Jersey calf (60 lbs liveweight) the initial rate of feeding would be about 6 lbs of milk per day, and with a Friesian calf (80 lbs liveweight), 8 lbs of milk **daily.** A gradual increase is made in the amount fed so that at a month the calf is receiving about 1 gallon per day. The aim should be to feed so much that the calf is just looking for a little more. Over-feeding should be avoided. It is particularly advisable when the calf is young to feed the milk at blood heat.

Milk too rich in butterfat should not be used as this is likely to cause scouring. Such high testing milk may be diluted with water until it contains about 3.5 per cent butterfat.

Many farmers feed the young calf entirely on whole milk until it is practically a month old in the belief that it is false economy to spoil the prospects of the future cow for the sake of a few shilling's worth of butterfat. Recent critical work on calf feeding shows that good results are obtained by feeding whole milk to two weeks of age only, and then changing over gradually to skim milk during the next two to three weeks. No meal feeding is necessary but good pasture must be available as soon as the calves are able to graze. Sudden changes in feeding are not good for any animal, least of all for a young calf, so that the change to skim milk must be gradual. When the calf is going on to separated milk, this is substituted for whole milk at the rate of about a pint a day so that by the time the calf is 3½ to 4 weeks old the whole milk has been wholly replaced.

FEEDING AFTER THE FIRST MONTH

After the first month, the feeding of the calf will vary according to the dairy by-product available. In any case it is essential that the calf be provided with (i) enough protein for the building of muscles and tissues, (ii) enough energy food for the maintenance of body temperature, for movement and for putting on condition; and (iii) enough mineral matter for skeletal growth. Furthermore, the food should be palatable, easily digested and not too bulky or fibrous.

REARING CALVES ON SEPARATED MILK

The essential difference between whole milk and separated milk is that the latter has been deprived of all its butterfat; in other respects the two are almost identical so that the problem of feeding separated milk is to supplement it with some fat substitute. There are three methods by which this can be done; (i) Add an oil such as codliver oil, or (ii) use some form of cereal or cereal meal, or (iii) provide good pasture. The cereal meals are not such concentrated foods as the oils, so greater quantities have to be fed. Oils of animal origin are superior to vegetable oils as the latter do not contain vitamin A which has been extracted from the milk with the fat. If codliver oil is to be used, it should be given sparingly until the calf acquires a taste for it. A teaspoonful increasing to a tablespoonful with each feed is sufficient. Feeding the oil should commence when the calf is about a month old, but when the calf is two to three months old, it can be discontinued.

There is a variety of meals which can be used successfully for calf rearing with skim milk. Pure meat meal alone is a cheap and useful supplement, but it is not very palatable, crushed oats or maize is useful but cannot be fed until the calf is about five weeks old when it is able to chew its cud. Linseed meal is an excellent supplement but is expensive when used alone. The many proprietary meal mixtures usually contain, in varying proportions, barley meal, linseed, pollard, maize meal, pea meal and meat meal.

Some of the best calves in New Zealand, however, are reared on skim milk, and pasture alone, after the initial feeding of whole milk for 2-3 weeks. Important features in

the management of such calves is that they are fed regularly and individually on warm milk from clean buckets. They are provided with the very best of pasture and are grazed in front of the milking herd. The question of meal feeding hinges on the monetary cost of meals, as compared with the extra labour involved in the rotational grazing of the calves.

REARING CALVES ON WHOLE MILK

Calves may be reared entirely on whole milk, using the same programme as recommended in the table for skim milk, but reducing the quantities fed. Calves reared on whole milk will make maximum growth, but the cost is high.

REARING CALVES ON WHEY

Whey has a very different composition from whole milk. It is minus the fat, a large amount of the protein and some of the mineral material. Whey is very dilute and has about half the feeding value of separated milk. The loss of casein (which goes into the cheese) renders the whey deficient in flesh-forming materials and so it has to be supplemented with protein-rich foods. It is also necessary to supplement the mineral content of whey.

For the first two weeks the feeding is the same as with skim-milk calves, but it is important subsequently to continue the feeding of whole milk for a longer period because of the difficulty in providing a suitable supplement for the whey. Accordingly it is recommended that whole milk should be fed entirely until the calf is four weeks old at least. Then the transition to whey feeding can be commenced so that at the end of five weeks the calf is receiving half milk and half whey to a total volume of 1½ gallons daily. Meal feeding should be progressively increased as the whey proportion is increased. Suitable meal mixtures include linseed meal in equal parts with (a) liver or meat meal, (b) pea meal or (c) ground oats or pollard with a small proportion of liver or meat meal. The quantities of whole milk, whey and meal to be fed are given in the table.

A salt mixture consisting of equal parts of slaked lime and ordinary salt added to the whey gives good results when fed at the rate of half a teaspoonful per feed for the first three weeks, gradually increasing to 2 teaspoonfuls per feed at 5 weeks.

Calves can be reared satisfactorily on this diet but it is more than ever necessary to pay strict attention to the points previously mentioned with regard to clean young pasture, good leafy hay, and, to do them really well, a grain supplement.

REARING CALVES ON DRIED SKIM MILK OR DRIED BUTTERMILK, OR WHEY PASTE.

A fluid with approximately the same composition as skim milk can be made by adding 1 lb of dried skim milk or buttermilk powder to an equal quantity of water, stirring to a paste, and adding 8 more parts of warm water. This gives a gallon of a fluid of approximately the same composition as skim milk and by following the recommendations for skim milk feeding similar results will be obtained. Codliver oil at the rate of a tablespoonful to a gallon is a valuable addition. With attention to cleanliness and regularity of feeding, calves can be reared successfully by this method. However, the price of dried skim milk makes this a relatively costly method of calf rearing.

A by-product of lactose manufacture, whey paste, is available in some districts for calf rearing. One pound of whey paste mixed with a gallon of warm water has a feeding value almost equal to that of skim milk except that it is not so rich in pro-

CALF FEEDING SCHEDULES.

		Skim Milk Schedule.				Whey Schedule.				
Age of Calf.	Live Weight.	Whole milk (per day)		Skim milk (per day)		Whole milk (per day)		Whey (per day)		Meal (per day)
Weeks	lbs	lbs	pts.	lbs	pts.	lbs	pts.	lbs	pts.	ozs.
1	70	7	6	—	—	7	6	—	—	—
2	80	8	7	—	—	8	7	—	—	—
3	90	4½	4	4½	4	9	8	—	—	—
4	100	5	4½	5	4½	10	9	—	—	—
5–8	150	—	—	15	14	7	6	7	6	1-6
9–12	200	—	—	20	18	—	—	20	18	7-10
13–17	250	—	—	25	23	—	—	25	20	10-12
17–20	290	—	—	15	14	—	—	20	18	12-10

tein. It should be fed in conjunction with a little whole milk supplemented with meat meal and cereal meals.

NURSE COWS

To increase the milk supplied or where a cow is unsuitable for milking by reason of being a hard milker, having a deformed udder, or some other reason, it may be profitable to use the nurse cow method. A cow is induced to take two or more calves by confinement in a small yard or box-stall for a day or two. Another method is to tie the cow's own and rejected calves for a time thereby inducing her to accept a larger family. In a similar way a single cow may be made to rear a number of calves in succession in one season.

MANAGEMENT FOLLOWING WEANING

Calves are weaned from hand-feeding at 4 to 5 months of age. It is advisable to keep them on the longer period if possible, particularly if the summer is dry, for calves should not be weaned on to dry fibrous feed. Weaning time and immediately afterwards is a very critical time with the rearing of calves. They should be weaned on to fresh green pasture, which is a most nutritious feed. To ensure that the calves are able to obtain a maximum food value from the pasture and to reduce the likelihood of worm infestation they should be grazed over the paddocks in rotation, with only 2 to 3 days on each pasture, ahead of the milking herd.

Just because the heifer calf is not a producing animal, it should not be regarded as a follower and be used as such, but on the contrary, it should be given the preferential treatment that its juvenile state demands.

CONCLUSION

The above recommendations have been made to suit most cases. The main points are summarised below:

1. Colostrum milk is essential.

2. A period on whole milk should follow.

3. If feeding skim milk, change gradually from whole to skim at from 2-4 weeks of age.

4. Feed warm milk.

5. Feed standard quantities. Underfeed rather than overfeed. Overfeeding is the cause of much of the digestive disturbances and scouring.

6. Feed at regular hours.

7. Cleanliness of the milk bucket and calf's surroundings is important.

8. Rotationally graze on pastures clear of parasites. Use either young grass or old pasture spelled from stock for some months. Pastures should consist of fresh young growth so that calves obtain adequate supplies of protein and make good gains.

9. Provide hay racks in the feeding house and feed as much good quality hay as the calves will clean up.

10. If milk, pasture or hay is in short supply, feed a suitable grain supplement.

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