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Profitable dairying depends, to a large extent, upon the successful raising of well-bred heifer calves. On the average, 20 to 30 per cent of the milking herd must be replaced yearly which means 3 or 4 heifers for each 10 cows. Many farmers increase their annual income by the sale of surplus cows.

A poorly grown or stunted heifer invariably develops into an undersized cow whose production is lower during the first lactations than if she had grown satisfactorily. High producing cows usually are well-developed individuals, at least of average size for the breed. Calves should be kept growing continuously from birth to maturity so they will become thrifty, well-developed cows.

Calves should be kept in separate pens, if possible, and treated as individuals. No single program, schedule, or method of feeding will apply to every animal. All changes in quality and quantity of feeds should be made gradually.

Several satisfactory methods of feeding calves have been suggested. There is one thing common to all of these methods; give the calf a good start on colostrum and whole milk.

Start the Calf on Mother's Milk

Milk produced the first 3 or 4 days after freshening is called "colostrum." It is imperative that the

calf receive the colostrum either by nursing or by hand feeding. Colostrum assists in the prevention of disease, is laxative, and contains large amounts of vitamin A.

Regardless of the feeding method used, calves of the Jersey, Guernsey and Ayrshire breeds should receive whole milk for the first 2 weeks. Calves of the Holstein, Brown Swiss, and Milking Shorthorn breeds do not necessarily need whole milk after the colostrum period if skim milk or "milk replacers" are available. The market value of whole milk is such that cheaper feeds must be substituted for it as soon as the calf is given a good start.

Continue Whole Milk to Calves of the Small Breeds for 2 Weeks

When the mother's milk is ready for market, milk from the herd will be satisfactory. Avoid milk from individual cows with high test, those advanced in lactation, or those having mastitis. Feed calves of the small breeds 4 to 7 pounds of whole milk daily during the first 2 weeks. Observe carefully the following rules during the first 2 weeks:

1. Let the calf nurse from 2 to 4 days, depending upon the size, strength and vigor of the calf.
2. Feed 4 to 8 pounds of whole milk daily during the first 2 weeks, depending upon the

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size of the calf. An average Jersey, Guernsey or Ayrshire calf should get not more than 4 to 7 pounds of milk per day while a Holstein, Brown Swiss, or Milking Shorthorn calf can take up to 8 pounds per day.

3. Weigh or measure each feeding carefully; overfeeding causes more trouble than underfeeding.
4. Warm milk is essential — body heat or 95° F.-100° F.
5. Use clean pails, washed and sterilized after each use.
6. **Remember:** Most troubles are due to over-feeding, irregular feeding, cold or sour milk, dirty unsterilized pails, or to exposure in damp, drafty, dark pens.
7. Start feeding hay and grain at 1 to 2 weeks of age.

Hay and Water Essential

There is no roughage equal to bright, green, leafy, alfalfa hay. A calf will usually start eating hay at 1 or 2 weeks of age. Liberal quantities should be supplied at all times. Give the calf fresh hay daily. Choice alfalfa hay contains high quality protein and is a good source of vitamins A and D. Long, leafy hay, chopped hay, or ground hay is satisfactory and should be fed in a manger or feed rack.

Calves should be given free access to clean water after 2 weeks of age, especially when the calf is on dry feed and during hot weather. Salt is also necessary unless included in the grain mixture. Calves confined for several months in pens with concrete or wooden floors may need very small amounts of iron and copper supplements added to the feed.

Plans of Feeding

Several satisfactory plans of feeding calves have been developed.

PLAN I

Limited Whole Milk and Dry Calf Meal

A satisfactory method of raising calves is to feed whole milk for 6 to 8 weeks, depending upon the condition of the calf, thereby giving the calf a good start, and at 2 weeks of age to start feeding a dry calf meal.

By putting a little of the dry calf meal in the calf's mouth after feeding milk, the calf will learn to eat the meal as early as 7 days. Feed calves of the smaller breeds 4 to 7 pounds of milk daily in 2 feeds. Feed calves of the larger breeds 8 pounds of milk daily in 2 feeds. This plan requires between 250 and 350 pounds of whole milk. The calf should be induced to eat as much green leafy hay and dry calf meal as possible.

After the second week the amount of whole milk may be gradually reduced. The calf should receive all the dry calf meal it will consume up to 3 or 4 pounds daily. The calf is continued on dry calf meal and hay until at least 4 months of age, when a simpler mixture can be used. The following grain mixture may be substituted, pound for pound, for the calf meal, after 4 months: 33 pounds of rolled or ground barley or yellow corn, 33 pounds of rolled or ground oats, 33 pounds of wheat bran. If poor quality alfalfa hay or grass or cereal hay is fed add 15 pounds of linseed oil meal or soybean meal.

The following dry calf meals for use during the first 4 months have given satisfactory results. These mixtures contain a high pro-

tein animal-by-product feed such as skim milk powder. The other feeds or ingredients can usually be obtained locally. Under present conditions calf meal No. 3 suggested by the committee on Animal Nutrition of the National Research Council is the most economical of the three mixtures.

Calf Meal No. 1

25 lb. rolled or ground barley or yellow
corn
25 lb. rolled or ground oats
15 lb. wheat bran
35 lb. dried skim milk
2 lb. steamed bone meal
1 lb. iodized salt

Calf Meal No. 2

25 lb. dried skim milk
25 lb. rolled or ground barley or yellow
corn
25 lb. rolled or ground oats
17 lb. wheat bran
5 lb. linseed oil meal
2 lb. steamed bone meal
1 lb. iodized salt

Calf Meal No. 3

25 lb. rolled or ground barley or yellow
corn
35 lb. rolled or ground oats
12 lb. wheat bran
12 lb. linseed oil meal or soybean oil
meal
13 lb. dried skim milk
2 lb. steamed bone meal
1 lb. iodized salt

It is sometimes advisable to feed a vitamin supplement to calves during the first 6 weeks, especially during the winter months. Feed 2 teaspoons of cod liver oil or 2.0 ml. of cod liver oil concentrate, or some other special material containing equivalent amounts of vitamin A and D daily.

PLAN II

Dried Milk Solution Plus Vitamin A and D and Aureomycin and Calf Meal

A solution made from dried sweet cream buttermilk or dried skim milk may be used satisfactorily to replace liquid skim milk in a ration for dairy calves.

To prepare the solution:

Mix 1 pound of dried buttermilk or dried skim milk in 9 pounds of warm water, plus 4000 USP units of vitamin A and 500 USP units of vitamin D, and 50 milligrams of aureomycin per pound of milk powder. Aureomycin is in the form of Aurofac-D (1 pound of Aurofac-D per 100 pounds of dry powder). This reconstituted milk should be fed in the same manner and the same amount as suggested in Plan I.

The reconstituted skim milk may be discontinued at the end of the seventh week provided the calf is eating ample quantities of dry calf meal and alfalfa hay. The calf should be induced to eat calf meal (any of the calf meals suggested in Plan I) and hay at least by the second week. The advantage of this plan is that the calf will be entirely on dry feed at the end of the seventh week, although the plan requires more labor and inconvenience during the milk feeding period.

Guide in Feeding

1. First 2 weeks feed 4 to 7 pounds of whole milk to Jersey, Guernsey and Ayrshire calves. Holstein, Brown Swiss, and Milking Shorthorn calves can be put on dried skim milk solution or "milk replacer" when taken off colostrum. Feed Holstein, Brown Swiss, and Milking Shorthorn calves about 8 pounds daily in 2 feeds. Induce calf to eat dry calf meal and hay.
2. Third week, change Jersey, Guernsey, and Ayrshire calves gradually to dried skim milk solution.
3. Continue dried skim milk solution during fourth, fifth, and sixth week. Feed all calf meal and hay the calf will consume. Supply clean water.
4. Seventh week—gradually decrease amount of milk solution and give all the calf meal the calf will eat up to 3 or 4 pounds daily with hay and water.
5. No dried milk solution after seventh week.

Milk Replacers

Commercial "milk replacers" may be used in general about the same as dried skim milk solution. That is, with Jersey, Guernsey and Ayrshire calves switch from whole milk during the third week to "milk replacer." In case of Holstein, Brown Swiss, and Milking Short-horn use "milk replacer" instead of dried skim milk solution after the colostrum period. Since "milk replacers" from different companies vary in constituents, it is recommended that the instructions of the manufacturer be followed.

Feeding the Heifer After Weaning From Milk

Pasture is the most economical means of feeding heifers and should be used to a large extent. A young heifer 6 months old will not graze enough even on good pasture to make the gains that she should. It is recommended that calves on pasture be fed 2 to 4 pounds of grain daily. However, heifers should not be fed too heavy. Feed them enough to keep them growing. After a heifer is 12 months old she will make satisfac-

tory gains on good pasture alone, until a few months previous to freshening.

Heifers under a year of age cannot consume sufficient roughage to make normal gains. They should be fed 2 to 4 pounds of grain per day.

Winter Feeding Yearling Heifers

The basis for winter feeding of heifers should be good quality roughage, such as alfalfa hay and silage. If the roughage is not top quality, about 2 pounds of grain should be fed daily. Silage alone is not satisfactory for heifers. They need more nutrients for normal growth.

Feed Heifers Grain Before Freshening

Thin heifers should be fed 3 to 6 pounds of low protein grain during the last 3 months before freshening. The object is to have the heifers in good condition when they drop their first calf. If the forage is of good quality and the heifers are in good condition, they will get along without grain feeding.