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Feeding and Managing Dairy Calves and Heifers

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Raising healthy heifers is important to the success of a dairy operation. These heifers are the future dairy herd and will be better than the cows in the herd today, if you follow improved breeding and management practices. You invest \$800 to \$1,500 to raise a heifer to 24 months of age, the age for optimal profitability. If heifers calve at more than 24 months of age, \$2 per day is lost in feed, herd replacements, and lifetime production.

Heifers must grow at an optimal rate to be large enough to breed on time, avoid calving problems, and have a successful first lactation. Some practices recommended for raising heifers will be discussed below.

The Newborn Calf

A clean, dry, draft-free environment for calving is essential for the health of the cow and calf. Immediately after birth:

- Remove any mucus from around the mouth and nose.
- Treat the naval with a mild (2%) tincture of iodine or some other suitable disinfectant.
- Insure that the calf is dry and away from drafts.
- Feed colostrum.

It is critical that the calf receive colostrum as soon after birth as possible, preferably within one hour. Colostrum, the first milk secreted after parturition, is a rich source of protein, minerals, and vitamins (Table 1). It is an especially rich source of immunoglobulin proteins (antibodies) which the calf needs to fight disease.

Calves are unable to produce antibodies for the first few

weeks after birth and must acquire them through colostrum. A newborn calf can absorb these antibodies through the intestinal wall, but this ability rapidly diminishes by 24 to 30 hours after birth. Thereafter, the calf digests these antibodies as it would digest other proteins, but it receives no immunization.

Research has shown that less than 1% of the calves that received colostrum within one-half hour after birth died. Chances of death steadily increased with time after birth before first feeding of colostrum, and 16 to 20% of the calves which did not receive any colostrum died before one month of age.

The calf should consume 4 lb of colostrum within the first two hours after birth, another 4 lb six to 12 hours

Table 1. Typical composition of first colostrum and normal Holstein milk.

Constituent	Colostrum	Milk
Total solids, %	23.0	12.4
Protein, %	14.2	3.2
Casein, %	4.8	2.4
Immunoglobulins, %	6.6	0.1
Fat, %	5.2	3.7
Lactose, %	2.9	4.8
Minerals, %	1.4	0.7
Calcium, %	0.26	0.13
Phosphorus, %	0.24	0.11
Vitamins		
A, µg/g fat	45	8
E, µg/g fat	125	20
Thiamin, µg/100 g	80	40
Riboflavin, µg/100 g	450	150

later, and should continue to be fed colostrum for three days.

It may be best to hand feed the calf to insure consumption rather than assume the calf has nursed or has received adequate amounts of colostrum.

Vaccines are now available against some causes of calf scours such as *E. coli*, as well as rota, and corona viruses. Two types of products are available:

- For the dry cow so that she will put antibodies against those organisms into her colostrum.
- Vaccines for the newborn calf.

Birth to Weaning

Milk or Milk Replacer

Feed calves milk, milk replacer, or fermented transitional milk during the first month or two of life until their digestive systems are sufficiently developed to utilize grains and forages. Whole milk is the standard for comparison; however, milk replacers are usually cheaper.

Feed milk at the rate of 8 to 10% of body weight per day (i.e., 8 to 10 lb per 100 lb calf). This amount can be fed in one or two feedings a day; however, feeding twice a day will encourage you to check for health problems more frequently and may give higher rates of gain, especially in winter. During extremely cold weather, feeding more milk or milk replacer and delaying weaning by a few days may save an additional calf or two. Provide water to calves, especially if they are fed milk only once a day.

When feeding milk replacers, follow manufacturer's directions. Milk replacers containing all milk products generally are better than those containing vegetable proteins, vegetable oil, or fish proteins. Milk replacers should contain (air dry basis) 20% protein – 22 to 24% protein if the replacer contains nonmilk proteins such as soyprotein or fishmeal – and at least 10% fat. Replacers containing 15 to 20% fat may be preferable, especially for calves housed in colder environments and for vealers.

Antibiotic addition to milk replacer usually reduces scouring and respiratory problems. However, do not feed antibiotics to calves to be sold for slaughter because of possible antibiotic contamination of meat.

Excess transitional milk produced during the first few days postpartum can be saved for later feeding in place of milk or milk replacer. Store it fresh by freezing, or refrigerate it until needed. A more common practice is to store it at room temperature in clean, nonmetal

containers. It will soon ferment, hence the names fermented, pickled, or sour colostrum. Because of its high lactic acid content, it can be kept for several weeks. Preservatives such as propionic acid or formaldehyde may be needed during the summer months, but these usually are unnecessary during cooler weather.

Since this "unsaleable" milk is like a mixture of first colostrum and normal milk, it contains more solids than normal milk and can be diluted slightly with water before feeding. Research at SDSU showed that 6 lb of fermented transitional milk plus 2 lb of water contained the same amount of solids as 8 lb of whole milk, and supported similar weight gains as were achieved when calves were fed whole milk.

Calves also can be fed mastitis/antibiotic milk if it appears wholesome and if it is not from a cow with coliform mastitis.

Calf Starters and Hay

In addition to milk or milk replacer, give calves free access to a calf-starter grain mixture and top-quality hay starting a few days after birth. The calf starter should contain 18% protein and be palatable to encourage the calf to begin eating at an early age. Fresh, clean water should also be available to calves.

Hay offered free choice to young calves should be good quality. Poor quality forages such as mature hays are not recommended since the calf's rumen (first stomach) is not large enough to utilize these forages. Likewise, silages and pasture are not recommended for calves under six months of age because these feeds contain too much bulk (60 to 80% water) for the calf's small rumen and silages don't stay fresh in the manger.

Calves can be weaned from milk or milk replacer as soon as they are eating 1.5 lb of dry feed daily which may be by four to six weeks of age. Grains and forages usually are cheaper than milk or milk replacers, so it is economically advantageous to get calves eating dry feeds as soon as possible.

Calf Housing

Keep calves in an environment that is clean, dry, and free of drafts. Adequate ventilation is important when housing calves indoors. Keep calves in individual pens or stalls during the milk-feeding period to minimize spread of diseases.

The SDSU Dairy Science Department has successfully raised calves in outdoor calf hutches for more than 30 years with minimal calf losses, even during times in winter when temperatures may drop to as low as -30 F. This type of calf housing is currently quite popular throughout most of the U.S.

Feeding the Weaned and Growing Heifer

Feed for maximum growth without fattening.

The objective of a feeding program for replacement heifers is to produce large, growthy heifers that can be bred at an early age. This permits the heifer to calve at an earlier age so she can start returning a profit sooner.

Holstein and Brown Swiss heifers should weigh 750 to 900 lb at breeding age. Heifers of smaller breeds should weigh 550 to 700 lb. To reach these weights by breeding age of 13 to 15 months, large breed heifers should gain 1.3 to 1.8 lb daily and smaller breeds should gain 1.0 to 1.3 lb daily. Growth of the bred heifer and developing calf should continue so that larger breed heifers weigh 1,200 lb and smaller breed heifers 900 to 1,000 lb at calving time which should occur at 24 months of age.

Meet nutritional requirements.

Protein, energy, mineral, and vitamin requirements must be met to achieve maximum growth rates. Recommended nutrient contents of diets are listed in Table 2. As a guideline, heifers will consume 2.5 to 3 lb of feed dry matter per 100 lb of body weight. Provide iodized trace mineralized salt as well as vitamins A, D, and E to animals of all ages.

Basic guidelines for a heifer feeding program include:

- Use a feeding program that best fits into your farm program.
- Make forages the foundation of a feeding program. Good quality forage reduces the requirements for supplementation.
- The amount of grain mix and protein percentage in the grain mix depends on quality of forages and age of calves.

Younger heifers need some grain, but they can become more dependent on forages as they get older and their rumen becomes more fully developed.

Calves under six months of age usually need 4.0 to 6.0 lb/day of grain mix plus good quality forage. The amount of grain can be reduced as they get older. By the time they are one year old, they usually can grow at acceptable rates while consuming only good quality forages. Some grain likely will be needed during the last few months of gestation.

Liberal supplement poor quality forages with a grain mix which provides both protein and energy. Heifers outside during cold weather need additional grain because they require 20 to 40% more energy to maintain body warmth under cold conditions.

Table 2. Recommended nutrient content of diets for calves and heifers.^{1,2}

Nutrient	Calf starter	Growing Heifers		
		3-6 mo.	6-12 mo.	>12 mo.
----- (% of dry matter) -----				
Total digestible nutrients	80	69	66	61
Crude protein	18	16	12	12
Fiber (minimum)				
ADF	—	16	19	19
NDF	—	23	25	25
Calcium	0.60	0.52	0.41	0.29
Phosphorus	0.40	0.31	0.30	0.23

¹National Research Council. 1989. Nutrient requirements of dairy cattle.

²Vitamin recommendations are: 1,000 IU of vitamin A, 140 IU of vitamin D, and 11 IU of vitamin E/lb.

Corn silage provides adequate energy for older heifers, but additional protein is usually needed. An all-corn-silage forage program may cause excessive fattening.

Pasture alone will not meet the nutritional needs of growing heifers, especially those less than a year old. Even excellent pastures may be short on energy, and mature pastures may require additional supplementation of both protein and energy.

Grain mixtures containing urea or other nonprotein nitrogen sources should not be fed to young calves, but these mixtures can be fed to heifers once they are ruminating. Precautions for urea feeding are the same as for the milking herd. That is, urea can supply up to 1% of the total ration dry matter.

Ionophores such as monensin, lasalocid, and other similar additives may improve the efficiency of feed utilization by growing heifers. In a Pennsylvania State University study, heifers fed monensin calved 38 days sooner because faster growth rates allowed earlier breeding. This saved more than \$60 per head at an additive cost of \$5 (1.2¢ / day). However, if heifers are not bred earlier, most of the economic advantages of more rapid growth rates are lost. It is recommended to feed 50 to 200 mg of monensin per head daily from 400 lb of body weight until calving or 60 to 200 mg of lasalocid with no minimum weight restriction.

Health Care

Health care for calves and heifers starts with maintaining sanitary conditions, but it can be supplemented with vaccines and other treatments to prevent certain problems. Vaccination programs include vaccinating all heifer calves and bulls to be kept for breeding against brucellosis plus vaccinating against other diseases considered to be potential problems in your particular area of the country.

Under some herd conditions it may be beneficial to treat calves and heifers with coccidiostats. Coccidiosis is more likely to occur in young calves, especially during periods of stress, but it can occur in cattle of all ages. Ionophores have some coccidiostatic activity.

Deworming also improves weight gains of heifers, especially when subjected to muddy pasture conditions.

Summary and Recommendations

Get the newborn calf off to a good start by providing a clean, dry environment, and by feeding colostrum within 1 hour after birth.

Feed a good quality milk replacer, whole milk, or fermented transitional milk during the liquid feeding period.

Provide the calf with a palatable calf starter and good quality hay free choice starting a few days after birth.

Wean calves as soon as they are consuming 1.5 lb of dry feed daily or more, if housed in cold environments during the winter.

Feed older heifers enough for maximum growth rates without fattening.

Make excellent quality forage the basis for economical heifer growing rations. Supplement the forage as necessary with a nutritionally balanced grain mix.

Provide some grain for heifers up to a year of age. Pasture or silage should not be the only forage fed to these heifers.

Provide older heifers grain only when forages are not excellent quality or when heifers are exposed to cold conditions.

Expect to provide bred heifers with some grain the last three to four months before calving.



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