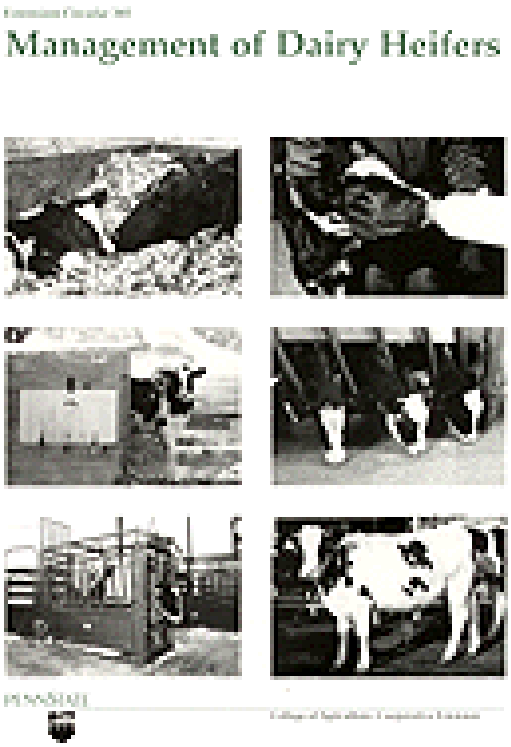
Extension Circular 385

Management of Dairy Heifers



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Dairy replacements are the foundation of any dairy enterprise. Improvement of a herd is possible when culled cows are replaced by well fed, healthy, genetically superior, and properly managed 2-year-old heifers. An excellent way to improve herd production is to mate cows to the best bulls available, then feed and manage replacement heifers so they reach their true potential in an optimal time period.

In most herds, dairy farmers are replacing 25 to 30 percent of the herd each year. This represents a large number of heifers that must be raised each year and a large investment of dollars. A successful calf raising program involves many aspects of genetics, as well as nutrition, housing, and overall management. No one specific program will work for everyone, yet all calf raising systems have many of the same sound components. This publication will outline a system of raising replacements that has been demonstrated to be successful throughout Pennsylvania.

Genetics and Breeding

Genetics and selection

A large number of proven and unproven bulls are available for many breeds. In reviewing sires, it is generally accepted that the higher the Predicted Transmitting Ability (PTA), the greater potential to transmit yield productivity to their offspring.

Criteria should be developed for purchasing semen to breed heifers. It is best to begin with the proven sires. Their records provide production, type, and calving ease data. The reliability of this information improves as the number of daughters increase.

A second mating option is to use the young, unproven sires. Although these bulls have no data for their own progeny, they are the sons of high PTA bulls and their dams had to meet certain genetic requirements. These young sires are selected for testing because of their estimated genetic value. From this group the proven bulls of tomorrow will be chosen.

Young sires should be randomly bred throughout the herd. Although some herds may use 100 percent young sires, geneticists agree that no more than 25 percent of the herd should be mated to young sires. Some caution should be exercised in mating virgin heifers to young sires because the bull's calving ease ability is not known. A benefit of using some unproven sires is the financial incentive. The initial semen cost is relatively low. In conjunction with this, most breeding organizations offer an incentive "cash return" program for information provided as the calf matures.

With seven out of every ten cows bred artificially, there are still many dairy farmers who consider natural breeding an essential reproduction tool. Natural service generally cannot provide the genetic advancement possible with proven sires. Breeding heifers to an unproven dairy or beef bull retards genetic improvements and reduces the number of herd replacements available. Bulls are dangerous; A.I. eliminates the need to have a potentially dangerous animal on the farm. Natural service bulls may be subfertile, delaying the age of a heifer's first calving and thus reducing milk production per day of herd life. On the other hand, semen quality and fertility of

A.I. bulls are monitored. Suboptimal semen is not distributed. Natural service bulls can also introduce venereal disease into a herd, whereas A.I. sires are disease-free.

Conformational type characteristics are generally unknown for natural service bulls. Furthermore, little information is available on size of calves sired by farm bulls or the incidence of difficult births. A.I. sires and calving ease summaries provide considerable information to the dairy farmer about production merit, type classification, and calving ease. With this information readily available, the risks involved in an A.I. program are much lower than those in natural service.

Additionally, there is a distinct financial advantage to merchandising A.I.-sired heifers. A.I. makes identification easier and promotes the use of more accurate breeding and health records. By using A.I., farmers can better control the time when heifers calve.

When planning a mating, it is important to avoid genetic defects. A defect can be present when both of the mated animals are carriers for that particular disorder. When both animals carry the recessive trait, it will appear in approximately 25 percent of the matings. Some of the genetic defects are mulefoot, limber leg, and DUMPS (Deficiency of Uridine Monophosphate Synthase). Bull studs and breed organizations identify bulls which are carriers of these genetic defects. These carrier animals should not be used when selecting the future genetics of your herd. Some of these genetic defects will cause early embryonic death, abortions, or stillborn calves. Others will produce a live calf, however, these animals will never achieve the same profitability as their herdmates.

One of the major decisions with regard to the future calf population is the selection of their parents. This choice is made when calves are either kept as replacements or culled from the herd.

Calves that are kept for replacements should be the result of a well thought-out mating with the best bull for a particular cow. The offspring of this mating will hopefully be a heifer that will have greater genetic potential for milk production. To know what kind of offspring will be produced, an Estimated Breeding Value of the heifer can be calculated. This will give the expected mature production of a heifer compared to herdmates in a breed average herd. The example below illustrates the simplicity of this calculation. It is a matter of adding the PTA of the sire and the PTA of the dam.

Example

For milk	Heifer A	Heifer B
Sire (PTA)	Sire A +1,749	Sire B + 649
Dam (PTA)	Dam A + 351	Dam A + 351
	+2,100	+1,000

This example shows that if Dam A was bred to Sire B instead of Sire A, a loss of 1,100 pounds of milk per lactation would be sacrificed genetically in her average offspring. This clearly points out the importance of doing a thorough job when selecting bulls.

To obtain the maximum benefit of selection, calf losses must be very minimal. Calving interval, competency of management in raising calves and heifers, and the method used to breed virgin heifers are three of the most important factors determining the number of quality replacement heifers available. Examples of the number of replacements available in a 100-cow herd for two calving intervals, three levels of management, and three methods of breeding heifers are listed in

Table 1.

Table 1. Influence of calf and heifer management, calving interval, and method of breeding heifers on availability of replacements.

	12-mos calving interval			13.5-mos calving interval		
Potential calves/100 cows/year	**100**			**90**		
Management conditions	**Good**	**Avg.**	**Poor**	**Good**	**Avg.**	**Poor**
Percent calf loss due to sterility, abortions, stillbirths, and death between birth and age 23 months	14	32	50	14	32	50
Number of calves remaining	86	68	50	77	61	45
Heifers remaining and genetically superior heifers available if heifers are bred A.I.	43	34	25	38	30	22
Replacements lost if heifers are bred to a beef bull or genetically superior replacements lost if heifers are bred naturally to a dairy bull[1]	13	10	8	11	9	7
Remaining replacements	30	24	17	27	21	15

[1]About 30 percent of the replacements born are out of first-calf heifers.
Source: G. Heersche, Proceedings of National Dairy Cattle Reproduction Workshop, Louisville 1982.

The average herd cull rate is 25 to 30 percent of the cows each year, so a 100-cow herd requires 25 to 30 replacements per year. For the examples in Table 1, sufficient replacements are available to maintain herd size if all heifers are bred to dairy bulls except under the "poor management" situation. If heifers are bred to a beef bull, sufficient replacements are available only with a 12-month calving interval and good management of the calf and heifer raising program. A successful calf raising program will have lower death losses and will provide greater opportunity to cull animals with a lower genetic potential. The lower 10 percent of the calves should be culled to allow for the maximum genetic advancement. However, if calf mortality has been high, all the available calves may be needed for replacements. In this situation, the genetic gain would be limited because inferior animals would not be removed from the herd. Table 2 shows how many replacements are needed for varying herd sizes and cow culling rates.

Table 2. Number of replacement heifers required for various herd sizes and several cow culling rates.

	Probable cull rate/year (%)					
Herd size	**15**	**20**	**25**	**30**	**35**	**40**
30	5	6	8	9	11	12
40	6	8	10	12	14	16
50	8	10	13	15	18	20
60	9	12	15	18	21	24
70	11	14	18	21	25	28
80	12	16	20	24	28	32
90	14	18	23	27	32	36
100	15	20	25	30	35	40
125	19	25	31	38	44	50
150	23	30	38	45	53	60
200	30	40	50	60	70	80
300	45	60	75	90	105	120

Table 3. Effect of calving interval on herd replacements in a 100-cow herd.

Calving interval (mos)	Average calves born per year (100 cows)	Bred heifers available for herd replacements (per year)
12	100	38
13	92	35
14	84	32
15	76	29

Assumes 75 percent of female calves born will survive to freshen as first-calf heifers.
Source: Illinois-Iowa Dairy Guide -1980, University of Illinois.

Poor reproductive performance in a herd will adversely affect selection opportunities. The potential number of calves available will decline as the calving interval increases. It is important, therefore, to maintain a sound reproductive management program in your entire herd, Table 3.

Accurate records of maternal performance are essential aids in determining which progeny should be raised for replacements. Use of Dairy Herd Improvement records is encouraged, along with records of identification, health, and reproduction. A newborn calf should be properly

tagged and identified as soon as possible. The sire and dam should be known and recorded for each calf. The introduction of farm computers and computerized DHIA systems have enabled producers to keep more accurate and up to date records with less time compared to manual records systems.

Heifer artificial insemination

Table 4. Method of breeding heifers.

Breeding method	Farms (%)
A.I. only	59.5
A.I. once, then bull	11.2
A. I. twice, then bull	8.5
Bull only	20.7

Source: Penn State Data; Journal Dairy Science 70:896, 1987.

Artificial insemination of virgin heifers can contribute the most to genetic progress within a herd. Progeny from heifers (first lactation) account for nearly 32 percent of all births. Table 4 shows, through a survey done in Pennsylvania, that 59.5 percent use A.I. only. Despite the disadvantages, potential problems, and safety involved, 40.4 percent of the farms surveyed still had one or more bulls to lessen the inconvenience involved in breeding heifers. Genetic progress is slowed when animals are not bred A.I. Studies have shown that the use of genetically superior A.I. sires results in genetic progress rates three to four times the rate of herds using natural service bulls.

The problems with calf delivery in heifers can be minimized if a common sense approach is taken. Well grown heifers should be mated to proven calving ease sires. Most sire organizations offer a list of calving ease bulls. Some producers use a beef bull either through A.I. or natural service. This also causes calving disorders because the beef breeds are selecting for larger birth weights and larger frame size. It is important to remember that using a beef breed is no substitute for well grown heifers. In addition, a large portion of the calf crop potential is lost. One of the major reasons that more heifers are not bred artificially is inconvenience. This can be resolved with adequate restraint facilities. When remodeling or building any heifer facility, include restraint and handling facilities for animals of all ages. The genetic potential available from using A.I. on heifers is well worth the time to catch heifers in heat and the investment needed for facilities.

Culling

Herd improvement can be increased if animals are culled for genetic reasons. However, if animals are removed from the herd due to poor management, genetic improvement is severely limited. Table 5 relates calf mortality with the number of replacement heifers needed.

Table 5. Heifer calves needed for one herd replacement with varying mortality and culling rates.

Heifer calf mortality rate (%)	Heifer culling rate (%)				
	4	6	8	10	12
5	1.10	1.12	1.15	1.17	1.20
10	1.16	1.19	1.21	1.24	1.27
15	1.23	1.26	1.28	1.31	1.34
20	1.30	1.33	1.36	1.39	1.43
25	1.39	1.42	1.45	1.49	1.52

For example, with a 15-percent calf mortality rate and a 12-percent heifer culling rate, 1.34 calves must be started to provide one 24-month-old replacement heifer.
Source: Based on 1976 Dairy Update No. 22, R.D. Appleman, University of Minnesota.

Average culling rates range from 25 to 30 percent. If cull rates exceed 30 percent, all available heifers will be needed as replacements. Merely having sufficient numbers of heifers available for replacements is not satisfactory. In such situations, genetic advancement is limited because the genetically inferior heifers are not removed from the herd. Dairy farmers should breed heifers to

A.I. bulls with top production proofs and good calving ease ratings. This allows them to select which replacements will enter their herd and which ones will be sold to other farmers (needing additional heifers to maintain herd size).

Also, with plenty of genetically superior replacements available, some inferior cows could be culled that otherwise would have been tolerated.

In determining the number of herd replacements needed, it is necessary to consider the effect of age at first calving. For each month after 2 years, the herd requires an increase of 4.2 percent in the annual replacement rate (Table 6). By calving at the recommended age of 24 months, fewer replacements are needed.

Table 7 shows the availability of replacement heifers with relation to calf survival in a 100-cow herd. This is important to know if heifer merchandising or heifer culling is to be done.

Table 6. Effect of age at first calving on size of replacement herd.

Age at freshening (mos)	Change from 24 mos (%)
22	- 8.4
23	- 4.2
24	0
25	+ 4.2
26	+ 8.4
27	+12.6
28	+16.8
29	+21.0
30	+25.2

Each month after 24 months requires an increase of 4.2 percent (1.00/ 24 months = 4.2%).
For example, if 50 replacement calves and heifers are needed when freshening age is 24 months, then 58 replacements will be needed when the freshening age is 28 months (50 + (50 x 16.8%)).
Source: Raising Dairy Replacements, A1485, University of Wisconsin.

Table 7. Potential surplus heifers in a 100-cow herd with 20 heifers.

Heifers born[1]	Average[2] percent survival rate	No. heifers raised, birth to freshening	Replacement[3] rates of 15%	25%	35%
Calves saved from cows only					
45	90	40	25	15	5
45	80	36	21	11	1
45	75	34	19	9	1
Including calves from 20 freshening heifers[4]					
55	90	50	35	25	15
55	80	44	29	19	9
55	75	41	26	16	6

[1] In a 100-cow herd, about 90 calves are born per year, one-half are heifers.
[2] Average survival rate from birth to freshening.
[3] Extra heifers for voluntary culling, herd expansion, or sale.
[4] With 20 two-year-olds and 100 cows, total calf crop is 110 calves, one-half are heifers.
Source: Adapted from J. Hlubik and Penn State Dairy Science Extension Mimeo 88-21, Costs to Raise Dairy Heifers.

Calving Time

Precalving heifer-dry cow

Maternity pen with a cow and newborn calf.

The care and feeding of heifers or dry cows does affect their unborn calves. Size of the fetus and calving ease are determined by genetic factors, nutrition, age, and the size and condition of the cow or heifer at calving time. Dry cows should be fed separately from the rest of the herd and should be in good body condition. Calving problems can result when cows are thin or fat, heifers are undersized or oversized, or calving facilities are poor. The results include stillbirths, injured cows or calves, and postpartum reproductive complications.

Cows should be moved to a closed maternity pen or box stall a week or several days before their expected calving date. Cows and their newborns need protection from the other cows. Clean, dry maternity pens should be at least 12' x 12' in size. The stalls or pens should be well lighted and ventilated but free from drafts. It is best to clean the pens after each use and apply lime or other granular material to the floor before covering it with adequate amounts of dry bedding such as clean straw. A good nonslip base and adequate amounts of bedding can prevent injuries and udder trauma during calving. Wet sawdust, moldy hay, moldy, damp silage, or spoiled haylage should not be used for bedding. Many cases of infectious mastitis can be traced to contaminated bedding, especially green wood shavings and sawdust. Moldy hay and silage, and manure contaminated bedding contain organisms that can infect the uterus and udder. These organisms can also infect calves. During mild, dry weather, a well drained paddock or small pasture with shade can also serve as a good calving area.

Care at calving time

Approximately 2 to 5 percent of all calves are born dead (stillborn), many of which could have been saved if someone were present at birth to render proper assistance. Too often cows get assistance only after the cow or calf is in critical condition. The value of cows and calves makes it very profitable to observe the cows frequently prior to calving. Cows should also be attended to during calving. Monitoring the birth process ensures that cows and their unborn calves receive assistance if it is required. As shown in Table 8, calf mortality rates increase dramatically with the difficulty of birth. The average calf mortality in Pennsylvania is about 9 percent (Table 9).

Table 8. Calf mortality by difficulty of birth category.

	Calving percent in category		Calf mortality (%) within 48 hours	
Calving category	Heifers	Cows	Heifers	Cows
Unassisted	45	79	8	6
Easy pull	30	15	10	8
Hard pull	14	3	35	24
Jack needed	7	1	55	66
Veterinarian	4	1	48	65
Total	100	100	17	8

Source: North Carolina State University.

Table 9. Calf mortality on Pennsylvania dairy farms during 1984-85.

Calving category	
Average calves born dead, %	5.0
Average calves dead before 1 year of age, %	3.7
Total average calf mortality, %	8.7

Source: Penn State Data; Journal Dairy Science 70:896, 1987.

North Carolina University researchers estimate that each difficult dairy birth costs $40 to $75 due to increased calf and cow mortality, reduced milk production, rebreeding problems, and the cost of additional labor required in delivery. Proper management of dry cows and heifers, and using sires with good calving ease ratings can help reduce these losses.

Cows should be checked every 2 hours after the onset of labor to monitor progress. Some cows show noticeable signs of calving and will give birth in a few hours, while others may not calve until the next day or may calve earlier than expected. Signs of discomfort usually appear when the cervix has begun to dilate. Arching of the back is apparent at this time. Definite straining does not occur until the chorioallantois (outer placental sac) approaches the vulva. Pressure from the fetal fluids moisten this membrane and help to complete the dilation process. Contractions become more intense as the fluid sac ruptures. Then there is a temporary weakening of abdominal contractions until the ammion (inner fluid sac) enters the vulva. Once this membrane ruptures, regular contractions and straining begin to increase in frequency and duration until parturition.

Cows should deliver 30 minutes to 1 hour after the fetus appears in the pelvic inlet, and heifers should deliver within 2 hours. If the cow or heifer does not progress accordingly, she should be examined to check for abnormal fetal position or other problems. Cervical dilation must occur before assistance is provided.

After calving

The cow should get up and assist the calf within 30 minutes after giving birth. If she does not getup soon after birth seek advice and assistance from a veterinarian. The cow should pass manure and drink water within this time. A normal cow will be alert, have a normal body temperature, and be willing to eat and drink within an hour or two after calving. The cow should be allowed to lick the calf after delivery. Licking stimulates the calf's blood circulation and may increase absorption of immunoglobulins in colostrum. Figure 1 shows calf-care management tips.

Figure 1. Calf care tips.

1) After the calf is born, its nostrils should be checked for mucus and cleared to facilitate breathing.

2) The calf's navel should be dipped with a 2-percent tincture of iodine solution or some other suitable disinfectant to prevent any infection at this time. Since these umbilical vessels connect directly to various organs in the body, infection at this site can be very harmful to the newborn. This must be done shortly after birth and before the navel is dry.

3) It is critical that the calf receive colostrum as soon as possible after birth, preferably within 1 hour. Most healthy calves are on their feet within 30 minutes and nursing within an hour.

4) Before colostrum is milked from the cow and then fed to the calf, or the calf is allowed to nurse the mother, the cow's teats and udder should be washed and sanitized. The sanitizing solution should contain 200 parts per million of chlorine, or another approved sanitizing solution, to decrease the amount of bacteria transferred to the calf through the digestive tract.

5) In extremely cold weather and cold housing conditions, it may be necessary to use blankets or a heat lamp to keep the calf warm until it is dry.

All calves should receive colostrum soon after birth. Research shows that 25 percent of the calves left alone after birth do not nurse within 8 hours and between 10 to 25 percent do not get adequate amounts of colostrum. Calves should receive 4 to 6 quarts (8 to 12 pounds) of undiluted colostrum per day for the first 3 days. Total daily intake of colostrum should not exceed 10 percent of the calf's bodyweight. Because the newborn calf's resistance to

Dairy farmer feeding colostrum to calf.

diseases is greatly affected by the timing of the colostrum intake and its quality, colostrum should be fed within 1 hour of life. This will give the newborn calf a higher level of antibodies in the blood and a better chance of survival until weaning age.

Management after calving

Each calf should be positively identified before it is removed from its dam. This is required if calves are to be registered and it is essential for good breeding program records. A neck strap or chain with a number or a metal or plastic ear tag can be used for identification. The ear tag or registration numbers of calves, sires, dams, and the birth dates should be entered in a permanent record book.

Permanent identification methods include photographs, sketches, tattoos, and freeze branding. The Holstein, Guernsey, and Ayrshire breeds require a photograph or sketch for registration. The other breeds, Jersey, Brown Swiss, and Milking Shorthorn, require tattoo markings inside the ear. The Ayrshire breed accepts both types of identification. The tattoo or freeze brand also provides permanent identification of dairy heifers of any breed for farm use.

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