

DAIRY HEIFER MANAGEMENT PROGRAM



BASICS

OVERVIEW

- Heifer rearing is the raising of replacement females from weaning to first calving.
- In many dairy herds, producers still tend to place primary emphasis on production in the mature milk cow. Heifer and calf rearing can be a low-priority system, allowing higher death loss and lowered life-long productivity.
- The extreme importance of heifer management must be emphasized because it is essential for the profitability and the success of the dairy.

SYSTEMS AFFECTED

Multisystemic

GENETICS

Heifer Selection Criteria and Genetics

- Heifer rearing is the major source of replacement animals for the milking herd. The genetic potential of replacement heifers should exceed that of the cows being removed from the herd. This should be taken into account any time animal selection and breeding criteria are evaluated for an individual animal or the herd.
- Genetic assessment of the heifer-rearing program includes:
 - DHIA records of dam
 - Herd records, including calf and heifer records
 - Genetic merit of the sire and dam; genomic evaluations if available
 - Adequate animal numbering and recording system
 - Health records of the heifer, the dam, and if possible the sire.
 - Evaluate the persistence of the dam's productivity and herd longevity.
- The genetic selection program emphasizing heritable traits of significance should be paramount in the producer's heifer-rearing program.
- Genetic epidemiology serves the understanding of breed-specific selection. All major dairy breeds possess genetic disease and unwanted heritable traits. When these traits are genetically dominant, they are deleterious to health or productivity.
- Most genetic diseases are of low prevalence but should still be monitored when evaluating an individual's genetic potential. Each heifer receives two genes for a particular trait, one from both the sire and dam. Three types of genes can occur: dominant, semidominant, and recessive.
- With dominant genes, every carrier will express the condition. A mating with one affected parent will result in 25% of the offspring expressing the condition. Environmental factors and modifying genes can affect the outcome of the dominant gene.
- Semidominant genes are very common in dairy cattle breeds. A single gene can produce the heritable defect, while a double gene can greatly increase its dominance. Selection for the carrier of this trait can intensify the heritability substantially.

- Recessive traits are only expressed if the animal has that gene from both parents. If the parents both carry one copy, they will appear normal but can pass the trait to their offspring and 25% will be affected.
- Carrier trait recognition can be a very important tool in understanding the genetics of the producer's breeding program. Controlling recessive genes is important in an epidemiological basis of production. Control of problem genes depends on gene frequency. This is the proportion of genes of the expressible trait within the herd. The gene frequency can be low within the breed overall, but high within a herd where a carrier male has recently been used.
- The heifer-breeding manager can rapidly reduce a negative recessive gene through selection, but eliminating it from a herd completely will be difficult. This should be emphasized to the producer when sire genetics are evaluated.
- One of the main problems in selecting against a recessive trait is the large numbers of carriers that are not easily recognized within the breeding herd.
- If a deleterious breeding situation is encountered, discontinue the current sire immediately. It can be easily seen that the use of herd breeding bulls in lieu of artificial insemination can easily intensify a negative trait throughout the herd fairly rapidly.
- Monitoring sire selection is of extreme importance to the overall productivity of the herd.
- Genetic selection programs should emphasize:
 - Calving ease (highly heritable)
 - Conformation, especially feet and legs and udder support
 - Milk production, including components
 - Disease resistance and health traits
 - Reproductive traits like daughter pregnancy rates (DPR) and stillbirth rates
 - Productive life and longevity
- Monitoring both DHIA and herd records will enable the evaluation of recurring herd problems diminishing herd productivity.
- Cross-breeding is becoming more common within the dairy industry. Breeding selection relies on hybrid vigor to improve animal production for varied uses. There can be benefits to crossing two dairy breeds for use in the dairy herd or crossing bottom end heifers with beef sires for higher calf prices.

SIGNALMENT

Species

Cattle

Breed Predilections

Dairy breeds

Mean Age and Range

N/A

Predominant Sex

Female



MISCELLANEOUS

Nutrition Program and Dietary Management

- The adjustment of grain to forage ratios in diets should be based on age and body size as well as body condition scoring. Growth is the goal during this period.
- Forage quality information must be available to adequately feed dairy heifers. Forage quality is extremely important in determining the protein content of the ration. Grain levels can then be adjusted to adequately balance the protein needs.
- Balance the ration for protein then for energy requirements, and then vitamin and mineral levels should be met to prevent nutritional deficiencies.
- Emphasis should be placed on adequate bunk space per individual animal. Small groupings of animals diminish nutrition stress. This helps eliminate aggressive competition, especially immediately after weaning.
- Free choice frost-free water needs to be present at all times.
- Monitoring the individual animal's body condition score and growth is extremely important to insure that heifers are not overfed between weaning and puberty.
- Pre-pubertal over finished heifers have been shown to lack mammary glandular tissue with a subsequent decrease in lactation ability over the productive life of the cow. Body condition scoring (BCS) should be an ongoing process.
- Recording weight gain is another important aspect of the nutrition program. Body parameters can be extrapolated either through girth measurement or by direct weight of each individual.
- Height at the withers is an important assessment. Monthly comparisons should be made to the herd average.

Heifer Housing and Comfort

- Housing of heifers plays a large part in animal health and comfort, and therefore the success of the heifer-rearing program.
- Housing problems of heifers raised indoors:
 - Inadequate air quality and ventilation. Generally, this is due to inadequate air inlet size restricting inward airflow. Inadequate outlet volumes, poor barn placement in relation to prevailing winds, and overcrowding are other key factors affecting air quality.
 - Temperature and humidity extremes. In the colder climates, low temperature upon air delivery with a lack of heating capability is of extreme importance. Second, high humidity in all seasons due to overcrowding is a key problem.
 - Inability to pen calves by age and size precludes calf comfort and predisposes to lowered production.
 - Inappropriate management for separation of heifers and mature cows will limit growth and production.
- Overcrowding and ventilation are the two housing limitations in heifer-rearing units.
- Weaning of the calf and moving it to an area of multimember housing are the two most stressful events in early calthood. This can be a special concern for calves moved from hutches to barns.
- Direct contact with the milking herd should be avoided. Heifers should be grouped by age and size in the new housing environment. Within these confines, adequate heifer rearing space must be available.
- Small group sizes immediately postweaning is a key component to heifer success. Initially, calves should be acclimated in group sizes of 4-8 individuals for the first 4 weeks

after weaning. This insures adequate adjustment to the new environment while minimizing stress.

- Weaned calves will require continual observation for the special accommodation of more timid calves and calves showing signs of illness.
- Free-stall housing is not recommended for the post-weaning age group, and is more appropriate for heifers older than 8 months.
- Naturally ventilated structures are preferred over mechanically ventilated programs, however, if closed barns are utilized, adequate airflow needs to be monitored and maintained.
- Heifer housing concepts important for success:
 - Frequent observations to ensure calves are eating and are not ill
 - Designated heifer rearing manager
 - Ample frost-free water
 - Adequate feed bunk space-14-18 inches for heifers up to 16 months, then 24 inches until close-up period where 30 inches is ideal.
 - Completely isolated from mature cows and their manure
 - Adequate pen size- 35 square feet of pen space each for heifers 2-4 months old and 40 square feet for heifers 4-8 months old. Then increase by 10 square feet for every 4-month age period until pre-calving.
 - Regular performance analysis—weight and height measurements, BCS, feed intakes
 - Extensive cleaning when animals are moved out of pens. All in and all out pen moves, when possible, will limit disease spread between groups.

Reproductive Management

- The primary goal of heifer fertility management is to achieve first freshening by 24 months of age and have greater than 90% of heifers reach freshening. Heifers should be 85% of their mature weight after they calve.
- As age at first freshening increases, herd productive life span and overall long-term productivity decreases. Heifer rearing is expensive and therefore, time the heifer is not in production should be minimized.
- The breeding of heifers should be based on weight and body size (on a specific breed basis). Puberty will be reached when heifers are 45-50% of mature body weight and ideal breeding weight is at 55-60% of mature weight. Health assessment is also important at this time. Reducing the age at first freshening with a genetic selection for calving ease is an important goal.
- Heifers calving at an older age can have a higher incidence of ketosis and dystocia.
- Regular assessment of a heifer's reproductive performance is extremely important in evaluating the success of heifer-rearing performance. Average herds reach 75-90% bred by 400 days old and 75-90% pregnant by 450 days with pregnancy rates near 30%. Conception rates in heifers should be 60% for conventional semen and 45% for sexed semen. These vary with breed and management style.
- Artificial insemination should be an important tool in the management of the heifer reproductive program. Utilizing heifer sexed semen on the first few services can be advantageous for calving ease, as well as for increasing heifer numbers. Though many producers rely on bulls to breed heifers, a well-managed artificial insemination program utilizing genetic selection for ease of calving and appropriate heat detection can be far superior to bull breeding. This is especially true when herd and production growth is the goal.
- Extensive genetic improvement can be made through selection of AI sires as well as diminished trauma secondary to bull mating and safer working conditions for employees.
- Initial assessment of the heifer should be made and using pedigree information, conformation of the heifer, genomic evaluations, and dam production data, sire selection can be made. Calving

ease in heifers is extremely important in the selection of a sire, especially when striving for lower ages at first calving. Using sexed semen is also of benefit for calving ease because heifer calves tend to weigh less than bull calves.

Disease Prevention Programs

- Maintenance of the heifer's health should be on a proactive and preventive basis.
- The two main disease processes affecting heifers are scours and respiratory disease. Farms should strive for less than 30% of heifers treated for scours or respiratory illness. Treated heifers are more likely to be culled before their first freshening or during the first lactation and tend to be older at first calving.
- Key components for inclusion in a heifer-rearing program:
 - Colostrum management for adequate passive transfer at birth
 - Diarrhea disease management- vaccination, colostrum, good nutrition
 - Clinical coccidiosis has been shown to be directly related to external stress factors including weaning, overcrowding, poor sanitation, concomitant disease, and inclement weather. Subclinical cases can cause reduced productivity as well. Prevention is attainable with calves on high volumes of milk and good starter intakes, leading to better immune systems and less weaning slump. Rations with coccidiostats are helpful for control of coccidia but intakes must be at or above the formulated level.
 - Respiratory disease management-vaccination, proper air quality/housing, good nutrition
 - Respiratory disease can cause poor gains as well as continued health problems for the rest of the heifer's life. With proper vaccination, proper ventilation in heifer housing and good nutrition, heifers can remain healthy.
 - Parasite control- internal and external parasites should be controlled
 - When generating an anthelmintic program, it is important to consider product costs, labor availability, time of year, restraint facilities, pasture stocking densities, and product specificity
 - Monitor external parasites such as flies and lice, which can cause discomfort and delay growth.
 - Pre-lactation mammary health- housing cleanliness, fly control, inhibit cross-suckling
 - Feet and leg health programs (emphasizing conformation as well as health)
 - Hairy heel warts, if present in the herd, must be addressed in the heifers with regular foot bath access. Hoof trimming should be performed when necessary, but is recommended once in the pre-fresh timeframe.
 - Vaccination programs
 - Assess on-farm disease incidence and prevalence, as well as risk of exposure, transport stress, and mingling with animals from other herds
 - Cost-benefit analysis is important but vaccination can be one of the least expensive tools used on dairies
 - Efficacy of vaccines on the market vs autogenous vaccines if necessary
 - Focus on prevention of disease through vaccination, optimal nutrition and housing rather than on treatment programs
 - Discussions of vaccine types (killed vs. modified live vaccines vs. mixed vaccines; univalent vs. multivalent) and proper technique (and timing) are important so that all involved understand the principles of vaccination
 - Heifer vaccination timing must benefit the animal while taking into account heifer facilities, pen moves, and vaccinating when animals can be easily handled.
- Veterinary procedural completion at the youngest age possible

- Minimize stress by disbudding and removing supernumerary teats at an early age using appropriate procedures, pain mitigation and local nerve blocks.

Record Keeping and Economics

- Discussion and progress evaluation of the health maintenance program should be reviewed on a quarterly basis by farm owners, managers, veterinarian, and nutritionist.
- The housing program should be assessed on a seasonal basis and the nutrition program should be assessed on a biweekly basis by the management.
- Genetic selection and breeding evaluation should be made on a per animal/herd basis. If genomic evaluations are being used, sampling should be done as early as possible in the heifer's life to ensure adequate time for decision making processes.
- Quarterly assessment of staff should be made to determine success of animal care and training and retraining of employees should be performed by skilled people as needed.
- The herd veterinarian should evaluate reproductive parameters monthly with a twice-annual assessment of the artificial insemination technique. Semen tank evaluation should be provided and kept up by the bull stud company assuring the highest quality storage of semen. The semen professional as well as the professional management, veterinarian, and support staff should also evaluate genetic selection on at least a quarterly basis.
- Record analysis should be ongoing including DHIA, farm records, genomic reports and sire information. The use of computer spreadsheet analysis for calf rearing should also be incorporated into the performance and economic evaluation of the program.
- Feed costs are the largest single expense of the dairy followed closely by raising replacement heifers so both should be managed appropriately to be efficient with good results.
- Successful management of the designated heifer replacement program can make the largest overall impact to dairies' profitability over time.
- It is a multifactorial program utilizing genetics, nutrition, housing, reproduction, health, and economics.

AGE-RELATED FACTORS

Heifers must have a calf in order to become a productive member of the herd and this must be accomplished in the best timeframe. Heifers calving too early that lack body size may struggle with calving and in the milking herd. Heifers calving too late, often because of diseases or poor reproductive management, have wasted resources during a long rearing phase and may also have continued health problems as a lactating cow.

ZOONOTIC POTENTIAL

Several diseases associated with heifer rearing are zoonotic and should be closely monitored. These include leptospirosis, cryptosporidiosis, Salmonellosis, tuberculosis, rabies.

SEE ALSO

- Artificial Insemination: Bovine
- Cleaning and Disinfection (www.fiveminutevet.com/ruminant)
- Dairy Economics (www.fiveminutevet.com/ruminant)
- Dairy Heifer Nutrition: Basics (www.fiveminutevet.com/ruminant)

ABBREVIATIONS

DHIA = Dairy Herd Improvement Association

Suggested Reading

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