Over the past 20 years, the dairy industry has made improvements in genetics, nutrition, milking systems, facility design, health programs, care, and management. All of these improvements have attributed to an increase in milk production. The welfare of a dairy animal is critical to the success of a dairy and for the provision of high-quality, safe, and wholesome dairy products.

Objectives:

1. Analyze production practices and feeding systems involved in the stages of dairy cattle production.
2. Determine the importance of body condition scoring, and describe how it is used to modify feeding practices.
3. Examine the role of Dairy Herd Improvement Associations.
4. Describe how pedigrees and Predicted Transmitting Ability (PTA) are used to improve herd quality.
5. Discuss the selection process for dairy cattle.

Key Terms:

- artificial insemination (AI)
- body condition score
- challenge feeding
- colostrometers
- colostrum
- crossbreeding
- culling
- Dairy Herd Improvement (DHI)
- dry cows
- hybrid vigor
- outcrossing
- Predicted Transmitting Ability (PTA)
- purebreeding
- reliability
- total mixed ration
Several common production practices occur during the different stages of a dairy cow. The quality of care the animal has received during every stage of its life impacts the lactating cow’s performance.

DAIRY CALVES

Dairy calves need an appropriate environment, a quality nutritional program, and a preventive health care plan to ensure the highest quality of care. The greatest chance for mortality in a dairy herd is between birth and weaning, so this period is critical.

Facility Practices

Dairy calves should be housed in a clean and dry environment with little stress. Calves also require protection from the heat, cold, wind, and rain. Calf hutches are the dominant type of facility on dairy farms because they are insulated from the weather and can be moved for sunlight or wind direction. Made of fiberglass, these hutches are placed outside and rest on the ground, making them easy to move for cleaning.

Feeding Practices

Feeding and nutrition are important to maintaining the health of calves. These animals receive colostrum the first few days of life. Colostrum is the first milk from the mother; it contains important nutrients, such as immunoglobulins, protein, fat, minerals, and vitamins. The producer should collect, store, select, and feed colostrum to calves within the first 24 hours of life.

Colostrometers are used on dairy farms to determine the highest quality and to measure the specific gravity of colostrum. The ideal specific gravity should be no greater than 1.106. The ability of the calf to absorb important immunoglobulins starts to decline within hours of birth. As a result, bottles or esophageal tubes are used for the first feeding to ensure nutrient receipt. Calves usually end their colostrum feeding around the fourth day and switch to whole milk or milk replacer.
The calves should also receive calf starter feed and quality hay. The feed should be palatable, easily digested, and high in protein. Calves also need access to clean, fresh water. Calves can consume 2 to 5 gallons of water daily.

**Health Care Practices**

A well-managed health care program will minimize death loss. Calves should be born in a dry, clean environment. The umbilical cord should be treated with iodine. All equipment used for feeding should be cleaned and sanitized after every use. In addition, vaccinations should be given to prevent any major/common diseases within the herd.

Surgery may be necessary. Some heifer calves are born with extra teats (more than four). Extra teat removal should be performed as soon as possible after birth to allow for a quick recovery. Dehorning is also a production practice conducted within 2 to 10 weeks of age. This process is conducted to protect other animals and the handler. Dehorning also helps reduce feeder space requirements.

All calves should be identified. This helps producers make decisions regarding feeding, selecting, breeding, or culling. The most common identification is the plastic ear tag. In addition, veterinarians attach metal ear tags after the animals have been vaccinated for brucellosis.

**REPLACEMENT HEIFERS**

Replacement heifer care starts at weaning and continues until the first calving period. Calves can be weaned as early as 30 days of age and should be weaned gradually. This allows for adjustments in feeding before entering into a group. Careful management decisions will prevent health problems and maintain growth schedules.

**Facility Practices**

Weaning programs should keep calves free from stress that can occur due to crowding, competition with older calves, and weather. A good production practice allows for weaning in groups of 5 to 12. Calf pens should be designed to drain well and should provide ample amounts of shade. As heifer calves grow, group sizes may increase. Yet it is important to maintain uniform groups of size and age.

**Feeding Practices**

Feeding practices (from weaning to calving) for heifers include fresh, clean water; starter and grower feeds; and high-quality hay. Calves usually stop milk feeding within a few days before weaning. The newly weaned calves should have constant water access and should continue on the same starter ration.

Feed is usually offered as free choice. The ideal rate of gain should be 1.5 to 1.8 pounds per day. Therefore, at least 5 pounds of starter grain with free-choice access to hay should be offered. The starter ration should contain 16 to 18 percent crude protein. About a month after weaning, switch to a grower grain mix with approximately 14 percent crude protein.
After 120 days of age, calves may be fed a **total mixed ration** (TMR), which contains all feedstuff mixed together. Salt and/or trace minerals should be available in a block or in loose form if they are not part of the ration. Heifers will continue high-forage diets until a few weeks before calving.

**Health Care Practices**

Replacement heifers should receive attention to health care to minimize disease problems. Proper housing, feeding, and management as well as attention to weather stress help to maintain a healthy replacement herd.

Vaccinations are recommended. Between four and eight months, a veterinarian should vaccinate heifer calves for brucellosis, tattoo their right ears, and use a permanent metal brucellosis vaccination identification or a USDA series number tag.

Other good health production practices include fly and parasite control. Routine manure removal and a clean farm reduces flies. Heifers that have been on pasture and those entering the herd from unknown locations should be dewormed. All calves should be observed daily for signs of illness or injury.

**LACTATING COWS**

Lactating cows require an appropriate environment, a quality nutritional program, and a preventive health care plan to ensure the highest quality of care. Lactating cows should be moved and handled in a quiet, consistent, and safe manner. Dairy cows respond to habit and should be well established at an early age.

**Facility Practices**

Lactating dairy cow care starts with a proper facility design. Well-designed facilities can reduce stress. Temperature stress is a problem. Lactating cows may have to divert energy from milk production to produce body heat. Also, heat-stressed cattle will eat less, causing reduced production.

Clean, dry bedding should be provided. This allows for comfort and for disease reduction. Other production practices related to facilities include providing a concrete area around water.
troughs, feed bunks, and entrances to reduce slippage. Many large dairy barns are built with a degree of slope to allow for proper drainage.

**Feeding Practices**

Lactating dairy cattle need energy, protein, fiber, vitamins, and minerals. Body fat is necessary as an energy source for lactation; however, excessive body fat can cause metabolic diseases and calving problems. Evaluating the body condition of cows on a regular routine should be part of management practices so feeding can be altered as needed.

It is common for high-producing dairy cows to obtain 50 to 60 percent of their rations from roughages and the other 40 percent from concentrates. Concentrates should contain high-energy feeds and protein supplements. The first four months of lactation will require a higher percentage of concentrates because production will be high during this time. Reducing concentrates for low-producing cattle or cows in the late lactation period reduces feed costs. Dairy cows can consume approximately 5 gallons of water per gallon of milk produced daily. Feed and water troughs should be cleaned regularly to reduce the threat of illness.

**Health Care Practices**

Common diseases, such as mastitis and foot rot, should be tended to immediately. Udders should be clean and dry when milked, and teats should be sprayed or dipped with a disinfectant after milking. The proper sanitation and management of bedding areas, the milking parlor, and equipment helps reduce the threat of mastitis. Trimming hooves and properly draining pens/lots minimizes foot disorders. Some producers trim switches (tails) or dock them. This practice aids in udder health and milk quality.

**DRY COWS**

Dry cows are cows that are not producing milk. The dry stage in dairy cows usually occurs 40 to 60 days prior to the next calving period. This allows the cows to prepare for the new calves and for colostrum production.
Facility Practices

Dry cows are usually housed in groups and should be protected from the weather. Freestalls allow the cows to enter and exit freely for feeding. There should be exercise pens available for use during waste removal and for comfort.

Feeding Practices

Feeding dry cows aims at stopping milk production by eliminating grain concentrates, high-quality legume forages, and corn silage at the early part of the dry period. These feedstuffs are replaced with lower-energy, high-fiber forage (e.g., grass or oats).

The feeding program for dry cows varies and should be adjusted for body condition. The program should also provide for the growing fetus and support lactation preparation. Dry cows in the proper body condition should gain 1 to 1.5 pounds per day during fetus growth. Thin cows should be grouped separately and fed a higher energy ration. Over-sized cows should be grouped separately and fed low-quality forages with protein supplements.

All dry cow rations should contain at least 15 percent crude protein. Forages, like hay, will serve as the primary feedstuff for dry cows. Calcium, phosphorus, and potassium intakes are important during the dry period.

Specific feeding programs are designed for cows during the last 10 to 16 days before calving. Challenge feeding is the gradual increase in the level of concentrates to help the cows reach their genetic potential in milk production; this also helps to prevent the metabolic disorder known as ketosis. Challenge feeding is started two to three weeks before calving.

Health Care Practices

Monitor cows until their udders do not produce milk. If udders become hard and swollen, they should be milked out. When new milk is present in the udders, the cows are susceptible to new infections. Therefore, it is important to maintain clean pens and pastures. Dry-cow therapy also helps to control mastitis. This process allows for each quarter of the udder to be treated with a long-lasting antibiotic that is approved by the FDA. Producers should always read and follow the instructions on the label.
Importance of Body Condition Scoring

Body condition score is used to evaluate an individual cow in relationship to the ideals for a specific lactation stage. This score provides an indication of the energy status and fat cover of a particular dairy cow. Certain scores are assigned to the amount of fat observed on several skeletal parts.

Different point systems are used to score the cows. Most common is a point system range from 1.0 to 5.0 in increments of 0.1 to 0.25. As the dairy cows experience lactation, changes in body condition scores will occur. Dairy cows are expected to lose body weight during peak production.

These changes in body condition due to fat cover will shift the energy balance. A negative energy balance will not allow cows to perform at maximum capacity. Therefore, lactating cows should be fed well-balanced rations to put on fat before moving into the dry period (with an ideal body condition score of 3.5 to 4.0). This enables cows to reserve energy, allowing them to produce more milk in early lactation.

Body condition scores greatly influence feeding practices. This scoring should be used as a management tool for producers to determine the ideal herd nutrition plan. Nutrition improvements will improve milk production, reproductive performance, and health. Extremely thin cows have metabolic problems and decreased milk production, while obese cows suffer from metabolic problems and calving trouble. As a result, keep cattle at the ideal body condition to improve overall dairy farm success.

Body condition scores should be performed at various times throughout lactation, at calving, and at first breeding. Recording the body condition scores helps in monitoring cows. For consistency, the same person should score the animals.

Dairy Herd Improvement Associations

The dairy industry utilizes Dairy Herd Improvement (DHI) programs and records to promote accuracy, credibility, and uniformity. Dairy Herd Improvement is a national dairy testing and record-keeping program through which the producer can test the herd and compare it with other herds across the nation.

The DHI program is the basis for the rapid improvements made in dairy cattle genetics and milk production efficiency. In this program, USDA and Extension Service personnel collaborate with dairy producers to help improve milk production and dairy management practices. Records are compared within a herd and with herds on a local, state, and national level. Producers use several testing plans to improve herd efficiency. Some of the tests conducted are sire evaluation, individual cow records of milk production, milk fat, and milk weights.
Pedigrees and Predicted Transmitting Ability

In dairy cattle, the Expected Progeny Differences (EPD) are called the Predicted Transmitting Ability (PTA). The PTA measures a bull’s ability to transmit milk-producing capacity to its female offspring. PTAs can be positive or negative. These values will depend on whether the bull’s female offspring yields more or less milk than female offspring of another bull under the same environmental conditions.

The USDA calculates and publishes data on cows that are within a testing program to show the relationship to these bulls. Common PTA values used to estimate the sire’s potential are the following: PTA value for dollars (PTA$), milk (PTAM), fat (PTAF), protein (PTAP), cheese yield dollars (PTA$cheese), percentage of fat (PTA percentF), and percentage of protein (PTA percentP). Other breed associations will calculate a PTA for a specific type.

Another term used in the dairy industry is reliability. This refers to the confidence in the PTA value. A low reliability percent will likely change when larger numbers of female offspring are added to the sire summary. Sires should be selected based on high PTA values, index values assigned by breed associations, and a reliability of at least 70 percent.

Pedigrees are used to evaluate the performance of past generations and to compare genetic traits through the use of PTAs. The use of performance or production data is crucial in the improvement of animal quality. Knowledge of pedigrees can also be a useful tool in assessing genetic abnormalities and traits.

The Dairy Cattle Selection Process

The producer must use breeding techniques to continually improve the herd while culling or removing animals. Culling is the practice of removing animals in poor condition or animals that do not express the desirable characteristics of the herd.

SELECTION OPTIONS

Culling animals from the herd creates space for more profitable animals. Before culling, consider the following factors: milk production, reproduction history, reproduction, and health status.
age, and chronic health problems. The Dairy Herd Improvement Program may help the producer.

Breeding may involve using a bull or using artificial insemination. **Artificial insemination (AI)** is a method, other than natural mating, used to bring sperm in contact with eggs. When using AI, producers can select sperm from different donors. Look at the female offspring of the sire and determine if they express desirable traits. The disadvantage of AI is catching cows in heat and taking the time to breed them. Keeping a bull on the farm limits the genetic pool, but it saves time by allowing the bull to detect heat.

Purebreeding is another means of herd improvement. **Purebreeding** is the mating of a purebred animal with another purebred animal of the same breed. Purebreeding can improve the herd by keeping registration papers of the ancestry of both the sire and the dam.

Outcrossing is another useful system of breeding. **Outcrossing** is the mating of an unrelated male and female. It will increase genetic diversity and help produce hybrid vigor within the breed. Hybrid vigor increases the strength of different characteristics, referred to as heterosis.

**Crossbreeding** is mating one breed of cattle to a recognized but different breed. A Holstein could be mated with a Jersey animal. Advantages to crossbreeding include higher production and more resistance to diseases. Disadvantages include not being able to register the animals because they are not purebred and difficulty predicting offspring appearance.

**Summary:**

Several common production practices occur during the different stages of a heifer/cow. Life-long animal care affects lactating cow performance.

The body condition score is used to evaluate an individual cow in relationship to the ideals for a specific lactation stage. This score provides an indication of the energy status and fat cover of a particular dairy cow; it should be used as a management tool for producers to determine an ideal nutrition plan for the herd.

The dairy industry utilizes Dairy Herd Improvement (DHI) programs and records to promote accuracy, credibility, and uniformity. Dairy Herd Improvement (DHI) is a national dairy testing and record-keeping program through which producers can test the herd and compare it with other herds across the nation.

In dairy cattle, the Expected Progeny Differences (EPD) are called the Predicated Transmitting Ability (PTA), which is a measure of a bull’s ability to transmit milk-producing capacity to its female offspring. Animal selection should be based on pedigrees, individual appearance, individual performance, and progeny testing. Being able to recognize desirable and undesirable traits is important in herd improvement. Use breeding techniques to continue herd improvement.
Checking Your Knowledge:

1. What are common health care practices performed on dairy calves to ensure good herd health?
2. What are the steps in weaning a dairy heifer?
3. Why is dry-cow therapy performed?
4. How does body condition score affect feeding practices?
5. How are PTAs used to improve herd quality?
6. What are some options to consider when encouraging herd improvement?

Expanding Your Knowledge:

Obtain a copy of a body condition scoring guideline (Elanco Animal Health). Research the differences between the scores from 1 to 5. Observe the fat cover over the tail, head, ribs, pelvic, and loin areas. Determine the factors that affect body condition scoring.

Web Links:

Dairy Farming Today
http://www.dairyfarmingtoday.org

Dairy Management Inc.
http://www.dairynfo.com