Imagine you are the manager of a large dairy herd. Looking at your production records over the past 16 months, you notice that pounds of milk have declined, along with other evaluation factors. From a quick glance at cow age, you realize several of your cows are getting old. It is time to start thinking about herd improvement. Through selection and other methods, your herd can be improved to equal or exceed previous measures.

Objective:

Identify selection within the dairy herd to encourage improvement.

Key Terms:

AM-PM Testing Program  
artificial insemination  
Basic Production and Management Program  
crossbreeding  
culling  
Dairy Herd Improvement Program  
Dairy Herd Improvement Registry  
embryo transfer  
hybrid vigor  
outcrossing  
Owner-Sampler Program  
purebreeding  
recognized breed  
Weigh a Day a Month Program  

Using Selection and Other Factors for Herd Improvement

A dairy cow herd should be evaluated on the desirable and undesirable traits expressed by the current animals in production and by their offspring. Efforts must be made to select for
traits that will improve milk production, milk quality, cow health, longevity of production, breeding ability, and other factors. When traits are identified that are in need of improvement, selection can be geared to correct the weak areas of the herd. This can be done by using methods such as the Dairy Herd Improvement Program, culling, artificial insemination, embryo transfer, purebreeding, outcrossing, and crossbreeding.

DAIRY HERD IMPROVEMENT PROGRAM

The Dairy Herd Improvement Program (DHI) is designed to improve selection within dairy herds through the Dairy Herd Improvement Association (DHIA). The DHIA is a testing and evaluation association coordinated by extension field agents and an independent regional supervisor. The supervisor is required to be unbiased toward the herds in the region, visit each farm once per month for testing, and prepare farm and regional reports. Tests performed by the supervisor include individual milk sampling from each cow in the herd, nutritional/feeding evaluations, reproduction, cow comfort, and overall management techniques. Data collected can be used to remove inferior cows from the herd, identify problem areas in management, and track progression or regression. Also, the evaluations of similar herds in a region can be compared, standards created, and elite herds identified. Selection based on DHI aids in identifying superior animals in herds, creating opportunities for progressive mating, and removing inferior animals.

The Dairy Herd Improvement Association offers other programs to improve selection and efficiency within dairy herds. The Dairy Herd Improvement Registry operates similarly to the DHI but also includes random, unannounced testing upon request of breed associations or other stakeholders. The AM-PM Testing Program is a more efficient, more cost effective method of evaluating milk samples from each cow. It still requires a visit by the regional supervisor but supplies efficient results. The Owner-Sampler Program allows for the dairy producer to test his or her own cows for productivity, but the results cannot be used for breed association and other reporting. The Weigh a Day a Month Program is very similar to the Owner-Sampler Program but includes less detail on milk quality for each cow. The final option from the DHIA is the Basic Production and Management Program. The dairy producer determines what will be evaluated and then records the information. Like the previous program, reporting the data is not allowed. The only reporting permitted by any of the DHIA programs requires the presence and applications of the regional supervisor.

CULLING

Culling inferior animals from the herd is crucial in improving milk production and the overall economic bottom line. Culling is the process of removing the lowest-producing animals from the herd, leaving the average and superior animals in production. To cull animals from the herd, a producer must first have each animal identified with an ear tag or electronic device. Then, he or she must record production information, milk profiles from each animal, health history, and other factors that affect productivity within the herd. Culling animals may be the hardest herd improvement practice for a dairy producer to perform. It requires eliminating animals from the production system by evaluating data and records, not animal personality, phenotype, or pedigree. However, it is an efficient method of improving the records of
the herd and allows for replacement animals that meet or exceed the current top-producing animals.

**ARTIFICIAL INSEMINATION**

Artificial insemination has become the most common practice for herd improvement in the dairy industry and the overall livestock industry. A multitude of high-quality bulls can be utilized in thousands of cows throughout the world without the male and female animals ever coming into contact with each other. Artificial insemination is the process of manually depositing semen into the reproductive system of a cow in an attempt to achieve a pregnancy. Bull semen is collected and processed to preserve it until the appropriate time to service a cow. The semen is frozen and then processed into a form that can be easily shipped or transported. The semen is then deposited into the cow by a technician, and new genetics are introduced into the herd. Bulls used in artificial insemination carry desirable traits that a dairy producer wants passed on to offspring within the herd. These may include increased milk production or improved skeletal structure. The new offspring possess traits from their mother and the desired traits from the artificial-insemination sire. These offspring can be maintained in the herd for improvement and for continual progression of the overall herd productivity.

**EMBRYO TRANSFER**

Embryo transfer is one of the newer methods used for herd improvement through selection. It involves advanced science and the use of hormones to create a pregnancy in a female animal that has not been serviced or inseminated. Embryo transfer is the scientific movement of fertilized embryos from a single female to multiple other females to achieve several pregnancies at the same time. This technique is typically used in the mating of a superior male and a superior female. The top female may be selected within the herd, treated with a hormone therapy, artificially inseminated with semen from a superior male, and several days later collected for fertilized embryos. The embryos are then placed in surrogate mothers, where they remain through birth, and are raised for replacements within the herd. Embryo transfer is ideal for herd improvement within herds that contain only a few superior animals and multiple average-producing animals. In this type of situation, the superior producers would be the embryo donors, while the average producers would be the surrogate mothers. A downside to
this is that the genetic makeup of the herd is narrowed to just a few animals and may create mating challenges in the coming years. Also, if a poor choice is made, the offspring and future replacements all have a similar makeup that may not be as superior or as successful as desired.

**PUREBREEDING**

Purebred dairy producers use purebreeding to maximize selection within the herd for improvement. Within this type of production system, only a selected breed is used to improve the herd. The use of a single breed for herd improvement is called **purebreeding**. This is a common practice for herd improvement in the United States. Approximately 90 percent of United States dairy cows are Holsteins. Many of those herds practice purebreeding to promote herd advancement. This practice has many advantages, including a large population for new genetics, predictable results, and premiums in the marketing of offspring. However, purebreeding also has disadvantages. These may include the rapid spreading of an unidentified inferior trait, overuse of a few superior sires, limitations in long-term breeding programs, and defined limits in breeding. Purebreeding is an acceptable method of improvement within a herd, but it requires strong management practices and the acceptance of risk in the commitment to a single breed of dairy cattle.

**OUTCROSSING**

Outcrossing is the mating of animals from unrelated families to introduce new traits. The practice is common among purebred breeders. Improvements are made through selecting superior bulls to breed cows of the same breed within a herd. Their offspring possess the desired traits of the newly introduced bulls and can eventually be used to replace inferior animals. Outcrossing involves some risk. Within closed purebred herds, an infrequent and undesired trait may be introduced. While this risk is low, outcrossing may cause an overall reduced production of offspring.

**CROSSBREEDING**

Crossbreeding is similar to outcrossing, except it involves the introduction of a new breed. Crossbreeding is the mating of two animals of different recognized breeds to capitalize on the advantages of each breed. A **recognized breed** is a type of cattle that shares similar traits and physical appearance and that has a defined organization for promotion and development of the cattle. The results of crossbreeding are called **hybrid vigor**, in which the traits expressed by offspring are superior to those from typical purebreeding. While purebreeding offers its advantages, the hybrid vigor of crossbreeding offers new traits that can accelerate offspring with a new standard of production. Hybrid vigor may result in increased milk production, decreased health issues, the meeting of nutritional requirements, and advanced quality of milk. Crossbreeding does not offer the advantages of record keeping or comparison between breeds, but it does offer increased production, identifiable traits for selection, and overall herd improvement.
**Summary:**

Using selection to improve a dairy herd offers several options. A dairy producer can use the Dairy Herd Improvement Program, culling, artificial insemination, embryo transfer, purebreeding, outcrossing, and crossbreeding. While each has its disadvantages, each has the advantage that it can improve a dairy herd. Each has a technique or program that can identify inferior animals or promote breeding for herd improvement. This can eventually improve profits or productivity of the herd of dairy cattle.

**Checking Your Knowledge:**

1. Identify at least three programs offered by the Dairy Herd Improvement Association. Explain how the information collected can be used to improve herd selection.
2. Why has artificial insemination become the most common practice for herd improvement?
3. What are the advantages of purebreeding in a herd?
4. What is a disadvantage of outcrossing in a herd?

**Expanding Your Knowledge:**

Visit a dairy farm or ask a dairy producer to speak to your class at school. Ask questions about purebreeding, outcrossing, and crossbreeding programs.

A certified artificial insemination or embryo transfer technician is another excellent resource person who can expand on the use of these techniques for herd improvement through selection.

**Web Links:**

- National Dairy Herd Improvement Association  
  [http://www.dhia.org](http://www.dhia.org)
- Trans Ova Genetics  
  [http://www.transova.com](http://www.transova.com)
- Holstein  
  [http://www.holsteinusa.com](http://www.holsteinusa.com)
- Ayrshire  
  [http://www.usaryshire.com](http://www.usaryshire.com)
- Guernsey  
  [http://www.usguernsey.com](http://www.usguernsey.com)
- Agricultural Career Profiles  
  [http://www.mycaert.com/career-profiles](http://www.mycaert.com/career-profiles)