

### **Inbreeding and the Dairy Industry**

Inbreeding, or the probability that alleles are identical by descent, can have spurious effects on individuals due to the reduction of heterozygosity. This reduction of heterozygosity can bring about inbreeding depression, which can reduce the vigor of a population. Consisting of 8.1 million Holstein cows, the US dairy industry has an average inbreeding coefficient of 6.8%. This can be partly attributed to the increased use of artificial insemination (AI) and increased selection for production traits. While there are many benefits of using AI, fewer bulls are available to contribute to the next generation, thus leaving the effective population size for Holsteins estimated at 200 animals. Dairy bulls with high ranking genetics will often be used more frequently than bulls with lower ranking genetics which can lead to increased inbreeding estimates. Research has found that each 1% increase in inbreeding results in a loss of milk production as well as lactation duration. McParland et al. conducted a study that followed a first lactation heifer with an inbreeding coefficient of 12.5%. This heifer, when compared to other first lactation heifers in her cohort, produced 136 fewer pounds of milk over the course of that lactation, experienced 2% more calving problems, and increased her calving interval by 8.8 days. While this is a significantly larger inbreeding coefficient than seen in the US, it can be used as an indicator of how inbreeding could impact the US industry if producers do not pay attention to inbreeding depression. Economically, for each 1% increase in inbreeding, producers lose approximately \$1,300 per cow, per year. At 6.8%, this comes out to be just under \$9,000. In order to reduce these spurious effects, producers need to be aware of the pedigrees of their animals and make educated mating decisions. If the potential genetic gain outweighs the potential loss of heterozygosity, then mating should occur and will help the industry move towards their breeding objectives. Semen companies, such as Select Sires, provides inbreeding calculator tools and will work with producers to identify pedigrees of previous sires. This is just one of the ways that producers can help manage inbreeding depression. The dairy industry is a robust population that can withstand a small amount of inbreeding depression, but in order to stay profitable, producers need to be cognoscente of the impacts that selection and inbreeding have on the industry.

#### References:

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