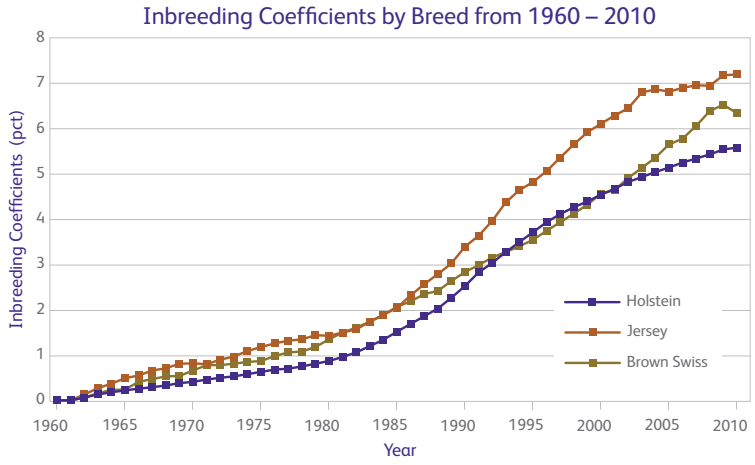
CLARIFIDE®

The Basics of Inbreeding

Inbreeding has been a longstanding struggle for dairy producers. As dairy cows have been bred for similar goals—more milk production per cow, greater on-farm profits—superior genetics from a few outstanding families have been multiplied throughout the industry. Over time, families not consistently offering these desirable traits have exited the population, creating a more condensed, less diverse gene pool. The long-term effect of this decision-making over multiple generations has been reduced genetic diversity from which to make selections, and has adversely impacted performance and health traits.

Inbreeding has increased significantly and continues to climb in each of the major dairy breeds over the years, as illustrated below.



The Negative Effects of Inbreeding

Increases in inbreeding can result in a reduction in productivity, commonly referred to as inbreeding depression. This not only impacts production levels, but can impact health and functional traits such as immune response and reproductive efficiency.

- Research[1] indicates that inbreeding costs $22 in relative net income per 1% increase in inbreeding coefficient.
- The same study[1] found that 1% increases in the inbreeding coefficient were associated with the following depressions in performance:
  - Decreases of 390 pounds of milk, 13 pounds of fat and 12 pounds of protein over the female's lifetime
  - Increase in age at first calving of 0.5 day
  - Decrease in productive life of 6 days
  - Decrease in lifetime days in milk of 5 days

Understanding Inbreeding in Your Herd

CLARIFIDE® offers tools for commercial dairy operations to manage inbreeding and reduce its negative effects on herd performance and profits. CLARIFIDE offers two measures of inbreeding that are outlined in the table below.

Trait	Definition	What it Means
Genomic Individual Inbreeding	Measures actual homozygosity and percentages of genes in common.	The level of inbreeding in the animal tested with CLARIFIDE. Generally, lower percentages are desirable and indicate less potential for inbreeding depression in the performance of the animal.
Genomic Future Inbreeding	Estimates the inbreeding of progeny of this animal if mated at random in the population. The reference population is all genotyped animals born in the last 10 years.	The level of progeny inbreeding if the animal is mated at random. Lower percentages suggest mating flexibility and the ability to use a broader range of sires from a randomly chosen group. High values indicate attention to mating decisions is needed to minimize progeny inbreeding and depression in performance.

Applying Inbreeding Results

CLARIFIDE inbreeding values can help manage the associated depression in the performance of tested and retained replacements, primarily through selection.

- CLARIFIDE can help reduce future levels of inbreeding and depression in daughters through strategic mating of tested replacements. This is accomplished through individual mating to less-related sires.
- CLARIFIDE inbreeding values can empower commercial dairy producers to exploit the benefits of mating tested females to proven, genetically superior and less-related sires.

The table at right compares results from two animals tested with CLARIFIDE, and helps explain how to effectively utilize the inbreeding information to make more profitable breeding decisions.

Assuming similar genetic merit in production traits:

- Heifer 1 is appreciably less inbred than Heifer 2 as quantified by the genomic individual inbreeding values. Assuming similar levels of predicted genetic merit in production traits, Heifer 1 is a better candidate for retention because of less inbreeding depression.
- Heifer 2 has a higher genomic future inbreeding than Heifer 1, which means Heifer 2 possesses more genes in common with those in the random population. Based on the genomic future inbreeding of Heifer 2, special attention to mating decisions is warranted in order to reduce the inbreeding of the animal's offspring.

Heifer	Genomic Individual Inbreeding	Genomic Future Inbreeding
1	3.2	2.4
2	12.5	10.6

Pfizer Animal Health

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References

1 Smith LA, Cassell BG, Pearson RE. The effects of inbreeding on the lifetime performance of dairy cattle. J Dairy Sci 1998;81:2729-2737.