

Technologies in Tandem: Genomic Testing & Sexed Semen

At the farm level, producers have long capitalized on making genetic progress through sire selection. The importance of using the best sires possible stems from the fact that over 90% of the genetic progress realized in most dairy herds results from sire selection. In herds that have the highest rates of genetic gain, importance is also placed on the selection of cows as dams of the next generation of replacement heifers.

Traditionally, opportunities for female selection were limited as all heifer calves were needed to be raised as replacements. Only through the use of embryo transfer could a breeder generate more heifers from the genetically superior dams in the herd, which could therefore also generate a surplus of heifers and an opportunity for heifer sales.

Today, due to improvements in reproduction and calf rearing, combined with the advent of sexed semen, many producers are able to create a situation of excess heifer replacements. Given the current acceptance of genomic evaluations, as indicated by the 70% market share occupied by genomic young bulls, progressive producers have adopted the strategy of heifer genotyping. This article examines the benefits of using sexed semen and genomic testing as complimentary technologies to maximize the potential profitability of the herd through genetics.

Sexed Semen

Sexed semen has now been available in Canada for about 10 years. Since its beginnings, sexed semen usage has seen limited uptake due to lower conception rates, price markup and the lack of availability for the most elite sires. While the cost for sexed semen still remains around \$15-20 greater per unit than conventional semen, advancements in this technology over time have improved the resulting conception rates. In addition, essentially all AI companies now offer sexed semen on a wide variety of their bulls including genomic young bulls and progeny proven sires. Although conception rates have improved compared to the early technologies for semen sorting, the best practice is still to utilize sexed semen for first and second inseminations with a preferred use on heifers compared to lactating cows.

The obvious key benefit to sexed semen is the shift in the expected sex ratio of calves from roughly 50:50 to over 90% heifers. An associated benefit is the reduced incidence of calving difficulties since heifer calves are born easier than males, which is particularly beneficial when considering matings for virgin heifers. The use of sexed semen provides greater opportunities to create heifer replacements from within your herd, thereby reducing the risk of introducing infectious diseases from purchased animals. From a genetic perspective, the use of sexed semen to breed the genetically superior females in your herd increases the likelihood that you will have a daughter available as a replacement heifer instead of taking the chance with a 50% probability of having a heifer with conventional semen.

Heifer Genomic Testing

A newborn heifer calf can have a genomic evaluation before reaching one month of age if a sample is sent into Holstein Canada shortly after birth. In general, testing with a low density SNP panel will suffice, which has a cost of \$45 per heifer. Genomic results can be freely accessed on the web sites of CDN or Holstein Canada and CDN offers a data management service that allows easy access to genetic and genomic evaluation results for all your animals.

The primary benefit of genomic testing your heifers is the increased accuracy of the resulting genetic evaluation. Without genomics, heifers receive a Parent Average that generally has a

Reliability for LPI and Pro\$ in the range of 35% to 40%. Once genotyped, this Reliability level roughly doubles to approximately 70%. The critical fact, however, is that genomic testing of females yields this 70% Reliability level regardless of the age of the animal. This means that the accuracy of a genetic evaluation for heifers that are one month old is almost the same as for cows with one or more lactations. Having more accurate genetic information for your heifers allows for better ranking among all females in the herd and mating decisions. Genotyping heifers has the added value of ensuring the correct parentage and is the easiest way to identify those carrying undesirable genes (i.e.: haplotypes) that negatively affect rates of embryonic death and calf mortality in the herd. Ultimately, all of these benefits of heifer genotyping translate into more genetic progress to achieve the herd objectives.

Combining the Technologies for a More Valuable Breeding Program

Although the use of sexed semen and genomic testing are valuable technologies on their own, the greatest benefits are achieved when they are used in tandem, especially over a few years to realize maximum genetic benefit. Genomic testing significantly improves your ability to identify the breeding age heifers and cows that are genetically superior for your preferred index, LPI or Pro\$, and provides a more accurate genetic profile for identifying the best mating sire. If desired, most AI mating programs can assist you with ranking females by your customized index as well as manage genetic recessives and inbreeding levels in resulting progeny.

Regardless of the ranking index, targeting the highest heifers, and perhaps even some cows, for use of sexed semen will produce more daughters from that portion of the herd. Depending on the proportion of all conceptions that result from sexed semen, versus conventional semen, you will end up with a surplus of heifers born relative to what is normally required as herd replacements. For example, if 25% of the pregnancies in the herd over a given time period resulted from sexed semen, then 60% of all calves are expected to be females, instead of the usual expectation of 50%.

The subsequent genomic testing of heifer calves then helps to identify those that should be kept and the bottom portion (i.e.: the extra 10%) can be sold at a young age to reduce the costs associated with rearing them all to first calving. The use of sexed semen alongside genomic testing capitalizes on all benefits of each technology to help achieve faster rates of genetic progress towards your herd objectives.

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