Igenity® Select Case Study

KEY POINTS

- Study was conducted over a six-year period at a Midwestern United States dairy with over 7,000 heifers and cows in lactation. All animals were genomically tested with Igenity® Select.
- Data collected represent how a dairy farm that has successfully implemented Igenity Select genomic testing has increased cow productivity through more precise selection across several economically relevant traits for their operation.
- At the end of six years, the average Net Merit (NM$) of each heifer calf exceeded a $500 increase, the improved genetic merit for milk corresponded to an additional 48 pounds of fat and 30 pounds of protein in comparison to the herd baseline at testing initiation, and the productive lifespan of the herd was extended by 2.8 months. Continuous implementation of Igenity Select testing allowed for consistent selection of genetically superior animals year over year, increasing the genetic merit and resulting in economic gain.

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INTRODUCTION

A progressive, 7,000 cow dairy in the Midwestern United States partnered with Neogen® to strategically improve the genetic quality and profitability of their herd. This dairy managed over 7,000 heifers and cows in lactation per year during this data collection period. Year zero served as the baseline for comparison against all subsequent years, as no genomic testing was being conducted at that time. The data presented illustrate how the dairy successfully implemented Igenity Select genomic testing to increase cow productivity through more precise selection across several economically relevant traits for their operation over the course of six years. To start, the dairy began testing all heifers two years of age and younger; then, they tested all heifer calves at birth until the entire herd was genomically tested.

GENETIC SUMMARY

Lifetime Net Merit (NM$): Genetic trends are the easiest and most practical way to evaluate genetic progress over time because it is possible to evaluate the effectiveness of selective breeding strategies to enhance desirable traits. **Figure 1** represents the herd's average for NM$ compared to the United States industry average over time. In the beginning, the difference in NM$ between the two groups was marginal, at just $13. Notice that with the consistent implementation of genomic testing, the difference in NM$ increased to $111 by year six. Therefore, it is the precise selection and breeding decisions made through consistent genomic testing that resulted in these cumulative improvements in both genetic merit and overall profitability. Considering NM$ as an indicator of economic viability, it is evident from these data that the additional net income gained by genetic advancement exceeded the investment in genomic testing.

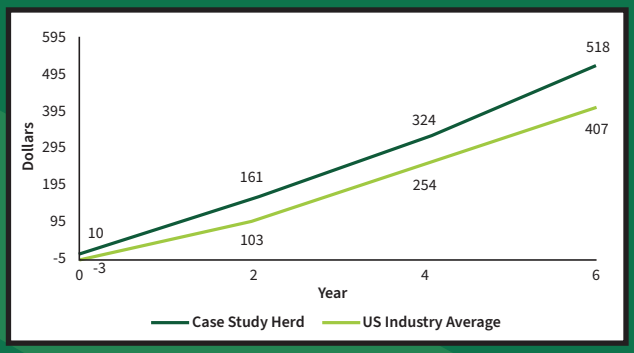

Figure 1. Average NM$ of the U.S. Dairy Industry by year compared to the Igenity Select Case Study herd.

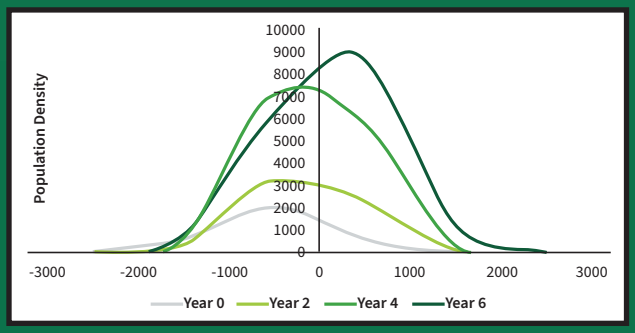

Figure 2. Distribution of Milk of Igenity Select Case Study Herd across six-year period.

Milk Production: Another helpful way to study differences in genetic merit over time is to examine how the herd population distribution curves move across different generations. For example, milk yield distributions in **Figure 2** shifted to the right from year zero to six, indicating an increase in milk production. This increase translated to improved genetic merit of the herd. The use of genomic information in breeding programs has advanced the precision of trait prediction, optimizing the ability to make precise genetic decisions but still defining enough variation to affect changes in genetic value.

It is equally important to evaluate trends within the protein and fat components over time. Not surprisingly, both fat and protein components increased in genetic merit. The observed gains represented in **Figure 3** correspond to approximately an additional 48 pounds of fat and 30 pounds of protein. While higher fat and protein yields are economically significant, it is important to not sacrifice milk yield to gain higher components. This is an excellent example of a balanced approach to genetic selection decisions which help optimize gains in both milk yield and components.

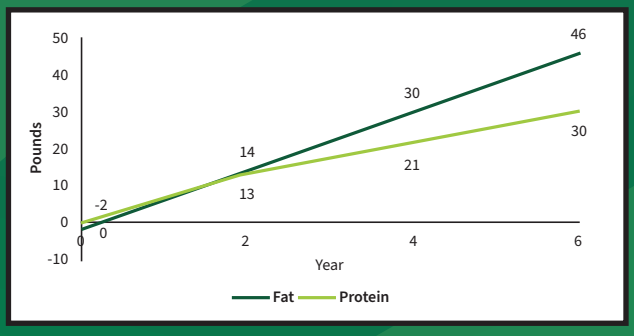

Figure 3. Genetic trends for Fat and Protein of Igenity Select Case Study Herd across six-year period.

Health: It is evident that the overall genetic merit of resistance to health disorders improved. Remember, a larger number in health traits represents a greater expected resistance (not prevalence) of an animal's offspring to the respective disorder. By comparing the difference between the baseline predicted transmitted abilities (PTA) and final PTA of individual health traits, the overall increase in genetic value across the six-year timeline is clearly demonstrated. As observed in **Figure 4**, consistent advancement in genetic merit was found for displaced abomasum (DAB), mastitis (MAS), metritis (MET), and ketosis (KET). While no difference in genetic value was observed for retained placenta (RP) or milk fever (MFV), this is likely because no selection pressure was made on these traits since no issues for RP and MFV were reported in this operation. Curbing the prevalence of health disorders in the breeding herd may be predictive of a subsequent decline in health risk among calf crops. Additionally, the average somatic cell score (SCS) marginally decreased (3.7%) from year zero to six.

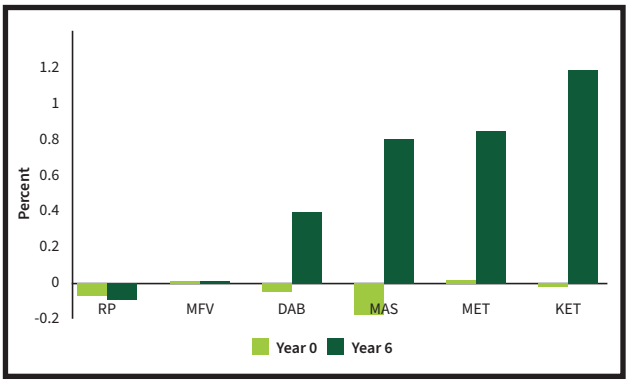

Figure 4.
Six-year comparison of individual health trait PTAs of Igenity Select Case Study Herd.

Fertility and Longevity: Of significant importance to this dairy was efficiently expanding the business by not only increasing the number of cows but also the genetic quality and productivity of each individual. Therefore, the genetic merit of fertility and longevity traits were deliberately emphasized when making selection and breeding decisions. The change in the PTA values between year zero and year six of the traits reported in **Table 1** provide confirmation of the significant increase (range = 59% - 187%) in genetic merit achieved by the farm. This advancement in genetic benefit for fertility traits is notable because these types of traits are among the most complex and challenging to improve due to their low heritability. This provides an excellent example of the power of Igenity Select to affect real change in genetic potential.

GENETIC PROGRESS

Year	0	1	2	3	4	5	6
CCR	-8%	-19%	-8%	21%	-15%	43%	72%
HCR	-2%	6%	35%	85%	57%	148%	184%
LIV	40%	8%	32%	31%	51%	78%	113%
HLiv	24%	40%	42%	60%	49%	70%	83%

Table 1. Average PTAs of fertility and longevity traits of Igenity Select Case Study Herd across six years.

As evident in **Figures 5a and 5b**, productive life (PL) stood out as one of the most prominent, showing significant genetic progress, with an extension of 2.8 months achieved in the first six years of genomic testing. This strong genetic improvement is particularly important to highlight because it is difficult to achieve due to low heritability and length of generation interval. Clearly, the extension of a dairy cow's productive lifespan has a direct impact on profitability and economic viability.

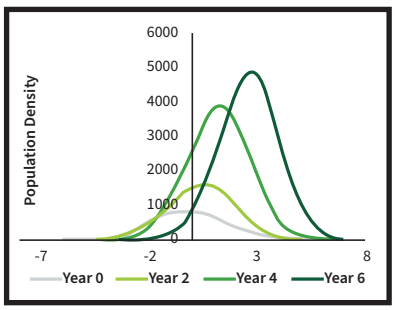

Figure 5a.
Distribution of PL of Igenity Select Case Study Herd across six-year period.

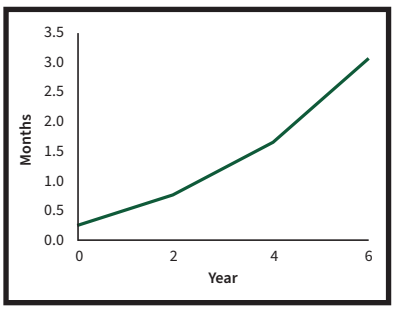

Figure 5b.
Genetic trend of PL of Igenity Select Case Study Herd across six-year period.

Igenity Select
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CONCLUSION

By utilizing Igenity Select to make targeted selection and breeding decisions, this dairy achieved meaningful genetic improvement that translated into improved productivity and profitability. NM$ values exceeded the industry average following a single year of genomic testing, indicating that rapid genetic enhancement can be accomplished. Continuous implementation of Igenity Select testing allowed the dairy to consistently select genetically superior animals year over year, further accumulating genetic merit and economic gain. At the end of six years, the NM$ of each heifer calf, on average, exceeded a $500 increase above the herd baseline present at testing initiation, and exceeded the national average by $100.

The dairy also demonstrated remarkable genetic progress, evident in significant gains across key performance traits such as milk yield, milk fat, mastitis, heifer conception rate, and productive life. This showcases the success of selective breeding strategies, particularly through the integration of genomic testing with Igenity Select for precise trait prediction. Using only a DNA sample, Igenity Select has been proven to equip producers with a simple tool to predict the future performance of genetic traits and, ultimately, the profitability of their operation.

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