Real Numbers: Functional Trait Impact on Dairy Profitability

Nate Zwald

Alta Genetics, W9249 Meadow Road, Beaver Dam WI 53916
Email: nzwald@altagenetics.com

Take Home Messages

- Today's genetic selection is based on more than just cow conformation
- Genetic improvements can be made by selecting for traits such as longevity, daughter fertility, stillbirth and mastitis resistance
- Dairy producers should have a genetic plan for improving the long-term profitability of their herd

Introduction

Since the beginning of AI breeding, type has played an important role, however it is no longer simply conformation that tells us which cows will last longer than others. Producers have always desired certain characteristics that are correlated with longevity and healthy cows; however, now we can measure fitness traits directly, and therefore it must be questioned if the conformation of a cow today is as useful as it was 10 years ago before real longevity and health information was available. In this paper we review the differences 3 large Alta Advantage® herds have realized through selection for longevity (PL), daughter fertility (DPR), stillbirth (SB, and DSB), mastitis resistance (SCS), and other newer traits. Each of the herds has re-evaluated their selection strategy, as they have seen with their own data that these new traits are VERY important in creating more profitable cows. Each of these dairies has different "genetic plans" with large, but varying amounts of weight on fitness traits. However each dairy should individually determine how important these traits will be to their dairy, as breeding goals should be determined according to YOUR goals. The underlying question is: Do you buy the "hot bull" or do you have a "genetic plan" that will build the kind of cattle that will make you profitable five years from now?

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■ Type that Counts!

The "true type" cow for the progressive dairy producer is the "FOUR EVENT" COW – a cow that freshens, gets bred, is confirmed pregnant, and later is dried off. Cows that only have these 4 "events" in a given lactation are the cows that generate profit for the dairy enterprise. Dairymen invest in proven semen and breeding programs to build genetics in the herd that help to create a trouble free, profitable cow. Is this investment paying off? And what groups of cows are creating the most profit for you?

For years, conformation was an important part of the equation, however this paper will focus on the impact that 3 separate Alta Advantage® dairies (all milking over 1,500 cows) have seen in their operations by looking at genetic differences for longevity, fertility, and other health traits.

■ The "Perfect Experiment"

Too many dairy managers evaluate genetics too simply, focusing on the relative fertility of bulls used. This is a huge point to benchmark for performance, for sure. However, it's the quality of the milking daughters that really count for long run profitability. The production, reproductive performance, longevity, and milk quality of daughters should be factored into the evaluation too.

Five plus years ago, not nearly as many herd owners were focusing on health traits, and many of the "good" health trait bulls were used at the same time as some "poor" health trait bulls just by chance. This created the perfect "experiment" that can now be evaluated as all the daughters are in milk for at least a couple of years.

■ Cows that Earn their Keep

Three Alta Advantage® dairies will be evaluated in this paper. Following is a short description of each:

Dairy 1: 1,600 cow dairy in New York. 13,155 kg herd average, 26% pregnancy rate, sand bedding, cows housed in pen sizes of 300+ cows

Dairy 2: 3,200 cow dairy in Michigan. 11,800 kg herd average, 18% pregnancy rate, sand bedding, cows housed in pen sizes of 400 cows

Dairy 3: 1,800 cow dairy in Wisconsin. 13,600 kg herd average, 22% pregnancy rate, mattresses, cows housed in pen sizes of 250 cows.

Production

Milk is the primary source of revenue on the dairy, and one would expect that cows sired by high milk bulls would generate daughters that produce relatively more milk. On Advantage® dairy #1, the 90 daughters of high milk bulls would be expected to produce about 500 kg more milk per lactation compared to the other 109 analyzed. In fact, the 90 daughters are generating nearly 635 kg more milk (Table 1). At a selling price of $75/100L, that means the 90 daughters are generating over $450 per cow more revenue than the others (Table 1). This herd is actually getting slightly more milk than what would be expected with the high milk sires.

Table 1: Dairy 1: Milk Performance – High Milk vs. Low Milk Bulls

	Number of Daughters	Average PTAM[1] of sires	Actual ME305[2] (lb)	Actual ME305 (kg)
High PTA[3] Milk	90	1,610	33,032	15,015
Low PTA Milk	109	514	31,651	14,387
Difference		1,096	1,381	628

[1]Predicted transmitting ability milk

[2]Mature equivalent 305-d milk yield

[3]Predicted transmitting ability

Generally it isn't simply milk production that is sold, or selected for, as most producers are paid for, and therefore select on components as well. This is an important point, because although predicted transmitting ability milk (PTAM) is negatively correlated with many of the health traits, predicted transmitting ability fat (PTAF) and predicted transmitting ability protein (PTAP) are not nearly as extreme. Therefore sires with high combined fat + protein (CFP) and favourable ratings for health traits are generally easier to find than sires with high PTAM and favorable ratings for health traits. Following is an example of CFP on Advantage® Dairy 2 (Table 2). In this dairy the difference between predicted transmitting abilities (PTA's) (and therefore the expected actual difference between performance) was 30 kg of combined fat and protein, however the dairy actually realized a much bigger difference than this (48 kg), meaning they realized MORE than the expected amount of genetic progress by selecting high CFP sires.

Table 2: Dairy 2: CFP production differences

	Observations	PTA CFP of sires	Actual CFP produced (lb)	Actual CFP produced (kg)
High CFP Daughters	511	71	1852	842
Low CFP Daughters	424	6	1747	794
Difference		65	105	48

Milk Quality

Somatic cell count (SCC) is a quality parameter on which milk premiums are often established in the US, with producers being compensated for low cell count milk. The lower the cell count, the more the producer gets paid. Benchmarking the genetics once again shows that the daughters sired by low somatic cell score (SCS) bulls are producing better quality milk compared to the high SCS sired cows. Based on the difference of the PTA SCS of the two groups, we would expect a difference of about one half of a point of linear score. The relative impact of this half point of linear score on SCC is going to depend on what the herd average is. In this herd, the margin of quality is a 156,000 lower cell count (Table 3). And lower cell count is also a sign of healthier udders too, which means less infection and treatment cost.

Table 3: Dairy 1: High SCS Sires vs. Low SCS Sires

	Number of Daughters	Average PTA SCS	Actual SCC
Low SCS	97	2.76	250
High SCS	106	3.20	406

Stillbirth

There are 2 genetic traits that measure stillbirth. The service sire's effect on stillbirth is generally referred to as SSB, or just SB (Table 4). This trait is highly influenced by the ease of calving, and is logically highly correlated with calving ease (larger calves are more often born dead). The second measure of stillbirth is the maternal impact on the trait (Table 5). For example, daughters of certain sires tend to have more dead calves regardless of who they are bred to. BW Marshall is one of the more popular bulls whose daughters have a tendency to have dead calves, regardless of what sires they

are bred to.

Table 4: Dairy 2: Daughter Stillbirth

	Calves Born	Weighted Average PTA DSB[1] of sires	Actual Stillborn percentages
High DSB Daughters	110	9.5%	10%
Low DSB Daughters	98	5.4%	4.1%
Difference		4.1%	5.9%

[1] Daughter stillbirth

Table 5: Dairy 3: Sire Stillbirth

	Number of calves born	Average SSB of sires	Actual Stillborn percentage
Low SSB Daughters	177	7.1	8.5
High SSB Daughters	156	9.0	12.8
Difference		1.9	4.3

Reproduction

The push for production often comes with some sacrifice to reproductive performance. The fertility of cows can help compensate for this, and genetic tools like daughter pregnancy rate (DPR) can be the tool to do so. On Advantage® dairy 1, which we are analyzing here, the 91 daughters of high DPR bulls are 13% more likely to conceive, are 5% more efficient at getting pregnant, and are open 15 days less than the daughters of low DPR bulls (Table 6). At a conservative rate of $10/cow/point of pregnancy rate, the 91 daughters of the high DPR bulls have an additional profit of $4550/year ($10*5points of pregnancy rate*91 cows), and increasing the pregnancy rate on the entire 2000 cows by 5 points would be worth $100,000/yr!

Table 6: Dairy 1: Reproduction - High DPR vs Low DPR

	Number of Daughters	Average DPR	Conc. Rate	Preg. Rate	Days Open
High DPR	91	1.9	45	31	107
Low DPR	84	-2.3	38	26	122
Difference		4.1	7	5	15

With reproduction so important in today's progressive dairies, we show a second example. In this example (Table 7), we see a much larger difference than expected in actual performance with the daughters of high DPR bulls outperforming those of low DPR sires by 9%, even though the expected difference was only 3%. A strict Ov-synch protocol on this dairy, where nearly all cows are synchronized, may be a reason that more of the management/environment conditions are eliminated, thereby raising the effective heritability in the herd.

Table 7: Dairy 2: Reproduction – High DPR vs. Low DPR

	# Eligible	Weighted Average PTA DPR	Pregnancy Rate	Days Open
High DPR Daughters	213	1.2	22%	135
Low DPR Daughters	425	-1.8	13%	178
Difference		3.0	9%	43

Longevity

Cows with longevity bred into them also provide dairy managers the opportunity to increase voluntary culling to improve genetic quality of the herd overall and harvest more milk. Productive life (PL) is a genetic tool to increase longevity of your cows, and analyzing the genetics in Advantage® dairy #2, shows that to be true (Table 8). The cull rate on low PL bulls was 2.5 times higher than on high PL bulls by the conclusion of the second lactation. A 14% cull rate on the high PL sired daughters means the last daughter in the 207 cow group will last for up to 7 lactations!

Table 8: Dairy 2: Longevity – High PL vs. Low PL

	Observations	PTA PL of sires	Actual avg months in herd	Cull rate through second lactation
High PL	207	4.3	15	14%
Low PL	138	-2.3	21.1	36%
Difference		6.6	6.1	22%

Dairy #3 has a much higher turnover rate (Table 9), due to a high voluntary culling rate because of extra animals being available for a planned expansion that has yet to happen.

Table 9: Dairy 3: Longevity – High PL vs. Low PL

	Observations	PTA PL of sires	Actual avg. months in herd	Cull rate through second lactation
High PL	196	4.0	19.2	33%
Low PL	232	-1.1	12.6	53%
Difference		5.1	6.6	20%

■ Management Strategies

Selecting sires that improve the genetic potential and payback of the cows in your dairy is worth the effort, and this goes for all traits: production, fitness, and type, which is why it is so important for you to develop a selection strategy that fits with your goals as a dairy producer. The process allows you to identify the genetics and breeding strategies for your dairy that contribute profit for YOUR dairy. And that makes for smarter decisions going forward.

There are several things you should consider when creating the breeding program for your dairy:

- **Find the Baseline**. The AI company representative you work with should be able to construct a benchmark and demonstrate the relative performance of genetics in your herd through a similar method as shown here. The analysis helps you make smarter decisions on the basis of better information.
- **Demand Accuracy**. Sire proof information is the starting point to determine what bulls should be added to your breeding program to create the cows that work. But the quality of the data that contribute to the sire proof must be accurate, and the testing environment should be competitive. Unfortunately, research has shown that 25% of daughters are mis-ID'd in traditional young sire testing programs. All daughters in

the Advantage® program are DNA-tested and evaluated in free stall and dry lot herds averaging 900 cows.

- **Production & Health Focus**. Work with health AND production traits. The heritability of health traits is often misunderstood to mean you won't make progress by focusing on productive life, daughter pregnancy rate, or somatic cell count. That's wrong! The heritability of these traits is already taken into account in the proof calculation. So in an accurate testing environment, a +1 DPR bull will sire daughters 1% higher on pregnancy rate compared to your herd average. Critically evaluate the importance of conformation in your dairy – are cows leaving the herd because they are non-functional, or because of other reasons such as mastitis, or poor reproduction? The answer should help you set your breeding goals.
- **Create an Index**. The dairy industry is great at creating "standard indexes" like lifetime profit traits (LPI), net merit index (NM), or type production index (TPI), and if one of these standard indexes fits your selection goals perfectly that is great, but there is nothing standard about your dairy and your business. You should build a genetic plan for your herd, and look for tools that help you build a selection strategy that creates the cows you want to milk in 3 years. Tools to create customized indexes for your farm are available.

Get Genetics that Pay!

You can take advantage of the "perfect place" to evaluate genetics in your dairy by benchmarking the cows on genetic parameters. This process shows you the cows that perform and the sire selections that were worth the money. That can help you make the genetic investments that will pay and create the trouble-free "four-event cows" you want.