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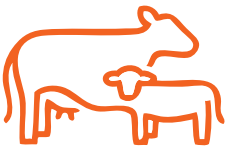
TECHNICAL BULLETIN



Building a Healthier Holstein Herd with CLARIFIDE® PLUS

Dairy producers can use CLARIFIDE Plus to select animals based on traits that affect health, performance and lifetime profit of cows and calves with a goal of a healthier, more productive herd.

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KEY POINTS

- Five traits with the most emphasis in Dairy Wellness Profit (DWP$) are Fat, Protein, Mastitis, Body Size Composite, and Lameness.
- DWP$ genetic progress results in genetic advancement in underlying traits. Improving DWP$ 277 DWP$ (one standard deviation) is expected to result in an increase of 20 lbs of fat, 11 lbs of protein, 1.54 STA Mastitis, decrease of 0.21 STA in Body Size Composite, and increase of 1.19 STA Lameness.
- Comparing cows in the best 25% DWP$ to cows in the worst 25% DWP$, the best group averaged 38% more milk production, 40% better income over feed cost, and 28% more days in milk.

Introduction

Selection indexes are a critical component of many breeding programs and provide a way to combine information about many traits into a single number that producers can use to rank animals and inform breeding decisions.[1] The purpose of a selection index is to predict an animal's genetic potential for total economic merit.[2] Historically, selection indexes throughout the world have focused on improving production traits.[3] However, this narrow selection goal contributed to a decrease in health and fertility.[4] Improvement of phenotype recording and development of new trait evaluations led to fertility,[5] longevity,[6] milk quality,[7] and health traits[8] becoming available to breeders.

Table 1 – Defines the relative values (%) for underlying traits for Dairy Wellness Profit 2022.

Trait	DWP$ 2022*
Fat	19
Protein	15
Milk	1
Productive Life	5
Cow Livability	3
Somatic Cell Score	-2
Residual Feed Intake	2
Body Size Composite	-9
Udder Composite	0
Feet & Legs Composite	0
Daughter Pregnancy Rate	3
Calving Ability	1
Heifer Conception Rate	0
Early First Calving	1
Cow Conception Rate	1
Zoetis Mastitis	11
Zoetis Metritis	3
Zoetis Retained Placenta	1
Zoetis Displaced Abomasum	1
Zoetis Ketosis	1
Zoetis Lameness	7
Zoetis Calf Respiratory	1
Zoetis Calf Scours	2
Zoetis Calf Livability	2
Zoetis Cow Respiratory	1
Zoetis Cystic Ovary	1
Zoetis Cow Abortion	5
Zoetis Twinning	1

*Sum of absolute values equals 100%.

Over more than 25 years, incorporation of these non-production traits in selection indexes has grown[9] as breeders strive to account for both incomes and expenses of an animal.

Selection indexes such as Dairy Wellness Profit Index (DWP$), Wellness Trait Index® (WT$®), and Calf Wellness Index™ (CW$™) are key components of the CLARIFIDE Plus genomic test offering. Dairy producers may seek to improve their herds by genomic testing heifers and ranking them based upon DWP$ to inform culling and breeding decisions. The dairy industry benefits from genomic technology as it results in faster genetic progress.[10, 11] As the rate of genetic progress is increased, it becomes more important that DWP$ is correctly formulated and includes key economically important traits for the goal of lifetime profit. Dairy producers are leveraging genomic technology to increase selection intensity on their females through culling decisions early in life and advanced reproductive technologies. With this combination of technologies and strategies, costs for having a non-optimal selection index could be substantial. As new traits become available, their influence on lifetime profitability is assessed and added to DWP$ when appropriate. Therefore, Zoetis updated DWP$ in April 2022 to incorporate new traits and update the economic values of traits previously in DWP$.

Dairy Wellness Profit Index

Dairy Wellness Profit Index is a multi-trait selection index that includes cow and calf wellness, production, fertility, functional type, longevity, livability, calving ability, and milk quality traits plus polled test results. Developed in 2016 by Zoetis Genetics and updated in 2018, 2020, and 2022, DWP$ estimates the

potential lifetime profit an animal will contribute to the dairy operation. DWP$ is expressed in a dollar value with higher positive numbers indicating the animal has the genetic potential to generate and transmit more profit over her lifetime.

As a result, the 2022 formulation of DWP$ describes more genetic variation compared to the previous version as documented by the large standard deviation (277 DWP). By including more traits affecting profitability, DWP$ 2022 describes more genetic variation in profit.

To further understand the impact of DWP$, the emphasis placed upon each trait in DWP$ 2022 is available in Table 1.

To assess how the use of DWP$ 2022 would alter genetic progress of underlying traits, the expected response to selection per standard deviation of genetic improvement of the index was estimated. Examining the response of selection, use of DWP$ 2022 will result in greater genetic improvement in residual feed intake and lameness. DWP$ 2022 will maintain a similar selection response for the rest of the traits in DWP$ (Table 2).

Association Between DWP$® Predictions and Lifetime Performance

As some of the first heifers tested by Zoetis are now finishing their careers, we are now able to examine how well DWP$ predicted lifetime profit. To determine DWP$ 2022 capability to predict lifetime profitability, a demonstration study was conducted.

Five large herds (n=7,810 enrolled cows) in the United States were chosen for this study because they had: (1) genomic predictions from females born in 2011-2014, (2) recorded production, reproduction, and health events to

Table 2 – Expected response to selection expressed in units of the underlying trait when average DWP$ 2022 are increased by one standard deviation (277 DWP$).

Trait	DWP$ 2022
Fat (lbs)	20
Protein (lbs)	11
Milk (lbs)	219
Productive Life (mo.)	1.42
Cow Livability (%)	0.66
Somatic Cell Score (log)	-0.07
Residual Feed Intake	-5.17
Body Size Composite (pts)	-0.21
Udder Composite (pts)	0.27
Feet & Leg Composite (pts)	0.08
Daughter Pregnancy Rate (%)	0.16
Heifer Conception Rate (%)	0.31
Early First Calving	0.68
Cow Conception Rate (%)	0.43
Calving Ability ($)	5.10
Zoetis Mastitis (STA)	1.54
Zoetis Metritis (STA)	1.90
Zoetis Retained Placenta (STA)	0.56
Zoetis Displaced Abomasum (STA)	1.04
Zoetis Ketosis (STA)	1.73
Zoetis Lameness (STA)	1.19
Zoetis Calf Respiratory (STA)	0.27
Zoetis Calf Scours (STA)	-0.07
Zoetis Calf Livability (STA)	0.38
Zoetis Cow Respiratory (STA)	0.76
Zoetis Cystic Ovary (STA)	0.22
Zoetis Twinning (STA)	0.61
Zoetis Cow Abortion (STA)	0.19

accurately estimate profit per cow, (3) at least 200 cows born in 2011. Dairy Wellness Profit (DWP$) predictions from 2012 were used to rank the 7,810 cows within herd and assign cows to percentile-based DWP$ groups (genetic groups: Worst 25%, 26–50%, 51–75%, and Best 25%).

Herd records were used to calculate lifetime energy corrected milk and income over feed cost based on the actual performance from first freshening through when they left the herd; for cows that were still in the herd, current totals were used. Table 3 shows that when ranked by DWP$ 2022, the best 25% of females produced 21,998 pounds more lifetime ECM per cow than the worst 25%. This additional lifetime ECM represents $1,474 additional Income Over Feed Cost (IOFC) per cow in the best 25% of females than the worst 25%. The difference in lifetime ECM and lifetime IOFC between the best and worst DWP$ groups when ranked by DWP$ 2022 indicates that DWP$ 2022 has the ability to predict potential lifetime profitability. Use of DWP$ under real-world conditions confirms the value of DWP$ in helping to coordinate selection toward greater profitability. DWP$ 2022 can assist dairy producers in their goal to improve overall lifetime profitability of their dairy herd.[12, 13]

Table 3 – Association between lifetime performance and DWP$ 2022 genomic ranking.

CLARIFIDE Plus DWP$ Ranking	DWP$ GPTA Value ($)	Lifetime ECM (lbs.)	Lifetime IOFC per cow ($)	Lifetime Days in Milk (days)
76-100% (Best)	618	79,263[a]	5,194[a]	873[a]
51-75%	429	72,404[b]	4,700[b]	821[b]
25-50%	295	66,422[c]	4,328[c]	763[c]
0-25% (Worst)	90	57,265[d]	3,720[d]	680[d]
Difference between Best & Worst	528	21,998	1,474	193

[a-d] Least Squares Means within column and DWP$ ranking with different superscripts diff ($P < 0.05$).
Feed costs are estimated from ECM and a fixed daily maintenance estimate and do not account for differences in body size or residual feed intake

Wellness Trait Index Update

To support selection for reduced risk of disease in dairy females, Zoetis developed the Wellness Trait Index® (WT$®). WT$ 2022 includes mastitis, lameness, metritis, retained placenta, displaced abomasum, ketosis, and cow respiratory disease plus polled test results. The WT$ index directly estimates potential profit contribution of the wellness traits for an individual animal. By including wellness traits that affect profitability, WT$ 2022 describes genetic variation in profit with a standard deviation of 130 WT$.

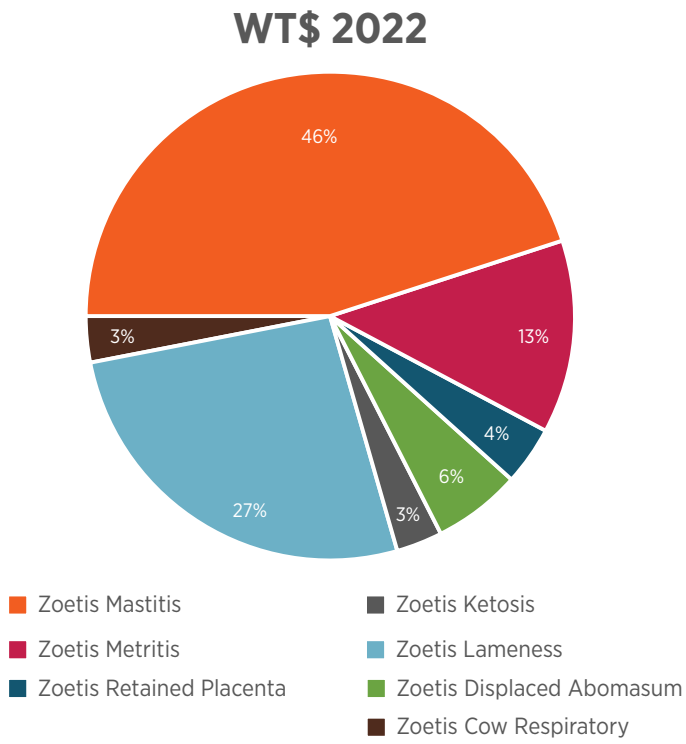

Chart 1 - Wellness Trait Index 2022

Calf Wellness Trait Index Update

To support selection for reduced risk of disease in dairy females, the Zoetis developed Calf Wellness Trait Index® (CW$®). CW$ 2022 includes calf scours, calf respiratory disease, and calf livability. The CW$ index directly estimates potential profit contribution of the calf wellness traits for an individual animal. CW$ 2022 describes genetic variation in profit with a standard deviation of 61 CW$.

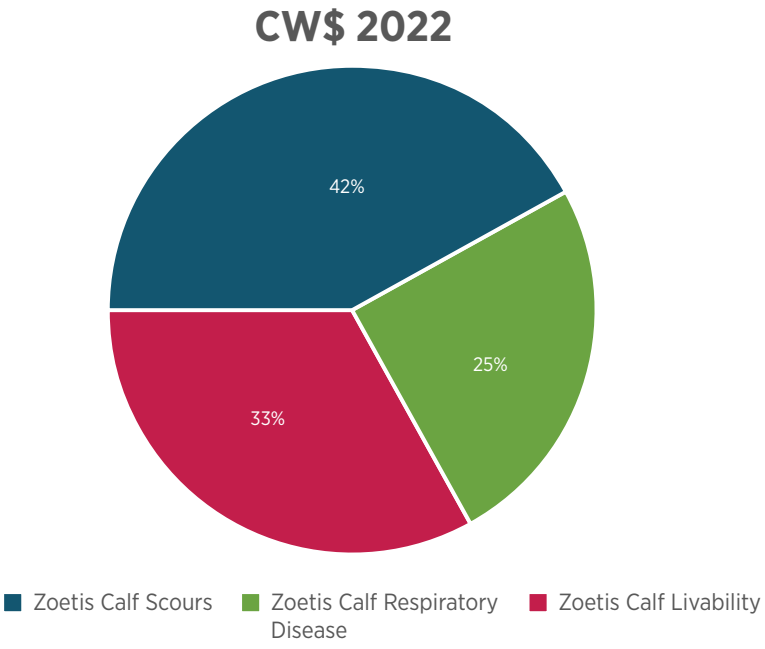

Chart 2 - Calf Wellness Trait Index 2022

Summary

Dairy Wellness Profit, Wellness Trait index, and Calf Wellness index provide an opportunity for dairy producers to select for overall herd profitability. The validation of DWP$ 2022 demonstrates the ability of DWP$ predictions to predict lifetime profit of Holstein animals. These results indicate that DWP$ 2022 predictions for young calves can be used to predict potential lifetime profitability.

Dairy Wellness Profit predictions are a useful tool for dairy producers interested in using genetics as a method to improve their overall herd profitability. Incorporating DWP$ 2022 into breeding and culling decisions will help dairy producers create future generations of animals that have the capability for higher lifetime profit when combined with best management practices.

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