

# Breed Long Lasting Cows

Dairies have a variety of goals for their genetics and breeding program – many want intensive management, others show type, and still others grazing management. Despite differences in breeding goals, the buzz word across the dairy industry seems to be long-lived cows. Due to current replacement costs, it is logical to combine management approaches with genetics for building cows that last longer in the milking herd. This article discusses the important factors for breeding cows with the genetic capability to have longer productive lives.

We'll start with a short quiz, but first, here's a quick reminder of the tools (genetic traits) available to us.

- **Yield traits** – Milk, Fat, Protein
- **Management traits** – Somatic Cell Score, Daughter Pregnancy Rate, and Calving Ease + Stillbirth (combined into Calving Ability)
- **Linear Type Traits and Composites** – Strength, Udder Depth, Dairy Form, Udder Composite, Foot & Leg Composite, etc.

These traits are **not independent** and also available are data on the correlations between different traits. These correlations between pairs of traits indicate that as one trait changes genetically, correlated traits also change. Traits like Milk Yield and Protein Yield are positively correlated, so breeding for more Milk Yield will result in more Protein Yield. On the other hand, traits like Milk Yield and Fat Percent are negatively correlated, meaning breeding for Milk Yield will lead to lower Fat Percent. Traits also can be uncorrelated like Milk Yield and Tail Length – breeding for Milk Yield will have no effect on Tail Length.

## Now for the quiz:

**Question #1** – Which set of traits are more strongly correlated with Productive Life: Yield Traits or Management Traits (SCS, DPR, Calving Ability)?

**Answer:** MANAGEMENT TRAITS

USDA-AIPL researchers summarized data for the U.S. Holstein population and the results are in Figure 1 (top right). Their work shows that correlations between Yield traits and longevity are quite low in today's Holsteins, while, correlations of PL with SCS and DPR are strong. This means that high yielding cows have only a slight genetic advantage to avoid culling, whereas progeny which last longer in the herd tend to be from sires which are superior for fertility and mastitis resistance values. This is not to say that milk production is unimportant for cow profitability, but instead states that Management Traits are much more important than Yield in explaining why cows leave herds.

**Question #2** - True or False: Body size related traits have no correlation with Productive Life (longevity).

**Answer:** FALSE

Relationships between Body Traits and PL were computed using data from across the U.S. and are illustrated in Figure 2 (middle right). These data show that the size related body traits are negatively correlated with Productive Life where traits like Body Depth, Strength, and even Thurl Width have moderate, negative associations with PL. In fact, these results reflect dairy managers' feedback, namely that longer lasting cows tend to be cows that are more moderately sized. In order to breed longer lasting cows for now and into the future, current data suggests to focus on more moderately sized bloodlines.

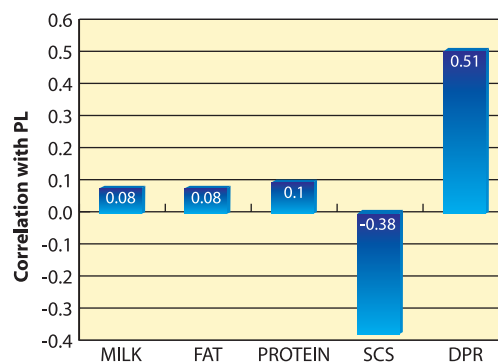
**Question #3** – Overall, list the 5 selection traits which that have the strongest correlations with Productive Life according to USDA-AIPL research.

**Answer:** DPR, CALVING ABILITY, SCS, UDDER COMPOSITE, and FEET & LEGS COMPOSITE

According to USDA-AIPL data for the U.S. Holstein population, these five traits (listed in order of the size of their correlations) are strongly associated with longevity – Daughter Pregnancy Rate, Calving Ability (Calving Ease and Stillbirth traits), Somatic Cell Score, Udder Composite, and Feet & Leg Composite (see Figure 3 for correlations). These results match

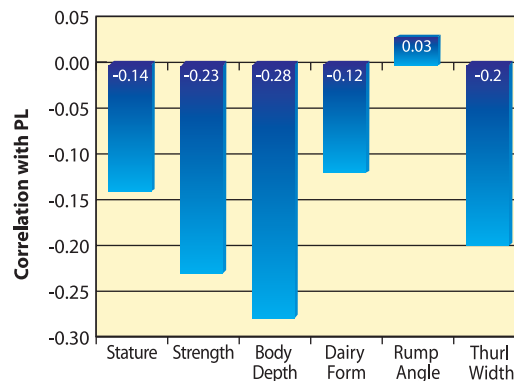
well with USDA-AIPL culling data which list the two most frequently cited culling reasons as Reproduction and Mastitis. Ultimately, these results state that by using bulls with higher PL values, daughters are expected to have greater longevity, improved fertility, better calving related traits, less mastitis, and more desirable udders and feet and legs.

**Figure 1**  
Correlations of Yield & Management Traits with Productive Life



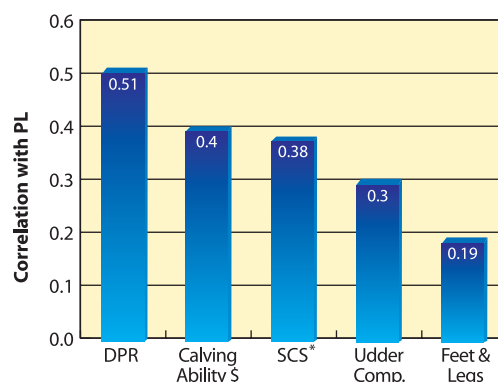
Source: USDA-AIPL, 2006

**Figure 2**  
Correlations of Body Traits with Productive Life



Source: Tsuruta and co-workers. 2005. J. Dairy Sci. 88:1156

**Figure 3**  
Important Trait Correlations with Productive Life



Source: USDA-AIPL, 2006

\*Absolute value of SCS

With all of these somewhat different longevity concepts in mind – moderate size, good management traits, and good udders and feet and legs, a logical next question may be, “So, what do bulls that sire long-lived genetics look like?” Let’s look at two different groups of bulls to get a “visual picture” of long-lived genetics – a group with high Type (PTAT) and a subset of bulls that excel for Productive Life.

To make this comparison, we’ll take sires from the active A.I. list to ensure there are enough bulls in the different subsets to reach robust conclusions. The high Type subset was designed to be bulls with PTAT of more than 1.4. A total of 189 active bulls met this criterion and the average type pattern for this group of sires is shown in Figure 4 (top right).

As expected, this group of elite sires for Type excel for Udder Traits, Feet and Leg traits, Stature, Strength, Body Depth, Thurl Width, and Dairy Form/Angularity. These linear trait results infer that bulls which are extreme on Type have some pluses as well as a few minuses for longevity. How do these various pluses and minus ‘sum’ for longevity and Management Traits for this group of bulls?

Figure 5 (second right) depicts the overall impact on Management Traits of the favorable and unfavorable correlations for this group of elite PTAT bulls. This overall impact is shown in the chart as Actual PTA averages and ‘Linearized’ or standardized averages for Management Traits and the index, Lifetime Net Merit \$. The data show that while this group of bulls is elite for PTAT, they are essentially average for Management Traits – Productive Life, Daughter Pregnancy Rate, Somatic Cell Score, Sire and Daughter Calving Ease and Stillbirths, and the index Net Merit \$.

Figure 6 (third right) shows a subset of bulls that excel for Productive Life and are again, sorted from the active A.I. list. The high PL subset was designed with bulls having a PL of 2.0 and higher, meaning that daughters of these bulls are expected to in the milking string for at least 2 months longer than bulls with PL values of 0. A total of 174 active bulls met this criterion and the average type pattern of this group of sires is shown in Figure 6.

These bulls excel for Udders and Feet and Leg structure traits. This result makes perfect sense based on dairy manager feedback and also lines up well with trait correlations with PL computed using USDA-AIPL data. Maybe the somewhat more unexpected result is that these high PL bulls are less extreme for size related traits, specifically Stature, Strength, Body Depth, Thurl Width, more moderate for Dairy Form, and as a result, also more moderate for PTAT.

Now, let’s look a bit further to see how this group of sires stack up for longevity and Management Traits. Management Trait and NM\$ averages shown as Actual PTA averages and ‘Linearized’ or standardized averages for these elite PL bulls are in Figure 7 (lower right). These high PL bulls have elite PTAs for Productive Life, good genetic merit for all other Management Traits, and an average of \$343 for Lifetime NM\$.

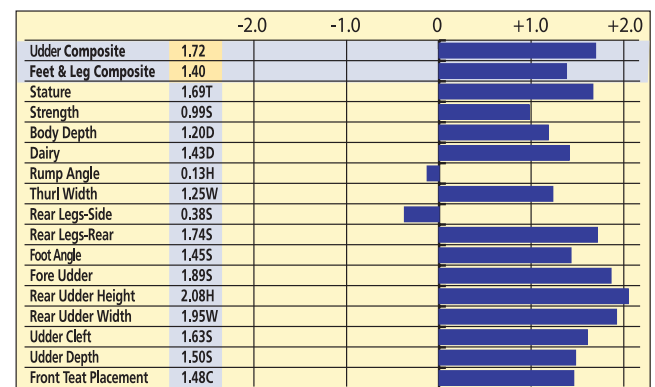
So, what does all of this mean? If you are looking to build cows that have good longevity, a balanced approach is necessary. This balanced approach involves:

- Starting with a balanced index which includes a majority of the important traits for profitability and longevity.
- From this, further refine selection for specific needs.
  - ✓ Positive longevity & fertility
  - ✓ Improved udders and feet & legs
  - ✓ Mastitis resistance
  - ✓ Avoid putting limits on PTAT
  - ✓ Avoid overly large cows
  - ✓ Avoid very angular cows

Regardless of your genetic goals – intensive management, show type, grazing management, or any other combination – ABS can help you to achieve your goals.

**Figure 4**

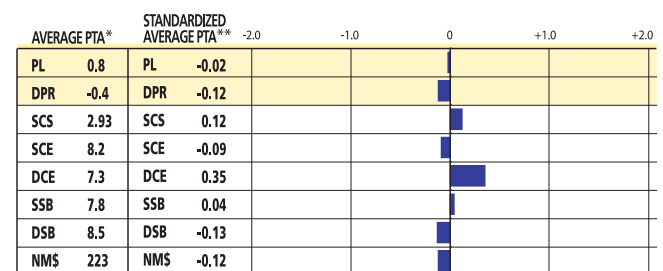
**Linear Type Pattern for Bulls with PTAT > 1.4**



189 bulls with PTAT > 1.4, Aug. 2006 Active A.I. list

**Figure 5**

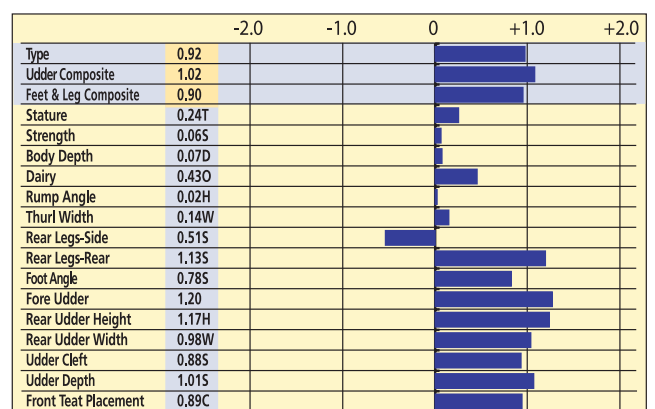
**Actual and Linear Management Trait Patterns for Bulls with PTAT > 1.4**



\*Calculation of average PTA across 189 sires with PTAT > 1.4, Aug. 2006 Active A.I. list  
\*\*Standardized values derived from PTA averages

**Figure 6**

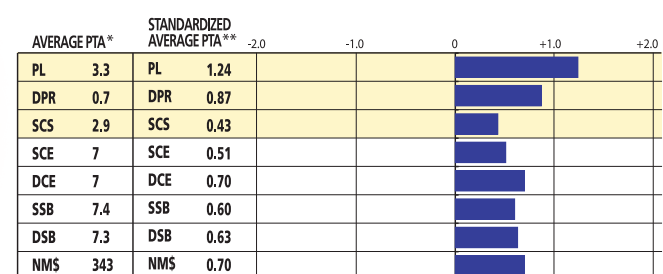
**Linear Type Pattern for Bulls with PTA PL ≥ 2.0**



174 bulls with PTA PL ≥ 2.0, Aug. 2006 Active A.I. list

**Figure 7**

**Actual and Linear Management Trait Patterns for Bulls with PL ≥ 2.0**



\*Calculation of average PTA across 174 sires with PTA PL ≥ 2.0, Aug. 2006 Active A.I. list  
\*\*Standardized values derived from PTA averages

