About the Holstein Conformation Composite (HCC)

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Overview

The Holstein Conformation Composite (HCC) is a conformation selection tool that identifies the combination of linear traits associated with a moderate size, balanced, functional Holstein cow.

The HCC assigns weights to 18 linear conformation traits based on their relationship with longevity, production, and balance, accounting for the correlations among the traits.

By contrast, Predicted Transmitting Ability for Type (PTAT) is a genetic evaluation based on Final Score alone. PTAT and the HCC both describe conformation in different ways. PTAT will continue to be published, and the HCC does not change how Holsteins are evaluated through the classification program.

HCC values will be reported for active A.I. bulls in July 2026, using April 2026 evaluations, and become an official trait for all Holsteins in August 2026. HCC values will appear on Official Holstein Pedigrees™, on animal lists on the Holstein Association USA website, and in sire selection tools such as Red Book Plus Online™.

The HCC is intended for breeders selecting for a moderately framed, functional, balanced cow that remains productive across many lactations. It is one more conformation tool to use similarly to PTAT, the Udder Composite (UDC), and the Feet and Legs Composite (FLC) when choosing genetics for your herd. The trait emphases reflect breeder priorities built over decades of selection and evaluated against Holstein Association USA conformation and longevity records.

Mission Statement

The following mission statement defines the cow the HCC is designed to select and the principles behind the formula.

> *The Holstein Conformation Composite (HCC) is a selection tool designed to identify animals with the combination of conformation traits most associated with balanced, functionally correct Holstein cattle. The HCC emphasizes intermediate optimum values for key traits that support long-term functionality. It promotes moderate frame size, balanced udders built for longevity and production potential, and sound feet and legs. The HCC identifies cattle that move well, maintain structural soundness, and produce profitably across many lactations, representing the balanced, durable cow that dairy producers recognize as their most profitable. Developed through collaboration between experienced breeders and the empirical analysis of Holstein Association USA's comprehensive database of linear conformation and production records, the HCC provides breeders an alternative to Predicted Transmitting Ability for Type (PTAT) by weighting individual conformation traits based on breed priorities, considering the relationships between traits, rather than being based on Final Score alone. The formula is evaluated periodically by Holstein Association USA's Conformation Advisory and Genetic Advancement Committees to ensure it continues to advance the Holstein breed and serve the evolving needs of breeders worldwide.*

The mission statement establishes four principles, reflecting breeder priorities for a functional, balanced cow:

- Intermediate optimum values for several traits rather than directional extremes.
- Moderate frame size.
- Udders evaluated for longevity and production potential, favoring longer teats and more moderately placed rear teats.
- Sound feet and legs for optimal longevity and athleticism.

Over time, as conformation and longevity data accumulate, weights and optimum values may be refined. Any revision follows the same process used for the TPI® and the other conformation composites (UDC, FLC, and BWC); committee recommendations are brought to the Holstein Association USA Board of Directors.

How the HCC Was Built

Holstein Association USA staff developed the HCC through extensive analysis of conformation and longevity records. Members of the Conformation Advisory and Genetic Advancement Committees gave feedback throughout, refining the formula across multiple iterations. The final formula combines breeder insight with extensive real-world data analysis and was approved by the Holstein Association USA Board of Directors.

Development Approach

Linear conformation traits are genetically correlated, so selecting one trait applies indirect selection pressure to others. Heavier weighting on rear udder height and width, for example, results in increased stature, because those traits are highly correlated. The HCC accounts for these correlations across all linear traits before assigning weights, so each weight reflects a trait's combined effect within the correlated set rather than its importance in isolation. Breeder experience defined the target cow, and data analysis set the weightings against longevity, fitness, and production outcomes in the Holstein Association USA database.

About the HCC Formula

The HCC combines 18 linear conformation traits in three groups. The table below shows the share of total weight in each group.

Group	# of Traits	Combined Weight
Frame	6	**42%**
Udder	8	**38%**
Feet & Legs	4	**22%**

Weight Distribution

The weights reflect the correlation structure among all linear traits; they are not a ranking of individual trait importance. A trait may carry a smaller weight because it is already accounted for through genetic correlations with other traits in the formula. For that reason, the group proportions are more informative than individual trait weights.

Stature is weighted directionally low, consistent with the moderate frame size in the mission statement. The aim is a moderate cow, not a short one. Recent studies have indicated that extremely short cows produce less milk over their lifetime, and extremely tall cows stay in the herd for fewer lactations. Because stature is highly correlated with several traits, the formula pushes stature down while pushing strength and other traits up, and it weights strength more heavily than stature. This keeps the formula aligned with the moderate, functional cow.

The Formula

The HCC uses a penalty-based approach rather than a simple weighted sum. For each of the 18 traits, the formula measures the deviation from a functional optimum and applies a quadratic penalty that grows as a bull moves further from the optimum.

The table lists each trait with its weight, optimum value, and direction. Optimum values are standardized PTA units relative to breed average, and the weights are interpreted as a set.

Trait	Component	Weight	Optimum	Direction
Stature	Frame	15.0%	-1.5	Directional Low
Strength	Frame	9.0%	+1.5	Directional High
Body Depth	Frame	3.0%	+0.0	Intermediate
Dairy Form	Frame	4.0%	+1.0	Directional High
Rump Angle	Frame	6.0%	+1.0	Intermediate
Rump Width	Frame	5.0%	+0.5	Intermediate
Rear Legs-Side View	Feet & Legs	5.0%	+1.0	Intermediate
Rear Legs-Rear View	Feet & Legs	2.0%	+2.0	Directional High
Foot Angle	Feet & Legs	8.0%	+1.5	Directional High
Feet & Legs Score	Feet & Legs	7.0%	+2.0	Directional High
Fore Udder	Udder	6.0%	+1.5	Directional High
Rear Udder Height	Udder	3.0%	+2.0	Directional High
Rear Udder Width	Udder	5.0%	+2.0	Directional High
Udder Cleft	Udder	8.0%	+1.0	Directional High
Udder Depth	Udder	5.0%	+0.5	Intermediate
Front Teat Placement	Udder	2.0%	+0.5	Intermediate
Rear Teat Placement	Udder	4.0%	-2.0	Intermediate
Teat Length	Udder	5.0%	+1.5	Intermediate

Directional high traits favor PTA above breed average; directional low traits favor PTA below it; intermediate traits favor a target near breed average, with values farther from the optimum scoring lower. Linear STAs are read against the breed average, which shifts with each base change, so the ideal STA changes over time. A +3.0 STA, or a fully “right-sided” linear profile, is not necessarily the goal.

Top HCC Bull Profile

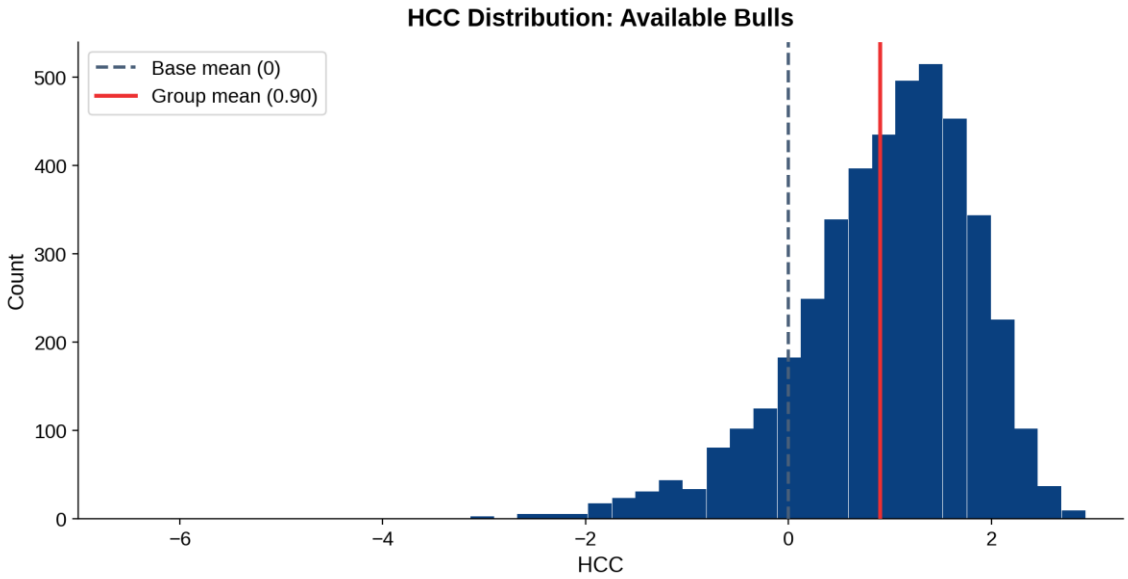
Bulls ranking highest for the HCC share a consistent linear profile. The table shows the mean PTA for each linear trait among the top 25 HCC bulls, as a deviation from breed average (mean HCC 2.16).

Top 25 bulls by HCC. Mean PTA for each linear trait relative to breed average (zero), representing the conformation their daughters are expected to express. Population: Holstein bulls in the April 2026 evaluation with a minimum 50% reliability.

Holstein Conformation Composite Summary Statistics

The following figures summarize the HCC across 4,375 available bulls, using the April 2026 genetic evaluation data.

Available Bulls: April 2026 Genetic Evaluation



Distribution of HCC scores for available bulls (n = 4,375). The blue dashed line marks the 2020 base population mean. The red line marks the group mean.

Composite Index Correlations: Available Bulls

PTA correlations between HCC, PTAT, UDC, FLC, and BWC for all available bulls (n = 4,375). Values are current as of the April 2026 genetic evaluation.

	HCC	PTAT	UDC	FLC	BWC
HCC	1.00	0.15	0.25	0.33	0.09
PTAT	0.15	1.00	0.85	0.65	0.65
UDC	0.25	0.85	1.00	0.50	0.41
FLC	0.33	0.65	0.50	1.00	0.51
BWC	0.09	0.65	0.41	0.51	1.00

HCC and PTAT Correlations with Production, Health and Fertility Traits

The HCC was designed to track longevity and fitness. This table compares how PTAT and HCC correlate with TPI, Net Merit, and key production, health, and fertility traits. Because PTAT is based on Final Score alone, with no direct emphasis on longevity, low to negative correlations are expected. The HCC was designed with longevity in mind, and the following correlations reflect that.

Trait	PTAT	HCC
TPI	-0.15	0.23
Net Merit ($)	-0.43	0.13
Milk Yield (lbs)	-0.11	0.05
Fat (lbs)	-0.29	0.12
Protein (lbs)	-0.22	0.13
Somatic Cell Score	0.10	-0.20
Daughter Pregnancy Rate	-0.29	0.12
Cow Conception Rate	-0.35	0.13
Productive Life	-0.42	0.22
Livability	-0.55	0.10
Feed Efficiency	-0.37	0.10

PTA correlations between HCC/PTAT and TPI, Net Merit, and key production, health, and fertility traits for all available bulls (n = 4,375). Values are current as of the April 2026 genetic evaluation.

Average and Range by HCC Percentile Group: Available Bulls (n = 4,375)

Cumulative groups ranked by HCC from highest to lowest. Each cell shows the group mean with the range (min to max) below. Values are current as of the April 2026 genetic evaluation.

Group	HCC	PTAT	UDC	FLC	BWC
Top 1%	2.67 (2.51 to 3.11)	1.48 (0.20 to 2.08)	1.27 (0.56 to 1.90)	1.24 (0.48 to 2.24)	0.48 (-0.56 to 1.45)
Top 5%	2.35 (2.12 to 3.11)	1.34 (-0.25 to 2.63)	1.13 (0.02 to 2.25)	1.01 (-0.23 to 2.24)	0.28 (-1.48 to 2.21)
Top 10%	2.18 (1.93 to 3.11)	1.30 (-0.25 to 2.69)	1.10 (-0.17 to 2.25)	0.91 (-0.28 to 2.24)	0.22 (-1.57 to 2.21)
Top 20%	1.99 (1.67 to 3.11)	1.21 (-0.44 to 2.69)	1.04 (-0.54 to 2.42)	0.77 (-0.72 to 2.24)	0.13 (-1.91 to 2.33)
Top 30%	1.84 (1.45 to 3.11)	1.14 (-0.51 to 2.76)	0.99 (-0.54 to 2.42)	0.67 (-0.72 to 2.24)	0.08 (-2.02 to 2.36)
Top 50%	1.61 (1.05 to 3.11)	1.01 (-0.81 to 2.79)	0.89 (-0.76 to 2.48)	0.51 (-1.28 to 2.24)	-0.01 (-2.03 to 2.36)
All	0.90 (-6.08 to 3.11)	0.81 (-4.00 to 3.92)	0.70 (-2.75 to 2.97)	0.25 (-3.35 to 2.78)	-0.17 (-3.43 to 3.11)

HCC Percentile Table: Available Bulls

HCC score at each percentile for all available bulls and by birth year cohort. Values are current as of the April 2026 genetic evaluation.

Birth Year	0	10	20	30	40	50	60	70	80	90	95	99	100
All	-6.08	-0.28	0.27	0.57	0.83	1.05	1.25	1.45	1.67	1.93	2.11	2.50	3.11
2025	-2.22	0.48	0.87	1.14	1.35	1.51	1.64	1.74	1.91	2.07	2.13	2.27	2.42
2024	-5.71	0.17	0.55	0.85	1.08	1.26	1.42	1.57	1.75	2.02	2.25	2.55	2.99
2023	-3.19	-0.50	0.14	0.50	0.79	1.02	1.23	1.43	1.68	1.92	2.11	2.47	2.88
2022	-5.97	-0.07	0.39	0.65	0.87	1.09	1.28	1.42	1.64	1.89	2.08	2.38	3.10
2021	-2.58	-0.36	0.13	0.45	0.71	0.90	1.08	1.28	1.46	1.77	1.99	2.41	2.94
2020	-6.08	-0.45	0.12	0.46	0.72	0.90	1.06	1.33	1.59	1.90	2.11	2.65	3.11
2019	-5.11	-0.53	0.04	0.29	0.50	0.74	0.96	1.16	1.39	1.76	2.14	2.59	2.68
2018	-3.73	-1.11	-0.41	0.20	0.53	0.72	0.90	1.13	1.28	1.59	1.87	2.27	2.53
2017	-2.77	-0.85	-0.21	0.15	0.31	0.56	0.88	1.02	1.31	1.63	1.91	2.41	2.62
2016	-2.66	-0.79	-0.32	-0.08	0.17	0.28	0.44	0.58	1.20	1.69	2.01	2.29	2.34
2015	-5.32	-0.64	-0.17	0.27	0.46	0.58	0.75	0.94	1.06	1.29	1.51	1.93	2.02
2014	-1.06	-0.22	-0.09	0.05	0.22	0.34	0.52	0.70	0.71	0.94	1.05	1.11	1.12
2013	-3.24	-0.32	-0.08	0.34	0.57	0.73	0.78	1.22	1.54	1.63	1.65	1.66	1.66
2012	-1.27	-0.93	-0.58	-0.15	0.28	0.65	1.01	1.43	1.85	1.89	1.90	1.92	1.92
2011	-1.03	-0.90	-0.51	-0.38	-0.34	-0.12	0.13	0.19	0.29	0.56	0.70	0.81	0.84