

INTERBULL breeding values calculated August 2023

This newsletter is primarily written for VikingGenetics staff and breeding advisors in Denmark, Sweden, and Finland, but can also be of interest for dairy farmers.

Table of content

International breeding values for the traits and breeds shown in table 1 have been published 8th August 2023

Current evaluation	
Daughter proven bulls: Yield Conformation Somatic cell count and udder health Longevity Calving – maternal and direct Female fertility Milking speed and temperament NTM for Nordic and foreign bulls	Young genomic tested bulls - HOL: Yield Conformation Somatic cell count and udder health Longevity Calving – maternal and direct Female fertility Milking speed and temperament

Table 1. Traits and breeds for which international breeding values are published.

Trait:	International breeding values for the breeds:
Yield	Red breeds, Holstein and Jersey
Conformation	Red breeds, Holstein and Jersey
Udder health	Red breeds, Holstein and Jersey
Longevity	Red breeds, Holstein and Jersey
Calving – maternal and direct	Red breeds and Holstein
Female fertility	Red breeds, Holstein and Jersey
Milking speed	Red breeds, Holstein and Jersey
Temperament	Red breeds and Holstein

You can find Interbull breeding values for all bulls with international breeding values on www.nordicebv.info

On the page you can search within breed or country. You can also search with the herdbook number or the name of the bull. Click on the herdbook number of the bull and view a graphical representation of the bulls' breeding values.

You can sort the bulls by different breeding values by clicking on the top line of the table.

Bulls from Denmark, Finland and Sweden are in the following grouped under DNK/FIN/SWE

Daughter proven bulls

In the tables below, only sires that have breeding values based on daughter information is shown.

Yield

In tables 2-4 is a comparison of the genetic level of yield for bulls from different countries. The analysis includes bulls born in 2016 or later, that have more than 60 daughters in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2016 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	7	90,0	83,1	80,3	79,6	13,3
Canada	27	93,9	92,4	89,4	90,0	6,9
Germany	7	102,7	108,1	104,0	106,6	4,5
DNK/FIN/SWE	167	100,0	103,8	103,2	104,4	8,0
UK	9	81,7	78,7	71,4	72,9	11,8
Norway	110	97,5	95,1	95,3	94,7	9,4
New Zealand	13	89,3	92,6	85,4	88,3	7,0
USA	6	79,5	74,2	70,5	70,2	16,0

Table 3. Genetic level for yield traits, Holstein. Bulls born in 2016 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	43	98,4	104,0	100,2	102,7	9,1
Austria	5	111,8	98,8	104,2	99,4	10,7
Belgium	15	101,8	104,1	102,7	103,6	7,3
Canada	389	109,3	110,0	108,3	109,0	11,0
Switzerland	80	97,1	98,7	96,9	97,8	9,2
Czech Republic	32	109,4	108,3	106,3	106,6	8,7
Germany	686	109,8	106,2	108,6	107,0	9,8
DNK/FIN/SWE	248	100,5	103,6	103,9	104,6	9,6
Spain	63	111,2	104,6	104,1	102,6	7,0
Estonia	6	93,3	91,3	88,5	88,8	8,3
France	267	103,9	101,9	104,2	103,0	8,7
UK	39	101,2	109,9	102,6	107,1	9,2
Israel	106	100,0	101,6	98,9	100,1	6,5
Italy	184	106,7	105,5	106,4	105,8	8,6
Japan	30	109,9	109,8	107,3	108,0	6,5
Luxembourg	13	117,8	108,8	112,5	109,2	7,1
Netherlands	511	105,0	106,6	106,0	106,6	9,4
New Zealand	609	74,6	92,4	85,2	91,9	6,3
Poland	104	105,4	103,9	104,0	103,6	7,6
Slovenia	28	98,9	92,2	92,8	90,9	6,5
USA	2206	108,6	111,4	107,4	109,3	10,0

Table 4. Genetic level for yield traits, Jersey. Bulls born in 2016 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	20	104,1	90,6	97,3	90,9	6,8
Canada	18	110,6	93,6	101,3	93,6	12,9
DNK/FIN/SWE	76	102,4	105,8	106	107	8,0
New Zealand	289	98,2	94,7	97,8	95,7	7,5
USA	360	115,6	100,3	109,2	101,5	10,8

International comparison for yield among most important populations shows that:

- Red breeds: DNK/FIN/SWE have higher genetic level than Norway and Canada
- Holstein: DNK/FIN/SWE, Canada, Germany, USA, and Netherlands have similar genetic level
- Jersey: Denmark has higher genetic level than USA. New Zealand has considerably lower genetic level

Conformation

The international genetic evaluation is done for 16 linear traits for Holstein, Red breeds and Jersey. In addition, frame, body condition score and locomotion are included in this trait group.

Breeding values for frame

EBV for frame is calculated from the 6 linear traits that are part of the international genetic evaluation. The composite NAV breeding value for frame also includes topline. There is no international genetic evaluation of topline.

We calculate international breeding value for frame based on a regression of NAV breeding values for the 6 linear international traits on NAV EBV for frame for Danish, Swedish and Finnish bulls born in 2004-05. The estimated regression coefficients are used to calculate international breeding value for frame for foreign bulls. This method is used to ensure the same relative weight between traits in NAV and international composite traits.

Breeding values for feet and legs

EBV for feet and legs is calculated from the 3 linear traits that are part of the international genetic evaluation. The composite NAV breeding values for feet and legs also include hock quality and bone quality. There is no international genetic evaluation for these two traits.

We calculate international breeding value for feet and legs based on a regression of NAV breeding values for the 3 linear international traits on NAV EBV for feet and legs for Danish, Swedish and Finnish bulls born in 2004-05. The estimated regression coefficients are used to calculate international breeding value for feet and legs for foreign bulls.

Breeding values for udder

The international genetic evaluation for udder includes 7 traits. The Nordic genetic evaluation for udder also includes teat thickness and udder balance. There is no international evaluation for these two traits.

We calculate international breeding value for udder based on a regression of NAV breeding values for the 7 linear international traits on NAV EBV for udder for Danish, Swedish and Finnish bulls born in 2004-05. The estimated regression coefficients are used to calculate international breeding value for udder for foreign bulls.

Genetic level of composite conformation traits

In tables 5-7 is a comparison of genetic level of composite conformation traits for bulls from different countries. The calculation includes bulls that have at least 25 daughters in genetic evaluation.

Table 5. Genetic level for conformation traits, Red breeds. Bulls born in 2016 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	34	103,4	9,6	103,4	4,7	102,1	8,6
Germany	8	105,6	11,3	106,9	4,6	103,6	5,7
DNK/FIN/SWE	176	97,9	11,3	100,9	5,0	101,6	7,5
UK	9	100,3	4,3			98,7	8,4
Norway	95	101,6	12,6	99,3	5,4	84,6	9,0
USA	5	112,0	7,6	105,6	3,9	112,2	9,7

Table 6. Genetic level of conformation traits, Holstein. Bulls born in 2016 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	12	115,4	8,9	97,3	5,0	104,7	12,8
Austria	5	101,0	7,0	102,2	3,3	106,6	6,9
Belgium	13	108,9	13,7	104,9	6,6	105,2	8,4
Canada	329	114,6	10,9	97,4	6,3	112,6	9,2
Switzerland	98	111,0	8,6	98,9	5,3	108,8	9,9
Czech Republic	37	109,9	10,1	99,5	3,8	104,4	9,5
Germany	666	108,9	9,4	101,9	6,3	107,7	8,1
DNK/FIN/SWE	229	100,9	10,4	101,2	6,1	104,7	8,9
Spain	67	115,6	8,1	102,0	6,7	107,6	8,5
Estonia	7	107,0	8,6	99,6	4,5	92,6	7,6
France	250	115,6	9,9	102,7	5,5	109,5	8,0
UK	32	104,0	11,0	99,1	3,7	103,6	7,2
Italy	184	113,7	10,3	100,5	5,4	107,0	9,3
Japan	298	112,3	10,1	98,8	5,5	102,9	8,4
Korea	5	109,2	7,6	101,2	1,6	98,2	4,1
Luxembourg	10	110,7	8,8	102,1	3,8	103,7	8,4
Netherlands	416	108,5	9,9	105,1	7,1	103,5	9,3
New Zealand	606	83,2	8,8				
Poland	79	112,0	9,2	101,2	5,8	99,7	8,4
Slovenia	28	106,0	12,5	98,1	6,5	94,0	6,2
USA	1344	108,3	11,0	98,0	5,8	107,3	9,3

Table 7. Genetic level of conformation traits, Jersey. Bulls born in 2016 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	8	108,6	6,2	104	6,9	91,9	5,4
Canada	24	110,8	8,2	105,1	7,7	99,8	9,4
DNK/FIN/SWE	78	100,1	8,5	99,9	7,7	100,3	9,2
USA	276	111,9	8	103,6	6,9	100,7	9,2

International comparison for conformation traits among most important populations show that:

- Red breeds: Canada have similar genetic level for feet&legs and udder as DNK/FIN/SWE. Compared to Norway, DNK/FIN/SWE have similar genetic level for feet&legs and higher level for udder.
- Holstein: DNK/FIN/SWE has same genetic level for frame than most other populations. North America, Spain, France and Italy have the highest genetic level for frame. Populations with grass based dairy farming like New Zealand has lower genetic level for frame. For feet&legs there are only small differences between populations. DNK/FIN/SWE has a below average genetic level for udder. North America and France has the highest genetic level for udder.
- Jersey: Denmark has lower genetic level for frame than USA, but same level for udders

Somatic cell count and udder health

Interbull does two international genetic evaluations – one for somatic cell count and one for udder health. In the first one only somatic cell count is included for all countries. NAV sends breeding values for somatic cell count to Interbull, so Nordic bulls get official breeding values for somatic cell count in countries where this trait is official. In the second evaluation breeding values based on mastitis diagnoses are included. NAV's official breeding value for udder health is used. For countries that do not record mastitis diagnoses, somatic cell count is included in this evaluation.

Index for udder health is published in the Nordic countries when reliability is 40% or higher. In tables 8-10 is a comparison of genetic level of udder health for bulls from different countries.

Table 8. Genetic level for udder health, Red breeds. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	15	100,2	7,7
Canada	14	95,6	6,7
DNK/FIN/SWE	198	100,2	8,7
UK	5	97,4	10,0
Norway	111	100,0	9,8
New Zealand	23	90,3	6,8
USA	7	95,9	10,1

Table 9. Genetic level for udder health, Holstein. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	60	95,2	6,5
Belgium	11	98,0	9,4
Canada	220	98,7	8,3
Switzerland	19	98,7	7,3
Czech Republic	35	96,3	7,6
Germany	478	100,4	7,2
DNK/FIN/SWE	215	102,1	7,2
Spain	76	99,3	7,9
Estonia	8	96,4	8,0
France	239	101,2	7,1
UK	28	100,2	6,4
Israel	113	100,3	7,6
Italy	177	99,9	8,2
Japan	232	92,4	7,5
Korea	19	91,5	6,5
Luxembourg	9	100,5	7,6
Netherlands	308	100,6	7,5
New Zealand	613	92,9	7,0
Poland	115	99,5	8,4
Slovenia	32	96,4	8,0
USA	1272	98,0	8,7

Table 10. Genetic level for udder health, Jersey. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	24	93,7	5,4
Canada	9	79,6	15,3
DNK/FIN/SWE	65	101,0	7,3
New Zealand	311	95,2	6,6
USA	169	87,5	8,6

International comparison for udder health among most important populations show that:

- Red breeds: DNK/FIN/SWE has same genetic level as Norway
- Holstein: DNK/FIN/SWE have similar or higher genetic level than other major European populations, USA and Canada
- Jersey: Denmark is substantially better than USA

Longevity

In tables 11-13 is a comparison of genetic level of longevity for bulls from different countries. Bulls are included if they have at least 40 daughters in the genetic evaluation.

Table 11. Genetic level for longevity, Red breeds. Bulls born in 2015 or later.

Country	No. of bulls	Average	STD
Australia	9	89,8	13,4
Canada	41	89,6	10,2
Germany	13	96,7	7,6
DNK/FIN/SWE	173	101,3	8,7
UK	13	82,8	7,9
Norway	108	92,2	7,8
USA	10	77,7	5,4

Table 12. Genetic level for longevity, Holstein. Bulls born in 2015 or later.

Country	No. of bulls	Average	STD
Australia	69	90,6	9,2
Austria	9	101,1	8,6
Belgium	22	99,4	7,6
Canada	489	100,5	8,8
Switzerland	113	93,0	8,4
Czech Republic	50	103,3	6,3
Germany	895	102,7	8,6
DNK/FIN/SWE	271	102,9	8,1
Spain	53	96,6	7,0
France	346	94,2	7,6
UK	60	100,3	10,5
Ireland	57	89,7	6,1
Israel	153	92,5	6,2
Italy	254	97,6	6,2
Luxembourg	15	104,3	9,8
Netherlands	643	102,0	8,9
New Zealand	582	86,4	5,2
Poland	161	97,9	8,6
Slovenia	48	93,2	5,9
USA	2749	103,1	8,9

Table 13. Genetic level for longevity, Jersey. Bulls born in 2015 or later.

Country	No. of bulls	Average	STD
Australia	22	92,7	7,7
Canada	25	93,5	6,7
DNK/FIN/SWE	88	100,4	7,0
New Zealand	149	90,0	4,5
USA	474	98,0	7,6

International comparison for longevity among most important populations shows that:

- Red breeds: DNK/FIN/SWE has higher level than the other populations
- Holstein: DNK/FIN/SWE are among the countries with the highest genetic level
- Jersey: Denmark has higher genetic level than other populations

Calving – maternal and direct

For Red breeds Canada, Denmark, Finland, Norway, Sweden and The United States send data to this evaluation. It has not been possible to obtain enough high correlations between countries for still birth, so the international evaluation only includes calving ease (maternal and direct) for Red breeds.

In the Holstein group there are international breeding values for both still birth (maternal and direct) and calving ease (maternal and direct), but only for first lactation. In the Nordic countries also, information from later lactations and from birth weight is included in calving, maternal and calving, direct.

We have calculated international indices for calving, maternal and calving, direct by performing a regression between NAV breeding values for still birth and calving ease and NAV breeding value for calving for Nordic bulls born in 2001-2006. The calculated regression coefficients are used to calculate a calving index for foreign bulls - same method is used for calving, maternal and calving, direct.

In Tables 14 and 15 the average genetic level for Red breed and Holstein bulls is shown for different countries. Only bulls born in 2016 or later are included. Bulls need to have breeding values for yield to be included.

Table 14. Genetic level for calving, maternal and calving, direct, Red breeds. Bulls born in 2016 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	33	94,2	6,7	17	95,7	6,8
DNK/FIN/SWE	175	100,7	6,9	157	100,3	6,4
Norway	109	100,3	8,5	111	92,2	7,1

Table 15. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2016 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	64	97,5	5,2	2	95,5	0,7
Austria	6	95,7	7,9	6	95,2	8,8
Belgium	15	98,0	4,0	14	99,6	7,4
Canada	419	97,9	5,6	325	101,9	5,1
Switzerland	106	96,8	5,4	77	98,7	7,9
Czech Republic	5	96,6	4,9	2	101,5	2,1
Germany	704	98,2	5,8	641	99,9	6,8
DNK/FIN/SWE	253	100,6	6,5	245	101,7	6,8
Spain	22	97,3	4,4	16	100,0	4,3
France	296	97,3	6,1	259	103,5	8,7
UK	37	99,7	4,1	16	100,1	7,2
Israel	49	96,9	4,5	116	91,8	5,3
Italy	181	97,6	4,5	113	99,9	5,3
Luxembourg	14	97,1	4,1	13	100,9	6,8
Netherlands	480	99,0	5,7	419	98,5	7,3
New Zealand	432	101,4	4,2	0		
USA	2326	100,2	5,3	1689	102,6	5,0

International comparison for calving traits among most important populations shows that:

- Red breeds: DNK/FIN/SWE and Norway have similar genetic level for calving, direct. For calving, maternal DNK/FIN/SWE has a higher level than Norway
- Holstein: DNK/FIN/SWE are among the best populations for both calving, direct and calving, maternal.

Female fertility

NAV calculates breeding values for female fertility based on linear regression between NAV breeding values for female fertility and NAV breeding values for the sub-indices in female fertility. Basis for the regressions are Nordic bulls born in 2001-2005 – see more information below. The estimated regression coefficients are used to calculate international breeding value for female fertility for foreign bulls.

In practice 3 regressions are calculated with different explaining variables (Jersey only 2 and 3):

- 1: Female fertility = Ability to conceive (R^2 , HOL = 0,05) (R^2 , Red breeds = 0,35)
- 2: Female fertility = Days open (R^2 , HOL = 0,87) (R^2 , Red breeds = 0,85) (R^2 , Jer = 0,87)
- 3: Female fertility = Ability to return to recycle after calving + ability to conceive + Days open (R^2 , HOL = 0,96) (R^2 , Red breeds = 0,94), (R^2 , Jer = 0,94).

R^2 (degree of explanation) indicates the proportion of the variance of the index for female fertility, that the traits in the regression can explain. Since the regression is used on foreign bulls, and the genetic correlations between international and NAV traits are not 1, the observed degree of explanation will be lower.

For each foreign bull we use the regression with the greatest explanatory power given the international sub-indices that are available. The degree of explanation therefore depends largely of the traits being available from the different countries.

Table 16. Genetic level for female fertility, Red breeds. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	5	96,6	12,8
Canada	27	95,7	7,8
Germany	7	89,4	14,4
DNK/FIN/SWE	163	100,0	10,2
UK	8	94,3	5,5
Norway	99	114,2	7,0
New Zealand	13	96,9	6,3
USA	6	88,2	6,2

Table 17. Genetic level for female fertility, Holstein. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	31	95,6	8,6
Belgium	15	95,7	6,4
Canada	367	96,7	8,8
Switzerland	77	96,0	3,2
Czech Republic	27	98,0	4,2
Germany	603	96,0	9,2
DNK/FIN/SWE	247	103,1	11,2
Spain	35	91,4	6,3
France	229	97,4	8,0
UK	30	101,7	6,9
Israel	103	96,6	2,5
Italy	171	95,3	7,0
Japan	30	91,5	5,8
Luxembourg	12	96,6	7,0
Netherlands	464	95,1	8,5
New Zealand	421	99,1	5,2
Poland	56	92,9	6,2
USA	2111	97,5	9,1

Table 18. Genetic level for female fertility, Jersey. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	18	90,8	6,3
Canada	18	85,3	11,5
DNK/FIN/SWE	90	101,0	13,4
New Zealand	190	97,7	7,0
USA	341	86,7	9,9

International comparison for female fertility among most important populations shows that:

- Red breeds: DNK/FIN/SWE has a lower level than Norway
- Holstein: DNK/FIN/SWE have a high genetic level
- Jersey: Genetic level is higher in Denmark than the other major countries

Milking speed and temperament

In Tables 19-21, the genetic level for bulls from different countries, born in 2016 or later are shown for Holstein, Red breeds and Jersey.

Table 19. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2016 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	5	92,4	4,3	5	99,6	7,6
Canada	31	90,3	16,1	29	94,9	15,2
Germany	7	103,8	4,1	8	104,5	3,6
DNK/FIN/SWE	188	98,9	8,0	164	100,8	11,9
Norway	103	93,6	4,3	96	98,2	5,3

Table 20. Genetic level for milking speed and temperament, Holstein. Bulls born in 2016 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	30	100,4	7,2	30	103,2	7,3
Austria	6	99,3	4,1			
Belgium	11	90,6	8,3	9	99,0	6,3
Canada	272	97,3	11,4	268	103,8	13,0
Switzerland	101	96,7	8,7	100	100,8	8,6
Germany	523	98,1	9,0	426	102,0	14,5
DNK/FIN/SWE	232	100,5	8,0	187	100,9	16,5
France	252	96,3	10,2	251	103,3	11,8
UK	31	100,6	9,4	31	104,4	5,9
Italy	169	95,8	3,7	168	103,3	7,9
Luxembourg	9	91,1	7,1			
Netherlands	367	94,7	10,5	326	102,5	13,2
New Zealand	612	103,5	3,0	612	97,5	2,8
Slovenia	35	94,2	7,5			
USA	671	100,6	12,0	652	104,4	13,4

Table 21. Genetic level for milking speed, Jersey. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australien	12	104,1	5,5
Canada	18	99,5	9,8
DNK/FIN/SWE	76	100,0	9,3
New Zealand	281	98,7	6,6
USA	19	100,1	9,1

International comparison for milking speed and temperament among most important countries show that:

- Red breeds: DNK/FIN/SWE has a higher genetic level for milking speed and temperament than Norway and Canada
- Holstein: DNK/FIN/SWE has similar level as other populations for milking speed and temperament.
- Jersey: Denmark has similar genetic level as New Zealand and USA

NTM for Nordic and foreign bulls

NTM index is calculated for all bulls (Nordic and others) that have official breeding values (NAV breeding values or international EBVs) for yield, udder health and conformation.

Interbull NTM is calculated by weighing the Interbull / NAV breeding values for yield, female fertility, calving (maternal and direct), udder health, longevity, feet&legs, udder, milking speed and temperament. The same economic weight factors are used as for NAV breeding values.

Rules for calculation of NTM based partly or entirely on international breeding values are stated below in order of priority.

1. Bull has NAV breeding value for a trait

If the bull has NAV breeding value for a specific trait, this is used in the calculation of NTM - no matter if the bull also has international breeding value for that trait.

2. Bull has no NAV breeding value, but has an international breeding value for a trait

If the bull does not have NAV breeding value for the trait, the international breeding value is used, provided that Interbull calculates international breeding values for that trait and the bull comes from a country which provides data for that trait.

3. Bull has no NAV or no international breeding value for a trait

For traits where no Interbull EBV is available or the bull has no Interbull EBV, and at the same time it is not tested in the Nordic countries, a pedigree index is used. Pedigree index is calculated as $\frac{1}{2} (EBV_{\text{sire}} - 100) + \frac{1}{4} (EBV_{\text{maternal grand sire}} - 100) + 100$. The contributions from the sire and maternal grand sire can be based on either NAV breeding values or international breeding values. If EBV_{sire} or $EBV_{\text{maternal grand sire}}$ are unofficial the pedigree index is set to 100.

Publication rules for NTM

All foreign and Nordic bulls that have Interbull breeding values for yield, udder health and udder get a public Interbull NTM. This NTM is calculated with a lower reliability than an NTM for Nordic proven bulls, where information for all traits is always available.

Genetic level for Interbull NTM

In tables 22-24 genetic level for Interbull NTM for Jersey, Red breeds and Holstein are shown. Bulls included are born in 2016 or later.

Table 22. Genetic level for NTM, Red breeds. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Canada	15	-19,0	9,2
Germany	5	11,0	7,6
DNK/FIN/SWE	161	7,6	9,9
UK	5	-26,4	10,1
Norway	96	-6,4	9,7

Table 23. Genetic level for NTM, Holstein. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	9	2,3	9,1
Belgium	12	3,8	7,8
Canada	241	6,6	12,1
Switzerland	60	-5,7	9,9
Czech Republic	32	4,8	8,1
Germany	512	6,6	9,2
DNK/FIN/SWE	241	9,4	8,4
Spain	62	0,0	7,9
Estonia	5	-17,2	12,2
France	236	2,4	8,5
UK	28	7,4	7,7
Italy	177	3,4	8,7
Japan	30	1,8	6,7
Luxembourg	8	8,6	5,4
Netherlands	363	6,0	9,9
Poland	95	-0,4	7,7
Slovenia	28	-14,8	6,7
USA	988	9,4	9,9

Table 24. Genetic level for NTM, Jersey. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
DNK/FIN/SWE	74	8,8	7,3
USA	33	-6,4	6,8

International comparison of NTM among most important populations shows that:

- Red breeds: DNK/FIN/SWE is better than Canada and Norway
- Holstein: DNK/FIN/SWE and USA have the highest level
- Jersey: Denmark's average NTM is more than 15 index points better than USA

Changes since last run

In the evaluation in August 2023 the following changes are done compared to April 2022 evaluation. Only changes in major countries:

Yield

- Norway (RDC) have decrease in information due to the rolling definition of Herd x year x season
- New Zealand (JER) have decrease in information due to the parentage testing and some records changes

Fertility

- USA (HOL) have decrease in information due to the pedigree correction and heard-year minimum edits
- New Zealand (JER) have decrease in information due to continuous DNA parentage testing and some update in phenotype records

Calving

- USA (HOL) have decrease in information due to pedigree correction and heard-year minimum edits

Conformation

- USA (HOL) have decrease in information due to pedigree verification
- Netherlands (HOL) have drop in information due to change in reliability calculation
- New Zealand (JER) drop in information due to the pedigree correction, parentage testing and record changes

Udder health

- Norway (RDC) have decrease in information due to the rolling definition of Herd x year x season
- New Zealand (JER) have decrease in information due to the continuous parentage verification and some phenotypic records updates

Longevity

- Denmark/Sweden/Finland have small decrease in information due to change in Herd x year x season definition
- USA (HOL) have Decrease in information due to the pedigree correction and heard-year minimum edits
- New Zealand (JER) have decrease in information due to continuous parentage verification and some phenotypic records updates

Milking speed and temperament

- New Zealand (JER) have decrease in information due to continuous parentage verification and phenotype records updates
- Netherlands (HOL) have drop in information due to change in reliability calculation
- Italy (HOL) have drop in information due to one year cut-off data

Genomic tested young Holstein bulls

In the tables below, only Holstein sires that have breeding values based on genomic information and no daughters is shown.

Averages are only shown for countries with more than 20 bulls.

Yield

In tables 25 is a comparison of the genetic level of yield for bulls from different countries.

Table 25. Genetic level for yield traits, Holstein. Bulls born in 2020 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	68	100,1	110,7	104,1	107,5	7,3
Belgium	13	112,9	120,8	115,4	118,0	5,8
Canada	427	110,9	122,9	113,8	118,0	10,6
Switzerland	20	103,4	106,6	104,1	105,2	9,8
Czech Republic	40	114,5	115,5	114,7	115,1	5,5
Germany	537	116,1	116,2	118,2	117,8	7,1
DNK/FIN/SWE	123	99,7	121,3	114,4	120,1	6,5
Spain	79	114,2	110,8	112,1	111,2	9,4
France	408	109,2	110,0	112,3	112,0	7,2
UK	35	103,7	118,3	109,6	114,2	20,5
Hungary	12	113,0	106,7	106,3	105,1	6,8
Italy	95	113,3	115,4	116,6	116,7	7,4
Netherlands	344	109,6	117,4	115,2	117,2	8,0
Poland	6	72,2	91,3	85,2	90,2	9,3
USA	67	111,6	113,2	114,2	114,2	6,1

International comparison for yield shows that DNK/FIN/SWE, has same genetic level as other major countries

Conformation

The international genetic evaluation is done for 16 linear traits for Holstein. In addition, frame condition score and locomotion are included in this trait group.

Calculation of frame, feet&legs and udder follows same principles as for daughter proven bulls.

In tables 26 is a comparison of genetic level of composite conformation traits for bulls from different countries.

Table 26. Genetic level of conformation traits, Holstein. Bulls born in 2020 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	20	109,9	12,7	99,7	4,9	111,7	8,4
Belgium	13	113,0	8,3	107,0	5,4	111,8	8,2
Canada	427	115,1	12,0	100,1	4,9	111,1	9,1
Switzerland	20	123,3	8,6	101,9	3,4	122,1	7,3
Czech Republic	40	110,9	6,1	100,6	4,5	105,7	8,3
Germany	537	109,9	8,9	104,2	4,8	111,9	7,9
DNK/FIN/SWE	123	104,2	9,9	102,7	4,7	110,2	7,2
Spain	79	113,7	10,2	104,6	4,5	115,5	9,0
France	408	117,5	8,9	105,0	4,2	118,4	8,0
UK	35	102,6	11,6	97,9	3,0	97,7	15,0
Hungary	12	109,5	6,1	98,3	4,3	105,3	5,8
Italy	95	114,1	8,3	100,7	4,2	111,8	7,3
Netherlands	344	109,9	8,7	107,1	7,4	106,6	8,0
Poland	67	114,3	7,4	102,2	3,7	110,5	9,2
USA	1517	107,2	9,7	98,3	4,5	104,1	7,6

International comparison for conformation traits among most important populations shows that DNK/FIN/SWE has lower genetic level for frame than most other populations. For feet&legs and udder there are only small differences between populations.

Somatic cell count and udder health

In tables 27 is a comparison of genetic level of udder health for bulls from different countries.

Table 27. Genetic level for udder health, Holstein. Bulls born in 2020 or later.

Country	No. of bulls	Average	STD
Australia	18	98,6	2,5
Belgium	13	101,1	4,8
Canada	427	99,0	4,9
Switzerland	20	100,0	5,0
Czech Republic	29	97,9	5,9
Germany	535	102,4	5,9
DNK/FIN/SWE	121	104,5	5,7
Spain	79	103,5	7,2
France	405	107,5	6,1
UK	35	98,7	4,9
Hungary	12	92,1	4,9
Italy	95	103,3	6,5
Netherlands	344	101,6	5,5
Poland	67	105,6	6,6
USA	1517	99,8	5,0

International comparison for udder health among most important populations show that DNK/FIN/SWE and France have higher genetic level than other major European and North American populations

Longevity

In tables 28 is a comparison of genetic level of longevity for bulls from different countries.

Table 28. Genetic level for longevity, Holstein. Bulls born in 2020 or later.

Country	No. of bulls	Average	STD
Australia	20	104,2	6,5
Belgium	13	107,1	6,6
Canada	427	106,7	6,2
Switzerland	20	102,3	7,3
Czech Republic	30	106,5	4,5
Germany	537	113,5	5,7
DNK/FIN/SWE	123	111,5	5,6
Spain	79	109,1	8,2
France	409	109,5	5,4
UK	35	105,6	9,2
Hungary	12	101,2	6,3
Italy	95	108,0	5,5
Netherlands	344	110,3	6,3
Poland	61	108,8	5,0
USA	1523	108,8	4,7

International comparison for longevity among most important populations shows that DNK/FIN/SWE and Germany has the highest level

Calving – maternal and direct

In Tables 29 the average genetic level for bulls is shown for different countries.

Table 29. Genetic level for calving, maternal and calving, direct, HOL. Bulls born in 2020 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	20	99,9	4,2	19	103,7	3,7
Belgium	11	98,5	4,9	13	102,8	4,5
Canada	420	99,6	4,6	427	102,7	5,0
Switzerland	19	97,6	4,4	20	102,4	4,9
Czech Republic	29	98,8	4,2	29	102,3	4,2
Germany	525	100,2	4,0	537	101,8	5,2
DNK/FIN/SWE	118	100,5	4,2	123	101,6	4,5
Spain	79	99,5	4,7	79	99,6	5,2
France	405	98,4	3,9	405	101,5	4,9
UK	34	102,3	3,2	33	103,1	5,4
Hungary	12	97,6	3,3	12	100,0	2,4
Italy	95	99,5	3,8	95	101,5	3,8
Netherlands	328	101,3	4,0	344	101,3	5,0
Poland	67	97,2	4,3	67	101,3	5,1
USA	1462	101,4	3,6	1517	104,4	3,9

International comparison for calving (direct and maternal) shows that DNK/FIN/SWE, has nearly similar level as other major countries

Female fertility

In Tables 30 the average genetic level for bulls is shown for different countries.

Table 30. Genetic level for female fertility, Holstein. Bulls born in 2020 or later.

Country	No. of bulls	Average	STD
Australia	20	103,1	5,7
Belgium	13	98,4	7,9
Canada	427	97,4	6,6
Switzerland	20	98,1	8,3
Czech Republic	29	97,3	7,0
Germany	537	102,2	6,4
DNK/FIN/SWE	123	106,4	6,9
Spain	79	100,4	7,8
France	405	102,7	6,4
UK	35	101,9	5,5
Italy	95	100,9	6,0
Netherlands	344	99,7	7,5
Poland	61	100,6	5,5
USA	1523	100,9	5,2

International comparison for female fertility among most important populations shows that DNK/FIN/SWE is in the top.

Milking speed and temperament

In Tables 31, the genetic level for bulls from different countries.

Table 31. Genetic level for milking speed and temperament, Holstein. Bulls born in 2020 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	18	104,5	9,5	16	106,4	2,3
Belgium	13	97,5	4,6	10	102,1	6,5
Canada	427	99,7	5,5	404	105,5	8,7
Switzerland	20	102,7	4,6	6	102,5	1,1
Czech Republic	29	99,2	8,5			
Germany	537	98,3	4,9	530	104,5	8,1
DNK/FIN/SWE	123	102,8	2,1	122	104,1	3,2
Spain	79	96,5	2,5	72	103,0	0,9
France	408	95,3	2,9	402	105,3	3,2
UK	32	99,0	4,4	29	104,7	1,0
Italy	95	95,8	8,3	94	104,4	5,4
Netherlands	344	97,0	4,5	342	103,4	11,1
Poland	67	93,6	14,3	61	103,0	1,5
USA	1494	100,6	3,5	1437	104,4	4,1

For milking speed DNK/FIN/SWE are among the countries with the highest genetic level. For temperament there are only small differences between populations.

Changes since last run

In the evaluation in August 2023 the following changes are done compared to April 2023 evaluation:

Yield:

- Italy have decrease in reliability due to changes in bull population

Fertility:

- Italy have decrease in reliability due to changes in bull population

Calving:

- Italy have decrease in reliability due to changes in bull population

Conformation:

- Denmark/Sweden/Finland have decrease in reliability for ANG due to a number of foreign bulls failing to meet requirements
- Italy have decrease in reliability due to changes in bull population
- Germany have some bulls affected by changed or added information in relatives

Udder health:

- Italy have decrease in reliability due to changes in bull population
- Germany have some bulls affected by changed or added information in relatives

Longevity:

- Italy have decrease in reliability due to changes in bull population

Milking speed and temperament:

- Italy have base change
- Germany have some bulls affected by changed or added information in relatives

Dates of publication of Interbull breeding values in 2023:

Month	Date
August	8
December	7

The indices can be found at the national databases in Denmark, Sweden, and Finland 2-3 days after they have been published by Interbull.

Regards

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