INTERBULL breeding values calculated April 2024

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 2th April 2024

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 2017 or later, that have more than 60 daughters in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2017 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	8	92,5	87,1	84,0	83,6	13,1
Canada	12	91,8	90,7	86,3	87,3	8,3
Germany	8	101,4	103,8	101,8	103	6,4
DNK/FIN/SWE	129	100,6	105,2	104,9	106,2	8,2
UK	9	84,4	78,3	72,9	72,9	17,4
Norway	103	98,7	94,0	96,1	94,3	9,4
New Zealand	10	89,6	90,0	84,9	86,5	10,9

Table 3. Genetic level for yield traits, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	42	97,7	104	99,8	102,7	10,3
Belgium	17	102,2	106,9	104,3	106,2	8,4
Canada	310	107,9	111,0	108,1	109,8	11,9
Switzerland	66	97,3	98,4	96,7	97,5	10,1
Czech Republic	39	109,2	108,0	106,5	106,7	9,7
Germany	560	111,5	106,4	110,1	107,8	9,1
DNK/FIN/SWE	201	100,4	103,1	103,7	104,2	8,4
Spain	48	112,0	103,9	105,2	102,8	7,9
Estonia	7	95,7	91,1	90,7	89,6	9,1
France	238	105,5	103,0	105,5	104,1	8,0
UK	39	99,7	109,6	102,2	106,9	8,5
Israel	92	99,0	100,5	98,3	99,5	6,6
Italy	145	106,4	105,8	106,9	106,4	8,6
Japan	15	110,7	107,6	106,7	106,3	7,9
Luxembourg	11	112,9	110,5	109,8	109,5	7,3
Netherlands	394	104,9	106,4	106,1	106,6	9,2
New Zealand	571	74,7	92,9	85,1	92,1	6,6
Poland	80	107,4	104,7	106,2	105,2	7,5
Slovenia	18	98,3	90,4	90,7	88,6	8,1
USA	1859	108,1	113,6	108,1	111,1	9,9

Table 4. Genetic level for yield traits, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	19	104,7	89,9	97,3	90,3	5,4
Canada	15	108,5	93,8	100,8	94,0	13,8
DNK/FIN/SWE	65	103,1	106,0	106,4	107,2	8,3
New Zealand	310	97,8	93,9	97,6	95,2	7,4
USA	300	114,6	101,4	109,3	102,6	11,5

International comparison for yield among most important populations shows that:

- Red breeds: DNK/FIN/SWE have higher genetic level than Norway and Canada
- Holstein: USA has the highest genetic level while DNK/FIN/SWE has average 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 2017 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	21	104,0	6,6	103,6	5,0	102,3	8,2
Germany	10	105,8	12,0	106,4	5,3	106,4	7,4
DNK/FIN/SWE	134	97,8	9,9	101,2	4,9	100,9	8,1
UK	8	102,4	7,9			95,5	9,5
Norway	75	102,6	13,2	99,1	5,7	85,5	9,4

Table 6. Genetic level of conformation traits, Holstein. Bulls born in 2017 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	18	118	14,1	99,7	5,8	109,2	15,3
Belgium	16	112,1	12,7	105,8	6,9	106,4	7,7
Canada	270	114,4	11,0	97,5	6,0	112,2	9,4
Switzerland	78	109,3	9,3	98,6	5,2	110,1	9,4
Czech Republic	44	109,8	10,0	99,6	4,5	103,6	8,4
Germany	532	108,3	9,5	101,8	6,1	108,2	7,9
DNK/FIN/SWE	184	100,6	10,4	101,3	6,0	105,2	8,6
Spain	53	113,9	8,8	102,1	6,8	108,2	8,9
Estonia	8	105,0	8,3	99,4	3,9	95,0	11,2
France	217	117,8	9,8	102,6	6,1	112,1	9,2
UK	26	103,9	12,1	98,0	3,7	104,3	7,6
Italy	139	113,3	11,1	99,8	5,4	107,6	9,3
Japan	230	112,2	10,2	98,2	5,5	103,5	8,3
Luxembourg	9	111,0	7,4	101,6	4,4	103,3	10,0
Netherlands	328	108,2	9,8	105,4	7,3	104,2	9,3
New Zealand	576	83,1	8,8				
Poland	56	111,9	11,0	102,1	5,4	101,8	9,4
Slovenia	17	105,9	11,6	98,4	5,7	93,5	5,6
USA	1177	107,8	10,7	98,3	5,8	106,4	9,2

Table 7. Genetic level of conformation traits, Jersey. Bulls born in 2017 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	7	108,3	6,2	104,9	7,4	94,7	5,2
Canada	19	112,7	4,8	105,7	4,7	100,8	8,3
DNK/FIN/SWE	69	100,6	8,8	99,4	8,5	102,6	9,8
USA	211	112,8	8,1	102,8	6,6	101,7	8,6

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 lower genetic level for frame than the main Holstein populations. Canadas, 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 Netherlands has the highest level and there are small differences between populations. DNK/FIN/SWE has around average genetic level for udder, while Canada and France have 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 2017 or later.

Country	No. of bulls	Average	STD
Australia	13	95,5	6,5
Canada	7	92,9	7,0
DNK/FIN/SWE	144	100,6	8,8
UK	5	100,3	5,0
Norway	102	101,0	9,1
New Zealand	18	93,2	6,9

Table 9. Genetic level for udder health, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	53	96,4	7,2
Belgium	14	99,9	8,9
Canada	172	98,8	8,6
Switzerland	25	100,0	8,0
Czech Republic	44	96,6	7,1
Germany	389	100,2	7,1
DNK/FIN/SWE	166	101,3	7,4
Spain	60	100,5	8,1
Estonia	9	99,0	9,2
France	200	101,9	6,6
UK	25	98,3	7,3
Israel	96	100,6	7,9
Italy	135	99,6	8,2
Japan	169	93,9	7,2
Korea	6	96,4	4,3
Luxembourg	6	98,5	7,1
Netherlands	238	100,3	7,3
New Zealand	582	93,4	6,8
Poland	87	99,9	9,0
Slovenia	22	97,8	7,7
USA	1013	99,2	8,3

Table 10. Genetic level for udder health, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	23	94,1	5,5
Canada	10	85,3	10,4
DNK/FIN/SWE	46	101,3	8,2
New Zealand	328	95,6	6,5
USA	100	85,4	9,5

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 has similar or higher genetic level than other major European populations, USA and Canada
- Jersey: Denmark is substantially better than the other populations.

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 2016 or later.

Country	No. of bulls	Average	STD
Australia	5	87,1	6,8
Canada	30	86,4	11,7
Germany	10	97,4	7,2
DNK/FIN/SWE	133	102,1	8,1
UK	9	80,4	5,7
Norge	120	91,5	7,3
USA	8	76,9	7,5

Table 12. Genetic level for longevity, Holstein. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	33	93,4	9,4
Austria	6	101,6	8,7
Belgium	17	103,0	7,0
Canada	415	101,7	8,9
Switzerland	100	95,3	8,3
Czech Republic	44	105,9	5,8
Germany	773	104,6	8,1
DNK/FIN/SWE	213	103,3	7,8
Spain	22	97,2	6,4
France	262	98,9	7,7
UK	33	97,7	14,2
Israel	127	93,0	5,8
Italy	141	99,1	7,1
Luxembourg	13	103,4	8,4
Netherlands	541	103,1	8,8
New Zealand	542	86,5	5,3
Poland	133	101,2	7,7
Slovenia	42	92,3	5,2
USA	2211	103,9	8,8

Table 13. Genetic level for longevity, Jersey. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	16	96,5	7,4
Canada	20	94,8	8,1
DNK/FIN/SWE	66	101,4	6,6
New Zealand	126	91,3	4,9
USA	374	99,4	7,7

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 the highest genetic level

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 2017 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 2017 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	20	93,3	6,2	8	98,1	7,6
DNK/FIN/SWE	130	101,0	6,7	108	99,9	6,4
Norway	100	99,5	8,1	102	92,2	7,1

Table 15. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2017 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	60	97,7	4,9	4	95,0	3,7
Belgium	17	98,9	5,1	17	100,6	5,5
Canada	335	98,6	5,6	260	102,3	4,6
Switzerland	88	96,9	5,4	62	100,4	7,6
Germany	636	99,1	5,9	569	100,8	6,2
DNK/FIN/SWE	206	100,9	5,7	201	102,1	6,1
Spain	34	97,5	3,8	8	102,0	4,1
France	275	97,1	6,1	245	105,2	7,5
UK	40	100,3	3,8	19	101,9	3,3
Israel	51	96,6	4,0	104	91,7	5,4
Italy	144	97,6	4,7	94	101,2	4,9
Luxembourg	13	96,6	4,1	10	101,2	7,2
Netherlands	400	99,4	5,7	350	99,0	6,9
Poland	96	97,2	4,3	84	97,7	6,3
USA	1996	100,4	5,1	1402	103,1	4,8

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 around the average 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 2017 or later.

Country	No. of bulls	Average	STD
Australia	7	96,6	9,4
Canada	12	95,4	6,8
Germany	8	94,5	8,4
DNK/FIN/SWE	119	99,9	9,8
UK	8	93,8	4,0
Norway	76	112,4	7,0
New Zealand	7	96,9	6,8

Table 17. Genetic level for female fertility, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	34	97,4	7,2
Belgium	17	92,5	6,9
Canada	296	96,7	8,5
Switzerland	66	95,5	4,0
Czech Republic	35	96,9	2,9
Germany	473	98,0	9,3
DNK/FIN/SWE	198	104,5	10,2
Spain	15	92,1	5,3
France	181	98,0	8,1
UK	25	102,2	6,9
Israel	91	96,7	2,6
Italy	120	96,7	8,7
Japan	15	93,5	5,0
Luxembourg	10	96,5	11,2
Netherlands	359	95,6	8,8
New Zealand	379	99,8	4,6
Poland	47	90,5	6,9
USA	1774	97,1	8,8

Table 18. Genetic level for female fertility, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	15	89,9	9,4
Canada	14	86,9	9,1
DNK/FIN/SWE	78	101,5	13,0
New Zealand	178	98,9	6,3
USA	273	89,0	10,0

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 higher genetic level than all other populations
- 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 2017 or later are shown for Holstein, Red breeds and Jersey.

Table 19. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2017 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	18	90,2	15,1	18	94,6	14,3
Germany	6	103,1	2,3	10	104,2	4,0
DNK/FIN/SWE	146	98,8	9,1	108	101,0	12,0
Norway	94	93,4	4,5	88	99,0	6,2

Table 20. Genetic level for milking speed and temperament, Holstein. Bulls born in 2017 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	25	103,0	9,3	25	105	9,6
Belgium	13	89,9	7,7	12	104,2	10,8
Canada	221	98,3	11,2	218	104,0	12,6
Switzerland	80	98,1	10,0	79	102,5	9,5
Germany	412	96,9	9,5	321	101,2	14,7
DNK/FIN/SWE	189	101,0	8,7	142	100,8	16,8
France	223	95,1	10,2	221	103,7	11,5
UK	29	101,3	9,8	29	104,3	6,5
Italy	110	95,6	4,0	110	102,8	8,4
Luxembourg	7	90,7	5,6			
Netherlands	295	94,2	10,9	262	102,6	13,3
New Zealand	580	103,4	2,8	580	97,7	2,2
Slovenia	25	95,6	7,8			
USA	540	99,6	12,4	525	103,6	12,8

Table 21. Genetic level for milking speed, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australien	15	103	10,8
Canada	18	99,7	7,9
DNK/FIN/SWE	63	101,0	9,8
New Zealand	296	98,1	6,9
USA	14	101,9	10,1

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 ½ (EBV_{sire} -100) +1/4 ($EBV_{maternal\ grand\ sire}$-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 $EBV_{maternal\ grand\ sire}$ 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 2017 or later.

Table 22. Genetic level for NTM, Red breeds. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Canada	10	-19,2	14,0
Germany	8	4,5	6,0
DNK/FIN/SWE	126	9,5	8,9
UK	5	-37,0	4,8
Norway	78	-7,4	9,0

Table 23. Genetic level for NTM, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	15	1,0	11,0
Belgium	14	6,4	8,3
Canada	206	7,7	12,2
Switzerland	52	-4,1	11,3
Czech Republic	39	4,4	8,7
Germany	417	8,2	8,5
DNK/FIN/SWE	196	9,5	7,7
Spain	46	1,4	7,4
Estonia	6	-16,8	11,8
France	212	5,4	8,3
UK	23	9,9	7,1
Italy	133	4,9	8,5
Japan	15	2,4	6,9
Luxembourg	6	9,2	8,4
Netherlands	281	6,7	9,1
Poland	66	-0,5	8,4
Slovenia	18	-15,7	8,5
USA	947	9,5	10,0

Table 24. Genetic level for NTM, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Canada	5	-8,8	12,6
DNK/FIN/SWE	64	8,9	8,2
USA	11	-6,7	10,1

International comparison of NTM among most important populations shows that:

- Red breeds: DNK/FIN/SWE is better NTM than Canada and Norway
- Holstein: DNK/FIN/SWE, UK and USA have the highest level and are closed followed by the major European populations.
- Jersey: Denmark's average NTM is more than 15 index points better than USA

Changes since last run

In the evaluation in April 2024 the following changes are done compared to December 2024 evaluation. Only changes in major countries:

Yield

- USA (ALL), has decrease in information due to the pedigree correction and herd-year minimum edits.
- Netherlands (ALL) has base change and minor update of the EDC calculation. Too many data were provided for the January test run, the error has been corrected resulting in drops of information especially for HOL.
- France, Germany and Canada (ALL) have base change.
- New Zealand (ALL) has drop in information due to the DNA parentage testing.
- Italy (HOL) has base change and drop in information due to the yearly data cut-off for phenotypes.

- Denmark, Finland, Sweden (RDC) has improved handling of Finnish AMS data. Finnish HOL discarded from RDC model. Update of genetic parameters/heritability.

Fertility
- USA (ALL) has removed separate groups for unknown foreign parents because most such animals are now from countries with no domestic U.S. descendants. Drop in information due to the pedigree correction and herd-year minimum edits.
- Netherlands (ALL) has base change. Too many data were provided for the January test run, the error has been corrected resulting in drops of information especially for HOL.
- Germany (ALL) has base change and HOL has drop in information causing some bulls to drops below the required threshold of 10 herds
- France and Canada (ALL) have base change
- New Zealand (ALL) has drop in information due to the DNA parentage testing.
- Italy (HOL) has change in statistical model/new variance components and data editing (stricter criteria). Change in trait definition of cc1, from "non return rate at 56 days" to "conception rate at first service". Change in trait definition of hco. Base change. Drop in information due to the yearly data cut-off for phenotypes

Calving
- USA (ALL) has removed separate groups for unknown foreign parents because most such animals are now from countries with no domestic U.S. descendants. HOL has decrease in information due to the pedigree correction and herd-year minimum edits
- Netherlands (ALL) has base change and update of genetic correlations.
- Germany (ALL) has base change. For HOL, drop in information causing some bulls to drops below the required threshold of 10 herds
- Canada (ALL) has base change
- New Zealand (ALL) has drop in information due to changes in pedigree due to DNA parentage testing
- Italy (HOL) has base change and applied a one-year cut-off of data

Conformation
- Netherlands, France, Germany and Canada (ALL) have base change
- New Zealand (ALL) has drop in information due to changes in pedigree due to DNA parentage testing
- USA (HOL) has decrease in information due to the ongoing parentage checks an correction.
- USA (RDC,JER) has removed separate groups for unknown foreign parents because most such animals are now from countries with no domestic U.S. descendants.
- Italy (HOL) has base change and drop in information due to the yearly data cut-off for phenotypes

Udder health
- USA (ALL) For both Somatic cell and udder health traits all breeds: Separate groups for unknown foreign parents were removed because most such animals are now from countries with no domestic U.S. descendants. In addition, for trait mas for JER and HOL: New VC estimated, affecting overall heritabilities and repeatability. Weights applied were updated from 0/1 to value estimated from VC, and used to standardize genetic variance across differing parities that have different heritabilities. Decrease in information due to the pedigree correction and herd-year minimum edits for RDC and JER breeds.
- Netherlands (ALL) has base change and minor update of the EDC calculation.
- Germany (ALL) has base change and for HOL, drop in information causing some bulls to drops below the required threshold of 10 herds
- France and Canada (ALL) have base change

- Italy (HOL) has base change and drop in information due to the yearly data cut-off for phenotypes.

Longevity
- USA (ALL) has removed separate groups for unknown foreign parents because most such animals are now from countries with no domestic U.S. descendants. HOL has decrease in information due to the pedigree correction and herd-year minimum edits.
- Netherland, France, Germany and Canada (ALL) have base change
- Italy (HOL) has base change. Drop in information due to the yearly data cut-off for phenotypes

Milking speed and temperament
- USA (ALL) has removed separate groups for unknown foreign parents because most such animals are now from countries with no domestic U.S. descendants.
- Netherlands and Germany (ALL) have base change
- New Zealand (ALL) has drop in information due to the DNA parentage testing.
- Canada (HOL,RDC) has base change
- France (HOL) has base change
- Italy (HOL) has base change. Drop in information due to the yearly data cut-off for phenotypes.

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 2021 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	100	98,8	108,0	102,2	106,3	8,8
Belgium	19	110,9	118,1	113,0	116,2	6,6
Brasilia	8	112,5	117,5	110,4	113,9	5,9
Canada	601	109,6	120,6	112,1	117,4	11,6
Switzerland	24	101,9	105,4	102,5	104,4	9,8
Czech Republic	54	114,6	116,0	114,6	115,4	5,8
Germany	705	115,4	115,1	116,8	116,3	7,5
DNK/FIN/SWE	156	99,1	118,8	112,4	119,3	8,2
Spain	104	112,2	108,7	109,7	108,6	9,7
France	571	108,5	108,8	111,4	110,7	7,8
UK	58	105,6	122,5	112,7	119,8	17,1
Hungary	29	110,9	107,1	106,0	105,4	7,4
Italy	128	112,6	114,4	115,8	115,8	8,5
Netherlands	542	109,0	115,6	113,9	116,1	7,9
New Zealand	9	72,0	93,7	85,3	93,4	6,4
Poland	88	111,6	111,7	113,7	113,2	7,6
USA	2261	111,3	124,9	115,8	121,9	7,3

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 2021 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	12	110,7	9,6	101,1	4,4	109,3	8,6
Belgium	6	106,7	11,9	104,7	6,8	108,2	8,0
Canada	349	116,6	11,4	100,3	5,2	111,5	8,5
Switzerland	5	123,8	6,5	102,6	2,6	119,6	5,0
Czech Republic	22	112,9	7,0	101,5	5,9	107,6	8,0
Germany	362	110,4	9,3	103,7	4,9	111,3	7,8
DNK/FIN/SWE	85	105,6	13,1	102,1	5,0	109,1	8,1
Spain	55	116,1	11,3	103,4	4,9	117,7	8,9
France	306	117,6	8,6	105,8	4,5	117,8	8,5
UK	34	106,9	10,1	99,7	3,0	104,0	10,4
Hungary	12	108,3	8,5	101,8	4,4	100,1	5,6
Italy	66	115,5	8,4	101,5	3,5	111,8	9,1
Netherlands	247	109,9	9,0	107,6	7,2	107,5	8,2
Poland	47	114,9	7,1	101,8	4,6	112,9	9,0
USA	1186	106,9	9,3	98,1	4,6	103,9	8,0

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 there are only small differences between populations. For Udder France and Spain have the highest level while DNK/FIN/SWE is around average.

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 2021 or later.

Country	No. of bulls	Average	STD
Australia	7	97,0	5,6
Belgium	6	105,2	5,8
Canada	349	98,9	5,5
Switzerland	5	98,1	7,6
Czech Republic	14	99,6	6,1
Germany	374	103,2	5,8
DNK/FIN/SWE	86	104,4	5,7
Spain	55	104,0	8,4
France	288	107,5	5,9
UK	37	100,5	4,8
Hungary	12	94,5	5,5
Italy	66	101,7	6,0
Netherlands	247	102,3	6,5
Poland	47	105,0	6,7
USA	1218	100,1	4,8

International comparison for udder health among most important populations show that DNK/FIN/SWE is around average for the European populations while and North American populations have a lower level.

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 2021 or later.

Country	No. of bulls	Average	STD
Australia	12	101,1	7,2
Belgium	6	109,1	5,5
Canada	349	106,7	5,6
Switzerland	5	105,9	11,6
Czech Republic	14	105,0	4,9
Germany	375	114,5	5,5
DNK/FIN/SWE	86	110,6	6,0
Spain	55	108,7	9,3
France	312	110,3	5,8
UK	37	108,5	5,3
Hungary	12	101,2	3,4
Italy	66	108,2	5,7
Netherlands	248	110,4	7,2
Poland	47	107,4	4,8
USA	1218	109,1	4,5

International comparison for longevity among most important populations shows smaller difference between the major populations.

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 2021 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	12	99,3	2,9	12	98,8	4,6
Belgium	6	99,3	3,7	6	100,8	2,6
Canada	349	99,1	4,3	349	102,7	4,7
Switzerland	5	99,6	4,1	5	101,4	5,5
Czech Republic	14	98,8	4,3	14	103,4	3,7
Germany	375	100,8	3,8	362	103,6	5,2
DNK/FIN/SWE	86	100,4	4,0	85	102,7	4,6
Spain	55	98,3	4,9	55	99,5	5,1
France	288	98,4	4,0	282	102,3	4,4
UK	37	101,6	3,2	34	103,1	3,7
Hungary	12	99,3	4,4	12	101,0	3,0
Italy	66	100,0	3,3	66	102,8	3,8
Netherlands	247	100,5	3,6	247	101,0	5,0
Poland	47	97,0	4,4	47	100,9	4,0
USA	1211	101,1	3,3	1186	104,3	3,7

International comparison for calving (direct and maternal) shows that USA is best, and DNK/FIN/SWE has similar level as the 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 2021 or later.

Country	No. of bulls	Average	STD
Australia	12	99,3	5,7
Belgium	6	99,2	6,5
Canada	349	96,3	7,0
Switzerland	5	96,8	7,0
Czech Republic	14	98,5	6,2
Germany	362	102,3	6,1
DNK/FIN/SWE	85	105,2	7,3
Spain	55	98,8	8,2
France	282	101,9	6,7
UK	34	102,9	5,0
Italy	66	99,6	6,9
Netherlands	247	98,4	7,0
Poland	47	100,3	6,3
USA	1186	100,4	5,1

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 2021 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	12	99,8	14,6	6	101,7	2,8
Belgium	6	88,3	11,3			
Canada	332	99,2	4,4	295	104,2	9,0
Switzerland	5	99,7	2,2			
Czech Republic	13	98,6	8,6			
Germany	361	100,1	3,6	354	104,1	7,7
DNK/FIN/SWE	85	103,8	2,9	84	103,2	6,6
Spain	55	97,5	2,1	50	104,5	6,1
France	306	95,4	3,8	273	105,4	5,8
UK	33	102,3	6,4	32	104,0	1,1
Italy	66	95,0	8,5	62	102,8	5,9
Netherlands	244	99,2	6,8	241	103,0	11,0
Poland	47	93,7	9,3	45	102,2	7,9
USA	1084	101,5	6,0	1020	103,6	3,7

For milking speed DNK/FIN/SWE has the highest genetic level. For temperament are only small differences between populations.

Changes since last run
In the evaluation in April 2024 the following changes are done compared to December 2023 evaluation:

Yield:
- Canada has base change, changes in the genomic reference population affecting the SNP estimates, when many MACE proofs are replaced by domestic EBV that include only local progeny of these international bulls (dropping out the USA progeny data).
- Italy has base change and cut-off one year of data in line with MACE
- Germany, Netherland and France have base change

Fertility:
- Canada has base change, changes in the genomic reference population affecting the SNP estimates, when many MACE proofs are replaced by domestic EBV that include only local progeny of these international bulls (dropping out the USA progeny data).
- Italy has base change. Changes in model and trait definition for cc1 and hco in line with MACE changes. Stricter editing criteria applied, like in MACE. Cut-off one year of data in line with MACE
- Germany, Netherland and France have base change

Calving:
- Canada has base change, changes in the genomic reference population affecting the SNP estimates, when many MACE proofs are replaced by domestic EBV that include only local progeny of these international bulls (dropping out the USA progeny data).
- Germany, Netherland and France have base change

Conformation:
- Canada has base change, changes in the genomic reference population affecting the SNP estimates, when many MACE proofs are replaced by domestic EBV that include only local progeny of these international bulls (dropping out the USA progeny data).
- Germany has base change. The new definition of ANG (Rib structure) last year has made the genomic reference population much smaller for ANG than all the other conformation traits.
- Italy has base change and cut-off one year of data in line with MACE
- Netherland and France have base change

Udder health:
- Canada has base change, changes in the genomic reference population affecting the SNP estimates, when many MACE proofs are replaced by domestic EBV that include only local progeny of these international bulls (dropping out the USA progeny data).
- Italy has base change and cut-off one year of data in line with MACE
- Germany, Netherland and France have base change

Longevity:
- Canada has base change, changes in the genomic reference population affecting the SNP estimates, when many MACE proofs are replaced by domestic EBV that include only local progeny of these international bulls (dropping out the USA progeny data).
- Italy has base change and cut-off one year of data in line with MACE
- Germany, Netherland and France have base change

Milking speed and temperament:
- Canada has base change, changes in the genomic reference population affecting the SNP estimates, when many MACE proofs are replaced by domestic EBV that include only local progeny of these international bulls (dropping out the USA progeny data).

- Germany has base change. A lot of new data were added for temperament compared to other traits.
- Italy has base change and cut-off one year of data in line with MACE
- Netherland and France have base change

Dates of publication of Interbull breeding values in 2024:

Month	Date
April	2
August	13
December	3

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
Ulrik Sander Nielsen, Jakob Lykke Voergaard, Carolina Markey, Terhi Vahlsten and Martha Bo Almskou