INTERBULL breeding values calculated April 2021

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 6th April 2021

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 2014 or later, that have more than 60 daughters in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2014 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	10	93,6	94,9	88,1	90,5	13,8
Canada	26	95,0	93,6	90,1	90,7	7,6
Germany	8	100,1	106,4	100,5	103,9	11,9
DNK/FIN/SWE	181	100,2	102,5	103,4	103,7	7,8
Estonia	7	99,1	89,4	92,6	89,3	6,3
UK	6	77,7	78,0	72,8	74,5	12,0
Norway	108	96,9	96,9	97,6	97,5	9,0
New Zealand	13	91,7	95,2	87,7	90,9	9,8

Table 3. Genetic level for yield traits, Holstein. Bulls born in 2014 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	65	95,9	101,8	95,9	99,2	8,2
Belgium	20	105,0	107,7	105,4	106,8	7,8
Canada	439	108,7	109,0	106,2	107,1	9,3
Switzerland	78	96,6	100,8	96,7	99,1	9,2
Czech Republic	34	109,0	108,0	104,6	105,3	8,4
Germany	654	110,7	106,9	108,4	107,1	9,4
DNK/FIN/SWE	275	102,8	104,6	105,4	105,6	9,5
Spain	64	109,3	103,2	102,5	101,2	8,7
Estonia	20	102,3	96,6	96,3	94,8	5,4
France	296	104,2	102,4	103,6	102,8	8,6
UK	86	104,2	109,8	104,9	107,8	8,7
Ireland	109	75,7	90,2	82,7	88,6	9,0
Israel	108	99,9	105,2	100,6	103,4	7,1
Italy	338	105,7	104,3	103,9	103,7	8,1
Japan	47	109,2	107,0	105,7	105,6	7,6
Luxembourg	6	113,0	112,8	109,3	110,3	5,0
Netherlands	530	105,9	105,7	106,1	105,9	8,9
New Zealand	700	79,7	93,8	88,7	93,7	6,7
Poland	68	102,3	100,5	99,4	99,3	9,0
Slovenia	25	95,0	89,6	88,0	87,2	6,6
USA	2435	109,4	110,3	107,0	108,3	9,1

Table 4. Genetic level for yield traits, Jersey. Bulls born in 2014 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	24	105,1	91,5	99,5	92,5	5,5
Canada	14	108,8	92,9	102,3	94,3	17,1
DNK/FIN/SWE	76	103,3	106,3	106,8	107,4	8,7
New Zealand	308	99,1	92,9	98,6	94,7	7,5
USA	353	117,5	101,0	111,5	102,9	10,1

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, Italy, 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 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 2014 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	38	101,3	7,6	103,1	4,0	105,0	8,1
Germany	16	107,1	7,6	106,1	4,1	104,0	10,5
DNK/FIN/SWE	183	98,6	10,6	101,1	5,2	101,2	8,8
Norway	44	103,0	11,7	99,0	5,1	87,4	10,4

Table 6. Genetic level of conformation traits, Holstein. Bulls born in 2014 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	26	109,3	9,4	98,7	4,5	100,8	12,9
Belgium	19	115,3	14,0	103,6	4,3	108,1	9,9
Canada	335	117,8	10,7	100,3	5,7	114,0	9,6
Switzerland	100	112,8	9,3	99,8	5,1	108,9	9,5
Czech Republic	36	114,0	9,0	100,2	6,1	103,0	10,5
Germany	636	110,5	9,3	102,2	6,0	107,3	9,1
DNK/FIN/SWE	271	102,1	11,2	101,6	6,4	103,7	9,1
Spain	65	117,6	8,9	101,9	5,4	108,2	7,5
Estonia	20	108,8	8,3	98,5	4,9	90,2	9,9
France	243	117,3	10,4	102,4	5,9	109,9	8,8
UK	64	112,7	9,3	100,9	3,7	107,0	9,1
Ireland	45	89,0	11,0	96,3	4,7	78,6	12,1
Italy	337	114,4	10,3	101,1	5,6	107,6	8,8
Japan	266	114,6	9,3	100,6	5,5	104,9	8,8
Korea	7	106,6	9,0	100,9	3,8	102,3	5,0
Luxembourg	6	107,0	5,8	106,5	4,4	106,7	7,0
Netherlands	449	110,2	9,8	103,8	6,4	105,4	9,5
New Zealand	683	84,9	9,5				
Poland	57	111,9	8,2	99,1	4,8	97,2	6,6
Slovenia	23	103,8	8,8	100,0	4,1	93,5	10,2
USA	1298	112,6	10,3	99,6	5,7	110,4	8,9

Table 7. Genetic level of conformation traits, Jersey. Bulls born in 2014 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	9	109,6	4,9	101,1	7,6	91,2	8,6
Canada	20	112,7	7,3	105,2	5,5	101,7	8,1
DNK/FIN/SWE	84	100,3	9,1	100,3	7,1	101,5	8,5
USA	311	113,8	8,8	104,0	7,1	99,3	8,4

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

- Red breeds: Canada have generally higher genetic level for udder than 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 most other populations. North America, Spain, France and Italy have the highest genetic level for frame. Populations with grass based dairy farming like Ireland and 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 2014 or later.

Country	No. of bulls	Average	STD
Australia	15	97,1	8,3
Canada	12	100,9	8,9
DNK/FIN/SWE	210	100,5	8,9
Estonia	6	93,4	11,2
Norway	109	99,2	10,7
New Zealand	46	94,7	7,3

Table 9. Genetic level for udder health, Holstein. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Australia	97	94,3	7,4
Belgium	15	97,3	8,4
Canada	182	98,3	8,2
Switzerland	20	95,8	6,6
Czech Republic	36	97,8	7,8
Germany	442	98,8	7,6
DNK/FIN/SWE	263	101,7	7,7
Spain	71	95,9	8,4
Estonia	22	92,4	8,5
France	272	98,7	8,0
UK	48	97,7	6,5
Ireland	109	96,0	9,1
Israel	111	100,6	9,7
Italy	302	97,8	9,0
Japan	236	92,9	8,9
Korea	19	92,9	5,9
Luxembourg	6	104,5	5,3
Netherlands	280	99,5	7,7
New Zealand	721	93,0	7,2
Poland	77	96,0	9,3
Slovenia	26	95,9	5,7
USA	1200	98,2	8,7

Table 10. Genetic level for udder health, Jersey. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Australia	36	90,6	5,2
Canada	6	96,8	8,6
DNK/FIN/SWE	84	100,4	7,3
New Zealand	382	94,7	6,9
USA	190	85,3	8,6

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

- Red breeds: DNK/FIN/SWE has higher genetic level than 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 2013 or later.

Country	No. of bulls	Average	STD
Australia	8	87,9	13,8
Canada	42	92,6	8,1
Germany	22	94,6	7,4
DNK/FIN/SWE	191	101,8	8,4
UK	5	79,0	4,8
Norge	197	89,6	7,8
New Zealand	29	85,6	5,2
USA	6	77,7	16,1

Table 12. Genetic level for longevity, Holstein. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	67	89,3	7,8
Austria	7	92,0	8,9
Belgium	29	98,5	7,3
Canada	563	100,7	8,7
Switzerland	136	91,6	8,1
Czech Republic	42	104,9	7,5
Germany	973	101,5	8,9
DNK/FIN/SWE	370	103,0	8,4
Spain	109	97,7	7,1
France	352	95,2	7,9
UK	124	100,0	7,5
Hungary	7	97,2	9,1
Ireland	170	90,5	5,7
Israel	153	92,8	5,9
Italy	319	100,4	6,1
Luxembourg	10	101,2	9,0
Netherlands	856	100,4	8,9
New Zealand	764	89,6	6,0
Poland	153	94,3	8,5
Slovenia	40	91,5	8,6
USA	2832	104,8	8,5

Table 13. Genetic level for longevity, Jersey. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	25	91,5	6,9
Canada	15	88,0	9,0
DNK/FIN/SWE	83	100,3	7,7
UK	5	90,0	5,8
New Zealand	337	95,1	4,8
USA	539	96,1	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: France has the lowest level, while USA and DNK/FIN/SWE have the highest 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 2014 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 2014 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	38	95,4	6,9	22	99	5,7
DNK/FIN/SWE	172	101,3	7,2	177	100,3	6,3
Norway	108	100,1	7,3	108	90,6	7,0

Table 15. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2014 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	99	95,6	6,4	0		
Belgium	20	99,4	6,3	18	102,6	7,1
Canada	475	96,8	5,9	368	102,1	7,1
Switzerland	109	95,5	5,7	78	95,8	9,3
Germany	735	97,0	6,6	630	100,0	7,7
DNK/FIN/SWE	282	100,5	6,2	278	102,8	8,1
Spain	70	95,2	4,4	33	100,5	4,2
France	314	96,3	7,0	280	103,0	8,6
UK	87	98,8	5,1	27	102,2	5,1
Ireland	50	100,3	3,9	0		
Israel	42	97,6	5,8	113	94,4	6,5
Italy	342	95,0	6,5	103	101,5	6,1
Luxembourg	7	96,4	5,3	5	103,4	5,8
Netherlands	526	97,5	6,5	416	98,7	8,6
New Zealand	723	99,9	4,8	0		
USA	2596	98,5	5,6	1792	102,7	6,3

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 2014 or later.

Country	No. of bulls	Average	STD
Canada	25	97,8	8,9
Germany	8	94,0	9,7
DNK/FIN/SWE	170	100,3	8,5
UK	6	93,2	9,3
Norway	92	112,8	8,5
New Zealand	13	100,4	7,1

Table 17. Genetic level for female fertility, Holstein. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Australia	49	90,1	9,6
Belgium	19	94,4	7,0
Canada	414	96,6	8,6
Switzerland	75	94,6	4,3
Czech Republic	32	96,3	2,5
Germany	570	94,6	8,4
DNK/FIN/SWE	277	101,8	10,4
Spain	19	92,4	5,3
France	245	95,7	8,6
UK	67	100,1	7,4
Ireland	109	107,8	3,5
Israel	107	97,1	2,4
Italy	315	95,0	7,9
Japan	47	92,0	5,8
Luxembourg	8	98,6	3,9
Netherlands	460	95,7	8,8
New Zealand	700	98,8	4,6
Poland	28	93,0	5,4
USA	2324	97,7	9,0

Table 18. Genetic level for female fertility, Jersey. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Australia	22	92,2	9,0
Canada	14	88,6	8,4
DNK/FIN/SWE	91	101,3	11,3
New Zealand	308	97,0	5,7
USA	328	84,1	11,3

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. However, Ireland has the highest 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 2014 or later are shown for Holstein, Red breeds and Jersey.

Table 19. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2014 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	8	99,6	2,4	8	104,4	2,4
Canada	38	91,4	14,3	37	93,9	13,0
Germany	6	96,7	5,7	15	99,1	5,1
DNK/FIN/SWE	187	99,9	7,6	177	100,3	11,4
Norway	81	94,0	5,4	86	98,2	8,6
New Zealand	11	98,1	6,5	11	98,8	6,0

Table 20. Genetic level for milking speed and temperament, Holstein. Bulls born in 2014 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	59	103,6	3,6	59	103,1	4,1
Belgium	12	94,6	7,4	13	103,5	11,7
Canada	273	100,2	10,2	271	104,3	9,0
Switzerland	104	94,8	8,9	104	100,3	8,6
Germany	514	99,4	9,5	422	103,0	13,3
DNK/FIN/SWE	269	100,0	7,3	218	102,2	16,2
France	209	98,9	8,8	208	103,8	9,0
UK	69	100,6	12,1	67	104,9	9,3
Italy	310	100,0	9,3	310	104,3	7,4
Luxembourg	6	98,7	8,4			
Netherlands	356	96,3	11,4	348	103,0	10,7
New Zealand	704	103,7	3,8	704	97,6	2,6
Slovenia	29	96,2	7,7			
USA	559	101,9	11,3	536	106,0	10,2

Table 21. Genetic level for milking speed, Jersey. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Australien	22	97,4	10,2
Canada	17	93,8	6,9
DNK/FIN/SWE	86	99,6	10,3
New Zealand	331	98,9	6,4
USA	25	95,1	8,5

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 higher than 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 2014 or later.

Table 22. Genetic level for NTM, Red breeds. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Canada	16	-11,9	6,2
DNK/FIN/SWE	181	6,4	8,5
Norway	44	0,1	9,7

Table 23. Genetic level for NTM, Holstein. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Australia	23	-3,5	9,2
Belgium	17	6,7	7,4
Canada	207	5,5	10,2
Switzerland	50	-3,0	10,1
Czech Republic	34	2,8	7,2
Germany	460	5,3	8,2
DNK/FIN/SWE	267	9,0	8,5
Spain	64	-2,2	9,2
Estonia	20	-11,6	5,2
France	240	1,4	9,1
UK	61	8,0	7,3
Ireland	50	-11,6	8,3
Italy	301	0,8	8,6
Japan	47	0,6	8,7
Luxembourg	6	13,3	3,9
Netherlands	367	5,3	8,5
Poland	65	-6,6	9,9
Slovenia	25	-18,0	7,6
USA	1089	8,4	8,9

Table 24. Genetic level for NTM, Jersey. Bulls born in 2014 or later.

Country	No. of bulls	Average	STD
Australia	5	-11,6	8,6
Canada	5	-9,0	9,5
DNK/FIN/SWE	75	8,5	7,6
USA	166	-7,7	6,9

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 15 index points better than USA

Changes since last run

In the evaluation in April 2021 the following changes are done compared to December 2020 evaluation. Only changes in major countries:

Yield		**Change**					**Comment**
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
DFS	JER		X		X		
France	HOL	X					
Italy	HOL	X		X			
Germany	HOL	X			X	X	

Fertility		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
France	HOL	X					
DFS	ALL			X			
Holland	HOL					X	Send DO instead of CI
Germany	HOL	X				X	
New Zealand	JER		X	X			Parenting testing
Canada	HOL	X					

Calving		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
Holland	HOL					X	
Italy	HOL	X		X			
USA	HOL			X		X	
Germany	HOL	X		X		X	
New Zealand	JER		X	X			Parenting testing

Conformation		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
France	HOL	X					
DFS	ALL			X			
USA	HOL		X	X			
Italy	HOL	X		X			
Germany	HOL	X		X		X	
New Zealand	JER		X	X			Parenting testing
Canada	HOL	X					Update of heritability's

Udder health		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
Holland	HOL						Send Clinical mastitis instead of Udder health index
DFS	JER		X		X		
France	HOL	X					
USA	ALL			X			Large submission of new / corrected data
Italy	HOL	X		X			
Germany	HOL	X		X			
New Zealand	JER		X				Parenting testing
Canada	HOL	X					

Longevity		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
Norway	RDC					X	
DFS	JER		X		X		
France	HOL	X					
Italy	HOL	X		X			
Germany	HOL	X			X	X	
New Zealand	JER		X				Parenting testing
Canada	HOL	X					

Milking speed and temp.		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
Holland	HOL					X	
France	HOL	X					
New Zealand	JER		X				Parenting testing
Canada	HOL	X					

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 2018 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	7	113,3	119,1	116,0	117,9	3,5
Belgium	21	106,3	111,6	110,8	112,1	10,4
Brasil	5	117,6	112,4	115,8	114,2	5,0
Canada	341	111,4	123,3	115,2	119,2	8,0
Switzerland	11	103,5	105,9	104,9	105,5	6,8
Czech Republic	22	115,8	118,6	116,5	117,5	5,8
Germany	432	117,4	118,1	120,2	119,9	6,2
DNK/FIN/SWE	177	105,1	115,2	113,0	115,4	7,6
Spain	56	116,2	112,1	114,5	113,2	7,2
France	309	110,9	113,0	114,8	114,8	6,4
UK	31	106,4	120,2	111,2	115,8	18,9
Hungary	53	110,0	110,0	107,0	107,6	7,9
Italy	70	114,5	117,3	117,8	118,3	5,2
Netherlands	202	109,8	117,7	115,9	117,8	7,0
Poland	57	112,9	112,0	114,1	113,5	6,0
USA	977	113,4	124,5	116,4	120,2	6,4

International comparison for yield shows that DNK/FIN/SWE, has a little lower genetic level than 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 2018 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	7	107,4	5,1	100,4	2,6	110,9	4,3
Belgium	10	107,0	7,6	107,0	5,5	109,5	6,7
Brasil	5	104,0	5,8	96,8	6,4	107,6	5,0
Canada	341	113,2	10,3	100,4	4,1	112,9	9,6
Switzerland	11	114,2	5,0	101,3	2,8	117,8	8,4
Czech Republic	22	114,1	5,7	102,2	4,9	104,6	6,5
Germany	432	110,4	8,3	104,4	4,5	112,9	7,3
DNK/FIN/SWE	177	104,1	8,5	102,0	4,8	109	7,0
Spain	56	114,3	9,4	103,8	5,0	115,6	8,7
France	309	118,7	8,4	105,0	4,5	118,3	8,0
UK	31	102,7	13,0	99,7	4,3	101,8	14,1
Hungary	53	112,9	8,3	99,8	4,6	106,9	7,2
Italy	70	114,2	8,1	100,7	4,1	111,7	7,6
Netherlands	202	109,4	8,2	107,4	5,2	107,7	8,3
Poland	57	117,7	9,4	103,2	4,3	109,8	8,1
USA	977	107,1	9,5	99,6	4,2	106,9	9,0

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 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 2018 or later.

Country	No. of bulls	Average	STD
Australia	7	103,2	4,3
Belgium	10	106,1	3,9
Brasil	5	100,6	3,8
Canada	341	102,1	4,9
Switzerland	11	102,3	5,1
Czech Republic	10	98,3	7,3
Germany	432	103,4	6,2
DNK/FIN/SWE	177	105,3	6,1
Spain	56	103,5	7,7
France	308	108,7	5,9
UK	31	100,4	5,6
Hungary	42	97,1	7,0
Italy	70	102,6	5,4
Netherlands	200	104,0	5,7
Poland	57	102,0	5,9
USA	977	101,0	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 2018 or later.

Country	No. of bulls	Average	STD
Australia	7	105,7	6,8
Belgium	10	109,6	1,7
Brasil	5	105,4	3,8
Canada	341	108,5	4,9
Switzerland	11	104,1	6,4
Czech Republic	10	106,7	6,7
Germany	432	113,5	5,9
DNK/FIN/SWE	177	113,2	6,7
Spain	56	109,5	7,0
France	309	110,0	5,9
UK	31	107,1	7,8
Hungary	53	100,3	5,0
Italy	70	105,8	4,2
Netherlands	202	110,7	6,0
Poland	57	104,6	6,1
USA	977	109,1	4,7

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

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, Holstein. Bulls born in 2018 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	7	100,3	3,4	7	104,0	2,9
Belgium	21	98,9	5,0	10	104,3	5,3
Brasil	5	103,6	1,7	5	106,6	1,7
Canada	341	100,2	4,9	341	107,3	4,8
Switzerland	11	98,8	5,1	11	101,3	5,0
Czech Republic	10	103,0	5,5	10	103,6	5,8
Germany	432	101,0	4,9	432	103,4	6,0
DNK/FIN/SWE	176	100,8	4,6	177	104,8	4,8
Spain	56	98,2	5,6	50	102,6	5,7
France	308	97,8	4,6	307	103,8	5,3
UK	31	102,8	4,2	30	104,8	7,0
Hungary	53	97,5	3,4	53	101,7	3,7
Italy	70	98,8	5,2	70	104,4	3,8
Netherlands	202	102,0	4,9	202	103,0	5,9
Poland	57	96,1	4,3	57	101,0	6,5
USA	972	101,7	4,0	977	107,0	4,1

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 2018 or later.

Country	No. of bulls	Average	STD
Australia	7	101,1	4,0
Belgium	21	97,8	6,3
Brasil	5	102,2	5,2
Canada	341	101,6	6,6
Switzerland	11	103,6	9,7
Czech Republic	10	96,9	6,6
Germany	432	100,5	7,1
DNK/FIN/SWE	177	107,0	7,1
Spain	56	99,8	7,9
France	308	100,0	6,4
UK	31	104,0	8,3
Hungary	12	96,9	5,0
Italy	70	99,7	5,9
Netherlands	202	99,0	6,4
Poland	57	97,0	7,3
USA	977	101,2	6,0

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 2018 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	7	99,0	0,5	5	103,7	0,8
Belgium	10	99,3	1,6	10	105,7	5,8
Brasil	5	97,1	0,4			
Canada	341	100,8	2,6	316	104,7	5,0
Switzerland	11	96,7	2,3			
Czech Republic	10	102,1	3,6			
Germany	431	98,6	4,1	428	105,7	8,8
DNK/FIN/SWE	177	102,1	2,4	177	105,8	4,0
Spain	56	95,3	8,5	49	105,5	4,6
France	309	96,1	2,7	301	105,7	6,0
UK	31	101,6	2,9	29	105,2	2,8
Hungary	12	98,3	5,0	12	104,5	1,2
Italy	70	99,2	4,9	69	104,5	3,6
Netherlands	202	97,5	4,6	200	104,8	11,0
Poland	57	97,5	16,9	31	106,5	5,6
USA	969	102,4	2,6	958	105,2	5,3

For milking speed DNK/FIN/SWE are superior. For temperament there are only small differences between populations.

Changes since last routine run
In the routine evaluation in November 2020 the following changes are done compared to April 2021 routine evaluation:

Yield:
- Base change for Canada, France, Germany and Italy
- Change in status of bulls in DFS
- Cut of 1 year of data in Italy

Fertility:
- Base change for Canada, France, Germany and Italy
- Change in status of bulls in DFS
- Cut of 1 year of data in Italy
- Hollands sends DO instead of CI

Calving:
- Base change for Canada, France, Germany and Italy
- Change in status of bulls in DFS
- Cut of 1 year of data in Italy
- Holland added the sex effect to the model for the stillbirth traits

Conformation:
- Base change for Canada, France, Germany and Italy
- Change in status of bulls in DFS
- Cut of 1 year of data in Italy

Udder health:
- Base change for Canada, France, Germany and Italy
- Change in status of bulls in DFS
- Cut of 1 year of data in Italy
- Sent in Clinical mastitis instead of Udder health index

Longevity:

- Base change for Canada, France, Germany and Italy
- Change in status of bulls in DFS
- Cut of 1 year of data in Italy

Milking speed and temperament:

- Base change for Canada, France, Germany and Italy
- Change in status of bulls in DFS
- Cut of 1 year of data in Italy
- Holland added age at scoring for temperament and month of calving for milking speed

Dates of publication of Interbull breeding values in 2021:

Month	Date
April	6
August	10
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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