INTERBULL breeding values calculated December 2020

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 1st December 2020

Current evaluation	
Daugher 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 Changes since last run	Young genomic tested bulls - HOL: Yield Conformation Somatic cell count and udder health Longevity Calving – maternal and direct Female fertility Milking speed and temperament Changes since last run

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 2013 or later, that have more than 60 daughters in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2013 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	30	92,1	93,0	88,6	90,3	12,6
Canada	49	91,3	91,0	86,7	87,9	8,7
Germany	14	101,3	106,1	101,1	103,9	10,4
DNK/FIN/SWE	412	101,5	102,6	103,4	103,4	7,7
Estonia	25	97,1	96,2	95,5	95,4	9,7
UK	12	79,7	79,8	73,2	75,3	8,7
Norway	312	94,9	94,8	95,4	95,3	9,7
New Zealand	41	88,0	91,3	86,1	88,5	10,4
USA	11	79,4	75,8	72,0	72,2	10,4

Table 3. Genetic level for yield traits, Holstein. Bulls born in 2013 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	92	95,0	99,7	95,2	97,7	7,8
Belgium	32	103,3	103,1	102,6	102,7	9,2
Canada	584	108,0	107,6	105,1	105,8	8,5
Switzerland	103	95,1	99,5	95,3	97,6	8,9
Czech Republic	42	106,3	107,1	102,3	104,0	8,0
Germany	903	109,4	105,9	106,6	105,6	8,9
DNK/FIN/SWE	439	102,1	103,0	104,2	104,1	9,1
Spain	115	108,4	102,8	101,3	100,4	8,1
Estonia	39	101,4	95,9	94,6	93,7	5,9
France	422	104,2	101,8	102,8	101,9	7,9
UK	151	102,9	106,8	102,5	104,7	9,5
Hungary	5	109,8	105,6	102,8	102,6	4,6
Ireland	167	76,7	91,4	83,6	89,7	8,9
Israel	143	98,8	105,6	99,0	102,7	7,2
Italy	394	104,7	103,5	102,5	102,5	8,0
Japan	79	108,5	105,9	104,8	104,5	8,2
Luxembourg	9	108,7	107,9	104,3	105,3	10,9
Netherlands	816	104,5	103,8	103,7	103,6	9,7
New Zealand	922	79,9	94,2	90,0	94,9	7,5
Poland	111	101,2	100,0	98,6	98,7	9,5
Slovenia	35	94,7	90,1	88,8	88,1	6,6
USA	3123	109,0	109,1	106,1	107,1	9,0

Table 4. Genetic level for yield traits, Jersey. Bulls born in 2013 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	35	105,4	89,5	100,2	91,7	6,0
Canada	16	104,1	92,0	97,6	92,1	17,6
DNK/FIN/SWE	106	102,3	105,0	105,3	106,0	9,0
New Zealand	427	98,2	92,5	98,5	94,7	8,2
USA	502	115,9	99,4	109,4	100,9	10,2

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 considerable 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 2013 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	50	100,0	7,1	102,5	3,5	105,8	7,5
Germany	22	105,2	7,4	106,4	3,8	103,1	8,5
DNK/FIN/SWE	275	98,3	10,2	100,4	5,2	100,9	8,4
UK	7	107,0	6,0			107,9	7,2
Norway	77	100,6	9,2	98,1	4,7	84,8	8,6
USA	5	107,6	9,6	102,4	1,1	109,8	9,7

Table 6. Genetic level of conformation traits, Holstein. Bulls born in 2013 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	42	110,7	9,5	97,5	3,7	100,2	13,2
Belgium	32	114,1	13,5	104,1	5,1	105,4	10,2
Canada	475	116,7	10,1	101,1	5,6	111,9	9,6
Switzerland	144	112,1	9,5	99,5	5,1	108,1	9,1
Czech Republic	48	113,2	8,9	100,4	5,3	101,8	11,1
Germany	893	111,3	9,4	102,1	5,9	106,4	9,3
DNK/FIN/SWE	432	101,9	11,0	100,8	6,4	103,0	8,7
Spain	127	117,9	9,2	101,3	6,2	107,6	8,0
Estonia	41	107,2	6,8	100,0	5,4	89,9	9,8
France	357	116,2	10,9	102,2	5,7	109,1	8,8
UK	116	113,3	9,5	100,7	4,7	107,7	8,9
Hungary	7	113,9	8,2	103,4	5,1	106,4	4,3
Ireland	67	89,4	10,4	96,1	4,9	80,0	12,7
Italy	383	114,1	10,4	100,7	5,1	107,5	8,8
Japan	424	114,1	9,2	100,6	5,0	104,1	9,3
Korea	26	110,8	7,6	99,7	2,6	103,4	5,6
Luxembourg	9	107,7	6,2	103,8	4,1	104,3	8,4
Netherlands	729	110,4	10,0	103,3	6,1	104,3	9,8
New Zealand	883	85,1	9,6				
Poland	107	110,9	9,0	99,6	4,0	94,9	8,0
Slovenia	34	103,0	10,5	99,5	4,0	93,6	9,2
USA	1679	112,6	10,2	100,1	5,5	109,8	8,8

Table 7. Genetic level of conformation traits, Jersey. Bulls born in 2013 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	10	109,6	6,5	102,0	5,8	90,6	9,3
Canada	24	112,6	6,6	106,7	5,5	102,5	7,3
DNK/FIN/SWE	125	100,5	9,4	100,8	7,0	100,3	8,3
UK	6	103,5	5,8			100,8	9,1
USA	508	112,8	8,9	103,2	7,1	100,1	8,5

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 2013 or later.

Country	No. of bulls	Average	STD
Australia	22	97,4	8,7
Canada	16	100,0	8,9
Germany	14	96,6	8,7
DNK/FIN/SWE	323	100,5	8,6
Estonia	10	97,1	9,4
Norway	202	96,2	11,3
New Zealand	76	93,3	7,5
USA	6	84,1	11,2

Table 9. Genetic level for udder health, Holstein. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	138	95,4	7,2
Belgium	30	97,9	8,5
Canada	285	97,2	8,1
Switzerland	17	95,5	5,0
Czech Republic	46	96,5	8,3
Germany	612	98,2	7,8
DNK/FIN/SWE	405	101,5	8,0
Spain	133	95,4	8,7
Estonia	41	93,6	9,5
France	370	98,5	7,5
UK	96	96,5	8,5
Hungary	7	96,6	8,2
Ireland	162	94,1	9,2
Israel	148	99,8	9,4
Italy	338	97,0	8,7
Japan	378	93,3	8,4
Korea	33	92,0	6,5
Luxembourg	6	96,9	7,1
Netherlands	757	98,8	7,7
New Zealand	986	91,4	7,2
Poland	140	94,5	8,8
Slovenia	37	95,9	7,2
USA	1555	98,7	8,3

Table 10. Genetic level for udder health, Jersey. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	49	92,7	6,3
Canada	5	87,7	5,6
DNK/FIN/SWE	126	99,3	7,7
UK	6	92,0	7,5
New Zealand	514	94,4	6,8
USA	273	86,7	8,9

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 2012 or later.

Country	No. of bulls	Average	STD
Australia	16	92,1	12,8
Canada	55	90,3	10,0
Germany	25	93,2	7,0
DNK/FIN/SWE	331	101,9	8,0
UK	10	81,0	5,2
Norge	297	89,4	8,0
New Zealand	34	86,6	4,2
USA	13	81,2	12,1

Table 12. Genetic level for longevity, Holstein. Bulls born in 2012 or later.

Country	No. of bulls	Average	STD
Australia	106	86,8	7,3
Austria	9	93,4	7,2
Belgium	43	98,9	7,5
Canada	790	99,3	9,2
Switzerland	181	89,9	8,6
Czech Republic	57	102,8	8,4
Germany	1204	100,6	9,2
DNK/FIN/SWE	546	103,0	8,0
Spain	162	97,1	7,1
France	578	94,0	7,8
UK	189	98,3	7,8
Hungary	11	94,8	8,4
Ireland	227	90,3	6,1
Israel	178	92,4	5,4
Italy	463	98,4	7,0
Luxembourg	14	99,9	8,4
Netherlands	1224	99,2	8,9
New Zealand	966	89,5	5,6
Poland	360	91,5	8,4
Slovenia	52	90,0	10,2
USA	3620	104,1	8,7

Table 13. Genetic level for longevity, Jersey. Bulls born in 2012 or later.

Country	No. of bulls	Average	STD
Australia	28	89,7	5,7
Canada	17	90,6	9,1
DNK/FIN/SWE	125	100,6	7,6
UK	8	87,4	5,8
New Zealand	389	93,5	4,3
USA	692	95,7	7,5

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 2013 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 2013 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	51	95,5	7,2	28	98,4	5,9
DNK/FIN/SWE	263	101,0	7,4	269	100,5	6,4
Norway	201	99,1	7,9	201	88,5	7,5

Table 15. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2013 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	140	95,6	6,1	2	91,5	13,4
Austria	7	93,1	8,3	5	95,6	12,9
Belgium	35	97,4	6,1	32	99,9	7,2
Canada	629	97,1	6,2	518	100,6	7,9
Switzerland	152	94,8	6,0	119	93,0	9,8
Germany	974	97,1	6,9	844	98,8	8,5
DNK/FIN/SWE	441	101,2	6,4	438	102,5	7,7
Spain	99	94,6	4,8	68	99,6	4,6
France	446	96,5	7,3	396	102,9	8,6
UK	156	98,3	5,5	55	100,3	7,0
Hungary	5	102,8	3,6	4	96,5	8,6
Ireland	111	100,1	4,3	1	101,0	
Israel	58	97,8	6,3	153	95,1	6,4
Italy	401	95,3	6,6	142	99,7	6,7
Luxembourg	12	96,8	7,2	8	100,0	7,4
Netherlands	795	97,2	6,6	655	97,8	8,7
New Zealand	981	99,3	5,0	0		
USA	3313	98,1	5,5	2383	101,9	6,7

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 2013 or later.

Country	No. of bulls	Average	STD
Australia	12	92,6	10,4
Canada	36	97,0	8,2
Germany	8	89,4	11,0
DNK/FIN/SWE	260	100,7	8,5
UK	7	94,6	7,8
Norway	191	113,4	8,5
New Zealand	27	100,7	6,6
USA	5	92,4	3,8

Table 17. Genetic level for female fertility, Holstein. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	69	90,5	10,9
Belgium	29	94,6	7,7
Canada	559	95,2	9,8
Switzerland	99	94,5	3,7
Czech Republic	39	96,3	2,0
Germany	818	93,3	8,9
DNK/FIN/SWE	454	101,7	11,3
Spain	68	90,7	6,6
France	365	94,5	8,8
UK	143	96,9	8,3
Ireland	166	108,5	3,6
Israel	134	97,2	2,4
Italy	361	94,1	8,1
Japan	79	91,2	6,7
Luxembourg	9	97,1	4,8
Netherlands	735	95,0	9,3
New Zealand	884	100,5	5,0
Poland	67	88,6	8,6
USA	3008	97,4	9,2

Table 18. Genetic level for female fertility, Jersey. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	29	90,9	9,9
Canada	17	87,8	8,4
DNK/FIN/SWE	124	102,1	10,9
New Zealand	417	97,6	6,6
USA	493	85,1	11,8

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 have 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 2013 or later are shown for Holstein, Red breeds and Jersey.

Table 19. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2013 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	8	98,4	4,0	8	99,3	4,9
Canada	50	91,2	13,1	49	93,0	12,3
Germany	21	99,1	7,4	21	99,3	5,4
DNK/FIN/SWE	287	99,7	8,2	256	99,9	10,9
Norway	157	95,1	4,8	166	97,0	6,9
New Zealand	21	101,6	6,1	21	100,6	6,3

Table 20. Genetic level for milking speed and temperament, Holstein. Bulls born in 2013 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	66	102,8	4,5	66	102,1	5,0
Austria	7	96,6	5,7			
Belgium	21	97,9	8,2	20	101,1	9,8
Canada	397	99,5	10,0	390	103,9	9,3
Switzerland	144	94,5	7,7	145	99,7	7,6
Germany	747	99,0	9,0	587	102,3	11,3
DNK/FIN/SWE	420	100,7	8,6	330	102,5	15,1
France	315	98,3	8,6	314	103,3	9,1
UK	122	101,2	14,6	116	104,1	10,7
Italy	388	100,0	8,9	387	104,7	6,3
Luxembourg	10	99,4	9,7	7	95,8	12,5
Netherlands	607	96,9	10,0	576	102,4	9,5
New Zealand	922	103,8	4,7	922	97,7	3,3
Slovenia	37	97,3	5,2			
USA	725	101,1	10,8	698	106,0	9,8

Table 21. Genetic level for milking speed, Jersey. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australien	40	98,4	8,3
Canada	28	94,1	8,2
DNK/FIN/SWE	160	99,7	9,7
New Zealand	551	98,8	7,2
USA	73	95,9	7,8

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 2013 or later.

Table 22. Genetic level for NTM, Red breeds. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Canada	30	-13,5	10,2
Germany	14	0,9	7,9
DNK/FIN/SWE	411	5,3	8,8
UK	7	-34,6	6,9
Norway	185	-7,8	10,9
USA	6	-28,2	6,3

Table 23. Genetic level for NTM, Holstein. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	34	-7,7	11,2
Belgium	29	0,4	11,5
Canada	321	2,3	10,1
Switzerland	20	-4,4	9,3
Czech Republic	42	0,8	7,7
Germany	621	2,8	9,0
DNK/FIN/SWE	428	7,1	9,1
Spain	115	-4,6	9,4
Estonia	39	-12,9	7,2
France	340	-0,2	8,5
UK	117	2,3	9,7
Hungary	5	-0,6	7,2
Ireland	73	-10,6	7,7
Italy	338	-1,2	9,0
Japan	79	-0,6	9,0
Luxembourg	6	3,7	14,5
Netherlands	712	1,1	9,8
Poland	106	-8,9	9,8
Slovenia	35	-18,1	7,7
USA	1350	7,2	8,8

Table 24. Genetic level for NTM, Jersey. Bulls born in 2013 or later.

Country	No. of bulls	Average	STD
Australia	9	-14,0	7,3
Canada	6	-13,2	11,9
DNK/FIN/SWE	106	6,4	8,6
USA	255	-9,1	7,5

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

Yield
- All breeds from DFS has adjusted pedigree information
- Jersey in New Zealand has change in information due to continuous DNA parenting testing

Fertility
- All breeds from DFS has adjusted pedigree information
- Holstein from Italy has change in number of information due to pedigree update
- Jersey in New Zealand has change in information due to continuous DNA parenting testing

Calving
- Holstein from Germany has included additional fixed effect - calf is pure/cross bred
- All breeds from DFS has adjusted pedigree information
- Holstein from Italy has change in number of information due to pedigree update
- Holstein from USA has included calvings before 1990.
- Jersey in New Zealand has change in information due to continuous DNA parenting testing

Conformation
- RDC in Norway have included Angularity for the first time
- All breeds from DFS has adjusted pedigree information
- Holstein from USA has modified overall udder score to increase the correlation with Productive Life and Somatic Cell Score
- Jersey in New Zealand has change in information due to continuous DNA parenting testing

Udder health
- HOL from Germany have larger numbers of bulls that loses daughters and herds due to data change
- All breeds from DFS has adjusted pedigree information
- HOL from USA has changed model and genetic parameters
- Jersey in New Zealand has change in information due to continuous DNA parenting testing

Longevity
- All breeds from DFS has adjusted pedigree information
- Holstein from Italy has change in number of information due to pedigree update
- Jersey in New Zealand has change in information due to continuous DNA parenting testing

Milking speed and temperament
- All breeds from DFS has adjusted pedigree information
- Jersey in New Zealand has change in information due to continuous DNA parenting testing

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 2017 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Belgium	74	106,9	108,5	107,0	107,6	9,6
Canada	541	112,3	119,3	114,5	116,9	7,5
Switzerland	23	103,7	105,7	103,1	104,0	7,0
Czech Republic	54	114,5	115,2	114,6	114,9	6,2
Germany	624	116,1	116,0	118,4	117,9	6,8
DNK/FIN/SWE	284	104,6	113,8	111,5	113,8	7,8
Spain	96	116,3	110,3	114,2	112,2	7,4
France	458	110,1	112,5	113,8	114,0	6,6
UK	42	104,5	118,5	109,7	114,2	14,8
Hungary	92	107,2	106,6	103,6	104,1	9,4
Italy	131	113,8	115,0	116,2	116,2	5,6
Netherlands	310	108,8	115,8	114,4	116,1	7,3
Poland	88	113,2	112,9	113,8	113,5	5,7
USA	1330	113,4	121,3	115,3	118,1	6,8

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 is 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 2017 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Belgium	74	112,6	7,8	102,3	4,2	109,9	6,2
Canada	541	112,3	10,1	99,7	4,2	113,0	8,8
Switzerland	23	116,5	7,9	100,0	3,9	120,3	8,8
Czech Republic	54	111,3	8,1	102,4	4,1	105,6	7,1
Germany	624	110,5	8,3	104,1	4,5	113,6	6,9
DNK/FIN/SWE	284	104,1	8,6	102,4	4,6	109,7	7,5
Spain	96	114,4	8,7	103,9	5,8	115,3	8,4
France	458	118,9	9,0	104,9	4,5	117,9	8,0
UK	42	102,2	11,5	99,1	4,5	105,0	12,0
Hungary	92	112,7	8,5	99,9	4,6	105,8	8,4
Italy	131	116,4	7,9	101,7	4,2	112,5	7,3
Netherlands	309	109,3	8,3	106,5	5,6	108,2	8,1
Poland	88	115,3	9,2	103,4	4,9	109,6	8,2
USA	1330	107,2	9,2	99,6	4,1	108,8	8,2

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 2017 or later.

Country	No. of bulls	Average	STD
Belgium	74	100,4	5,1
Canada	541	101,5	5,1
Switzerland	23	100,2	5,0
Czech Republic	33	99,8	6,6
Germany	624	103,3	6,5
DNK/FIN/SWE	284	105,7	6,6
Spain	96	104,5	8,3
France	458	107,6	5,9
UK	42	101,9	5,5
Hungary	92	93,7	8,1
Italy	131	102,7	5,4
Netherlands	307	103,9	6,0
Poland	88	103,1	5,9
USA	1328	100,8	5,1

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 2017 or later.

Country	No. of bulls	Average	STD
Belgium	74	102,9	5,5
Canada	541	108,4	5,2
Switzerland	23	104,3	5,6
Czech Republic	33	107,4	5,7
Germany	624	113,1	6,3
DNK/FIN/SWE	284	114,0	6,7
Spain	96	109,5	6,5
France	456	108,8	6,1
UK	42	109,4	7,0
Hungary	92	100,4	6,3
Italy	131	107,2	4,9
Netherlands	309	110,2	6,2
Poland	47	105,6	6,7
USA	1330	109,2	4,9

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 2017 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Belgium	73	98,4	4,8	16	104,6	5,6
Canada	515	100,1	4,3	541	107,0	5,0
Switzerland	19	97,7	4,9	23	101,4	5,5
Czech Republic	33	99,9	4,1	33	104,5	4,0
Germany	563	100,7	5,0	624	103,2	5,6
DNK/FIN/SWE	241	100,8	4,6	284	105,2	5,0
Spain	96	98,8	5,2	92	102,0	5,7
France	455	97,9	4,6	455	103,7	5,9
UK	41	102,3	3,9	41	105,4	5,3
Hungary	92	97,0	4,1	92	101,9	4,5
Italy	129	98,7	4,8	131	105,1	4,0
Netherlands	260	102,0	4,9	309	103,0	5,8
Poland	47	97,0	4,1	47	101,7	7,9
USA	1186	101,8	4,2	1330	107,6	4,5

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 2017 or later.

Country	No. of bulls	Average	STD
Belgium	74	96,5	4,7
Canada	541	101,2	7,3
Switzerland	23	99,3	10,1
Czech Republic	33	96,5	6,2
Germany	623	100,1	7,1
DNK/FIN/SWE	284	106,5	7,7
Spain	96	98,9	6,8
France	457	99,0	6,5
UK	42	104,9	7,5
Hungary	38	97,4	6,2
Italy	131	99,8	6,2
Netherlands	309	98,6	7,1
Poland	88	95,8	7,4
USA	1330	101,2	6,2

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 2017 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	541	100,4	2,6	521	105,1	4,7
Switzerland	23	99,0	3,4			
Czech Republic	32	99,2	4,5			
Germany	621	99,7	2,8	616	105,6	6,9
DNK/FIN/SWE	284	102,9	2,7	282	105,1	3,4
Spain	96	95,4	5,1	92	106,5	3,8
France	456	97,3	2,5	447	105,6	4,2
UK	42	101,9	3,6	40	105,8	2,6
Hungary	38	98,1	5,1	38	104,5	2,1
Italy	131	99,5	4,8	118	104,5	4,3
Netherlands	309	98,4	4,4	307	105,2	10,1
Poland	47	99,9	2,3	47	106,2	2,0
USA	1324	102,4	2,6	1303	105,4	4,7

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 August 2019 the following changes are done compared to April 2020 routine evaluation:

Yield:	No change
Fertility:	Holstein in Nederlands has re-included the interval trait
Calving:	No change
Conformation:	Holstein in Germany has re-included Angularity
Udder health:	Holstein in Nederlands has re-included mastitis treatments
Longevity:	No change
Milking speed and temperament:	Holstein from Germany has re-included milking speed

Dates of publication of Interbull breeding values in 2021:

Month	Date
April	7
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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