

INTERBULL breeding values calculated August 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.

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International breeding values for the traits and breeds shown in table 1 have been published 10th August 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	92,5	93,1	85,8	88,2	13,6
Canada	30	93,4	91,6	87,8	88,5	7,2
Germany	13	99,9	104,7	100,5	103,0	10,1
DNK/FIN/SWE	207	100,3	103,0	103,5	104,1	8,0
Estonia	8	98,4	88,6	92,1	88,8	6,4
UK	8	77,9	79,6	71,9	74,6	11,1
Norway	117	96,7	96,1	96,8	96,5	9,2
New Zealand	13	90,7	94,0	86,2	89,4	9,7

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	78	95,9	101,5	95,5	98,7	8,1
Belgium	21	104,3	106,8	104,3	105,8	7,1
Canada	492	109,0	108,9	106,3	107,0	9,6
Switzerland	81	96,5	100,1	96,4	98,4	9,0
Czech Republic	35	108,7	107,5	103,9	104,7	8,5
Germany	770	110,4	106,7	108,3	106,9	9,5
DNK/FIN/SWE	308	102,6	104,3	105,2	105,4	9,6
Spain	81	108,3	102,5	101,5	100,3	8,7
Estonia	20	102,2	96,3	96,4	94,9	5,2
France	336	104,0	102,0	103,4	102,5	8,9
UK	91	104,0	108,8	104,0	106,7	9,0
Ireland	109	75,6	89,6	82,5	88,2	9,2
Israel	122	100,6	105,5	101,0	103,6	7,0
Italy	365	105,7	103,9	103,8	103,4	8,1
Japan	51	108,8	106,8	105,0	105,0	7,6
Luxembourg	7	114,1	111,4	110,0	109,9	4,5
Netherlands	609	105,7	105,4	105,6	105,5	9,1
New Zealand	703	79,1	93,2	88,0	93,1	6,2
Poland	84	102,2	100,9	99,3	99,5	9,4
Slovenia	32	95,5	89,2	88,8	87,4	6,3
USA	2689	109,3	110,1	106,7	108,0	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	29	105,2	92,2	100,0	93,4	5,7
Canada	19	110,4	94,7	102,8	95,3	17,6
DNK/FIN/SWE	89	103,1	105,7	106,1	106,8	9,1
New Zealand	312	99,5	92,6	98,6	94,5	7,3
USA	407	116,7	100,1	110,3	101,7	10,4

International comparison for yield among most important populations shows that:

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

Conformation

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

Breeding values for frame

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

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

Breeding values for feet and legs

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

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

Breeding values for udder

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

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

Genetic level of composite conformation traits

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

Table 5. Genetic level for conformation traits, Red breeds. Bulls born in 2014 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	40	101,1	7,8	102,8	4,6	104,0	7,8
Germany	17	108,0	8,1	105,9	4,2	103,4	10,4
DNK/FIN/SWE	185	98,5	11,2	101,1	5,3	100,8	8,9
UK	6	104,5	5,0			105,2	4,0
Norway	50	102,9	11,4	98,5	5,2	86,4	10,2

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	27	109,5	9,1	98,3	4,0	99,1	12,8
Belgium	21	113,9	14,6	103,6	5,2	106,9	9,1
Canada	368	117,3	10,6	99,6	5,9	112,7	9,4
Switzerland	113	112,6	9,4	99,5	5,0	107,7	9,4
Czech Republic	38	114,0	8,9	100,0	6,4	101,9	10,7
Germany	761	110,5	9,0	102,0	6,2	106,3	9,0
DNK/FIN/SWE	307	101,6	11,1	101,2	6,2	103,0	8,9
Spain	94	117,7	8,8	102,1	5,7	107,1	7,4
Estonia	20	108,8	7,9	98,3	4,7	89,0	10,0
France	298	116,7	10,3	102,4	6,1	109,2	8,6
UK	70	112,5	9,4	100,5	3,9	106,3	9,1
Ireland	45	89,2	11,0	96,2	4,6	76,8	12,5
Italy	362	114,0	10,3	100,8	5,6	106,3	8,8
Japan	342	114,1	9,5	100,4	5,5	103,8	8,9
Korea	11	109,0	8,7	100,5	3,7	99,9	4,5
Luxembourg	7	109,6	8,8	105,6	5,0	106,6	7,4
Netherlands	510	110,5	9,8	103,8	6,5	104,3	9,5
New Zealand	684	84,9	9,5				
Poland	69	112,1	7,7	99,5	4,8	96,3	6,8
Slovenia	30	103,7	10,5	99,5	4,7	92,5	9,0
USA	1453	112,0	10,4	99,0	5,8	109,4	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	10	107,2	5,0	100,7	8,0	90,6	7,9
Canada	27	110,3	8,9	104,8	7,3	99,7	9,0
DNK/FIN/SWE	85	99,6	9,1	100,0	7,4	101,1	8,5
USA	369	112,8	8,8	103,5	7,3	98,6	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 same genetic level for frame than most other populations. North America, Spain, France and Italy have the highest genetic level for frame. Populations with grass based dairy farming like 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	16	97,7	7,7
Canada	13	99,8	8,3
DNK/FIN/SWE	246	100,3	8,5
Estonia	9	95,6	10,9
Norway	122	98,5	10,1
New Zealand	49	94,5	7,6

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

Country	No. of bulls	Average	STD
Australia	101	94,4	7,6
Belgium	18	97,2	7,3
Canada	224	97,7	8,1
Switzerland	24	94,8	6,8
Czech Republic	38	96,8	8,7
Germany	515	98,3	7,7
DNK/FIN/SWE	295	102,2	7,8
Spain	96	96,9	7,9
Estonia	22	91,6	8,4
France	303	98,5	8,0
UK	57	97,9	6,6
Ireland	109	94,3	9,2
Israel	127	99,7	9,5
Italy	334	97,2	9,0
Japan	303	92,1	8,8
Korea	28	94,0	6,2
Luxembourg	7	104,9	7,5
Netherlands	327	99,3	8,0
New Zealand	721	91,8	7,4
Poland	96	96,0	9,3
Slovenia	32	94,1	7,9
USA	1410	97,3	8,8

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

Country	No. of bulls	Average	STD
Australia	39	90,7	6,0
Canada	8	90,7	13,6
DNK/FIN/SWE	96	100,7	8,0
New Zealand	386	95,3	7,0
USA	213	86,3	8,3

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	10	86,2	12,3
Canada	48	94,7	9,3
Germany	23	94,7	7,3
DNK/FIN/SWE	239	101,4	8,2
UK	7	83,9	8,6
Norge	201	90,0	8,0
New Zealand	29	85,8	5,0
USA	6	76,4	13,5

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

Country	No. of bulls	Average	STD
Australia	90	89,5	7,8
Austria	7	90,5	6,6
Belgium	33	98,6	7,9
Canada	616	100,0	8,9
Switzerland	148	90,9	8,0
Czech Republic	42	103,6	7,9
Germany	1075	100,7	9,0
DNK/FIN/SWE	425	101,8	8,5
Spain	139	97,7	7,1
France	414	94,0	7,9
UK	137	99,3	7,7
Hungary	8	97,2	9,3
Ireland	170	90,5	5,5
Israel	159	92,8	5,8
Italy	260	99,3	6,5
Luxembourg	10	102,5	10,1
Netherlands	929	99,7	8,9
New Zealand	763	89,3	6,0
Poland	170	94,2	8,4
Slovenia	46	92,0	8,5
USA	3128	103,8	8,5

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

Country	No. of bulls	Average	STD
Australia	32	91,2	6,5
Canada	17	88,8	8,9
DNK/FIN/SWE	94	99,8	7,9
UK	5	89,5	5,9
New Zealand	338	94,4	4,8
USA	585	96,4	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: 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	40	95,2	6,9	25	97,8	5,9
DNK/FIN/SWE	207	101,0	7,2	200	100,5	6,3
Norway	121	99,9	7,1	121	90,8	7,3

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	104	95,7	6,4	0		
Belgium	22	98,8	5,9	19	100,1	8,4
Canada	526	96,7	5,9	389	101,5	6,9
Switzerland	123	95,6	5,5	86	94,9	9,6
Germany	841	97,0	6,4	721	99,1	7,9
DNK/FIN/SWE	319	100,3	6,7	312	102,1	8,0
Spain	89	95,0	4,3	53	99,8	4,1
France	350	96,1	7,0	309	102,0	8,8
UK	89	98,6	5,2	29	100,9	5,3
Ireland	50	100,2	3,8	0		
Israel	51	97,6	6,0	130	93,7	6,3
Italy	364	95,0	6,3	136	100,6	6,3
Luxembourg	7	96,9	5,3	5	101,8	6,0
Netherlands	598	97,4	6,5	466	98,0	8,8
New Zealand	723	99,8	4,8	0		
USA	2854	98,4	5,6	1818	102,2	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
Australia	10	92,0	17,5
Canada	30	97,3	9,3
Germany	12	94,0	8,5
DNK/FIN/SWE	200	100,3	8,7
UK	8	93,6	9,6
Norway	103	112,7	8,1
New Zealand	13	100,2	7,2

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

Country	No. of bulls	Average	STD
Australia	72	89,2	9,6
Belgium	21	94,0	6,8
Canada	466	96,2	9,1
Switzerland	81	94,4	4,2
Czech Republic	33	96,1	2,5
Germany	675	93,8	8,6
DNK/FIN/SWE	315	102,0	11,0
Spain	38	92,9	7,0
France	289	95,2	8,6
UK	72	100,3	7,8
Ireland	109	107,3	3,3
Israel	113	97,0	2,4
Italy	348	94,2	8,3
Japan	51	91,3	6,5
Luxembourg	8	98,8	4,0
Netherlands	535	95,2	8,9
New Zealand	703	98,2	4,6
Poland	41	91,8	5,8
USA	2572	97,5	9,2

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

Country	No. of bulls	Average	STD
Australia	26	91,4	8,4
Canada	18	86,6	10,9
DNK/FIN/SWE	108	99,8	12,8
New Zealand	312	95,4	5,8
USA	383	83,3	11,5

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 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	9	100,1	2,8	9	105,9	4,1
Canada	40	91,5	14,8	39	94,6	14,4
Germany	7	98,9	4,8	16	99,8	4,9
DNK/FIN/SWE	220	99,7	7,9	182	100,1	11,1
Norway	108	94,0	6,5	90	99,1	8,7
New Zealand	11	98,1	6,5	11	99,0	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	66	103,2	3,6	66	102,9	4,3
Belgium	14	97,8	6,8	15	101,7	11,9
Canada	307	99,6	10,4	305	104,2	9,5
Switzerland	117	94,4	9,4	117	100,0	9,2
Germany	600	99,3	9,8	512	102,9	13,6
DNK/FIN/SWE	301	99,9	7,3	256	101,7	16,1
France	259	98,0	8,7	256	103,1	9,1
UK	72	100,7	12,4	70	104,3	9,6
Italy	319	100,3	9,3	319	103,9	7,5
Luxembourg	6	98,2	7,9			
Netherlands	399	95,7	12,0	394	102,9	11,1
New Zealand	704	103,2	3,8	704	97,4	2,6
Slovenia	34	95,9	6,4			
USA	642	101,9	11,2	623	105,4	10,4

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

Country	No. of bulls	Average	STD
Australien	24	98,1	10,1
Canada	21	93,0	7,4
DNK/FIN/SWE	98	100,4	11,1
New Zealand	336	99,3	6,4
USA	28	96,8	9,4

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 $\frac{1}{2} (EBV_{\text{sire}} - 100) + \frac{1}{4} (EBV_{\text{maternal grand sire}} - 100) + 100$. The contributions from the sire and maternal grand sire can be based on either NAV breeding values or international breeding values. If EBV_{sire} or $EBV_{\text{maternal grand sire}}$ are unofficial the pedigree index is set to 100.

Publication rules for NTM

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

Genetic level for Interbull NTM

In tables 22-24 genetic level for Interbull NTM for Jersey, Red breeds and Holstein are shown. Bulls included are born in 2014 or later.

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

Country	No. of bulls	Average	STD
Canada	22	-14,7	6,6
DNK/FIN/SWE	207	6,3	8,8
Norway	50	-0,9	9,6

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

Country	No. of bulls	Average	STD
Australia	27	-4,4	10,5
Belgium	19	4,3	7,2
Canada	254	4,6	10,7
Switzerland	55	-5,2	9,9
Czech Republic	34	2,0	7,6
Germany	516	4,7	8,6
DNK/FIN/SWE	296	8,7	8,8
Spain	68	-4,3	8,9
Estonia	20	-12,1	5,5
France	246	0,3	9,4
UK	65	6,5	7,8
Ireland	50	-12,8	8,4
Italy	325	-0,4	8,8
Japan	51	-0,8	8,7
Luxembourg	6	13,0	2,8
Netherlands	406	4,4	9,1
Poland	68	-8,4	10,1
Slovenia	26	-19,3	7,2
USA	1239	7,7	9,0

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

Country	No. of bulls	Average	STD
Australia	5	-11,2	8,7
Canada	6	-10,2	9,2
DNK/FIN/SWE	88	7,6	7,8
USA	179	-8,6	7,3

International comparison of NTM among most important populations shows that:

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

Changes since last run

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

Yield		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
DFS	All			X			
Spain	HOL	X					
New Zealand	JER		X	X			Change of pedigree info (DNA testing)

Fertility		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
DFS	All			X			
Germany	HOL			X	X	X	
USA	All			X		X	
Spain	HOL	X					

Calving		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
DFS	All			X			
Italy	HOL			X		X	
Germany	HOL		X	X		X	
USA	All			X		X	
Spain	HOL			X		X	

Conformation		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
New Zealand	JER			X			Change of pedigree info (DNA testing)
DFS	All			X			
Spain	HOL	X					

Udder health		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
New Zealand	JER			X			Change of pedigree info (DNA testing)
DFS	All			X			
Italy	HOL			X		X	
Spain	HOL	X					

Longevity		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
New Zealand	JER			X			Change of pedigree info (DNA testing)
DFS	All			X			
Italy	HOL			X		X	
Spain	HOL			X		X	

Milking speed and temp.		Change					Comment
Country	Breed	Base	Pedigree	#Data & EDC	#Bulls	Editing & model	
New Zealand	JER			X			Change of pedigree info (DNA testing)
DFS	All			X			
Italy	HOL	X		X			
Spain	HOL	X		X		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	15	109,1	115,1	111,9	113,8	7,0
Belgium	25	106,4	111,1	110,4	111,4	9,6
Brasil	5	117,4	110,4	115,0	112,6	6,0
Canada	410	111,0	123,2	114,6	118,8	8,6
Switzerland	17	103,1	105,6	104,1	104,8	6,0
Czech Republic	30	116,8	117,7	117,1	117,4	7,2
Germany	552	117,2	117,7	119,7	119,3	6,2
DNK/FIN/SWE	211	104,3	115,4	112,6	115,4	7,8
Spain	84	115,1	112,3	113,4	112,6	6,9
France	359	111,0	112,6	114,6	114,6	6,6
UK	36	106,3	120,4	110,3	115,1	17,5
Hungary	57	110,4	109,4	106,5	106,9	8,7
Italy	95	113,9	115,3	116,9	116,9	5,5
Netherlands	250	109,5	116,7	115,2	117,0	7,3
Poland	75	112,3	111,7	114,0	113,4	6,2
USA	1368	112,9	124,1	115,8	119,7	6,6

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.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	15	112,4	11,4	100,2	3,3	114,1	9,5
Belgium	14	106,8	8,3	106,3	4,1	110,2	5,6
Brasil	5	103,8	5,9	96,2	6,2	107,0	5,7
Canada	410	112,8	10,3	99,6	3,9	111,6	9,5
Switzerland	17	114,2	7,0	100,2	4,4	115,9	7,1
Czech Republic	30	112,7	6,1	101,6	5,5	104,5	6,5
Germany	552	109,6	8,3	103,7	4,6	111,8	7,1
DNK/FIN/SWE	211	103,7	8,9	101,5	5,0	108,5	7,3
Spain	84	113,5	9,6	104,3	5,4	114,8	9,2
France	359	118,3	8,3	104,6	4,6	117,3	7,8
UK	36	103,3	13,2	99,8	4,2	102,6	14,3
Hungary	57	111,9	8,2	99,3	4,4	105,9	6,8
Italy	95	112,9	7,9	100,2	4,3	111,2	7,8
Netherlands	250	108,8	8,2	107,3	5,4	106,9	8,5
Poland	75	116,2	9,6	103,2	4,1	110,0	7,5
USA	1368	106,5	9,3	98,9	4,3	105,9	8,6

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

Somatic cell count and udder health

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

Table 27. Genetic level for udder health, Holstein. Bulls born in 2018 or later.

Country	No. of bulls	Average	STD
Australia	15	100,6	4,8
Belgium	14	103,3	4,8
Brasil	5	99,0	4,1
Canada	410	100,1	4,9
Switzerland	14	100,5	6,1
Czech Republic	15	100,2	7,8
Germany	552	102,5	6,0
DNK/FIN/SWE	211	105,4	6,3
Spain	84	104,2	7,4
France	357	108,3	5,9
UK	36	99,2	5,2
Hungary	42	95,8	6,7
Italy	95	102,2	5,5
Netherlands	250	102,9	6,1
Poland	75	104,2	7,0
USA	1368	99,3	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	15	103,0	5,8
Belgium	14	108,8	7,0
Brasil	5	105,6	4,3
Canada	410	107,7	5,1
Switzerland	17	104,9	6,2
Czech Republic	15	108,7	7,1
Germany	552	113,1	5,9
DNK/FIN/SWE	211	112,3	6,4
Spain	84	109,4	6,8
France	359	109,6	5,8
UK	36	107,1	7,5
Hungary	57	100,2	5,4
Italy	95	106,4	5,2
Netherlands	250	110,7	6,4
Poland	75	104,6	6,3
USA	1368	108,5	4,8

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	15	99,4	5,0	15	102,1	5,5
Belgium	22	98,8	4,9	14	103,1	5,6
Brasil	5	102,8	1,9	5	106,6	2,1
Canada	407	100,2	4,8	410	106,7	4,5
Switzerland	17	100,7	4,8	17	101,9	5,2
Czech Republic	15	103,3	5,1	15	103,3	4,7
Germany	534	100,6	4,7	552	102,9	5,9
DNK/FIN/SWE	195	100,9	4,9	211	103,7	4,9
Spain	84	98,7	5,6	57	102,1	5,6
France	358	97,5	4,8	358	103,1	5,3
UK	36	102,7	4,2	35	104,4	6,6
Hungary	57	97,2	3,1	57	101,5	3,6
Italy	95	98,9	4,7	95	103,3	4,4
Netherlands	239	102,0	4,8	250	102,5	6,0
Poland	75	95,8	3,8	75	100,2	6,2
USA	1343	101,5	4,0	1368	106,4	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	15	100,2	6,0
Belgium	25	97,0	5,3
Brasil	5	101,2	5,4
Canada	410	101,0	6,5
Switzerland	14	103,9	10,6
Czech Republic	15	98,9	6,6
Germany	552	101,2	6,9
DNK/FIN/SWE	211	107,3	7,3
Spain	84	100,1	7,3
France	357	100,3	6,4
UK	36	103,7	7,8
Hungary	12	96,4	4,1
Italy	95	100,4	6,3
Netherlands	250	99,5	6,4
Poland	75	98,2	7,7
USA	1368	101,3	5,9

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	15	100,8	1,4	10	103,3	1,5
Belgium	14	100,0	2,9	14	104,4	6,6
Brasil	5	97,3	1,3			
Canada	410	100,9	2,9	326	104,9	5,2
Switzerland	17	97,4	2,4			
Czech Republic	15	100,9	3,7			
Germany	551	98,8	3,2	540	105,6	7,9
DNK/FIN/SWE	210	102,0	2,7	209	105,2	4,1
Spain	84	96,3	4,4	56	105,0	4,4
France	356	96,2	2,2	354	105,8	2,7
UK	36	102,2	2,2	31	104,7	2,9
Hungary	12	97,9	4,5	11	104,9	1,3
Italy	95	99,2	4,5	79	104,2	3,5
Netherlands	250	97,8	3,6	247	104,8	9,6
Poland	72	97,5	16,7	43	107,6	1,9
USA	1360	102,9	2,7	1301	105,2	5,0

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 2021 the following changes are done compared to April 2021 routine evaluation:

Yield:

- Change in proof for some bulls in France

Fertility:

- Change in proof for some bulls in France
- Drop in reliability in DFS

Calving:

- Drop in reliability for some bulls in Italy

Conformation:

- Change in proof for some bulls in France
- Drop in reliability for some bulls in Italy

Udder health:

- Change in proof for some bulls in France

Longevity:

- Change in proof for some bulls in France
- Drop in reliability in DFS

Milking speed and temperament:

- Change in proof for some bulls in France
- Drop in reliability in DFS

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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