INTERBULL breeding values calculated August 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 11th August 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	23	92,0	93,3	89,6	91,0	11,2
Canada	47	90,4	90,6	86,0	87,4	8,2
Germany	14	100,8	106,0	100,6	103,5	10,1
DNK/FIN/SWE	397	101,5	102,6	103,5	103,5	8,0
Estonia	21	97,9	97,9	97,2	97,5	9,0
UK	9	82,0	81,4	73,7	75,9	9,7
Norway	302	94,3	94,6	95,1	95,0	9,6
New Zealand	32	87,5	91,8	86,8	89,5	9,6
USA	11	78,1	74,3	71,0	71,1	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	74	95,4	99,8	95,6	98,0	7,4
Belgium	30	103,4	103,5	103,0	103,2	9,5
Canada	526	107,9	107,7	104,9	105,7	8,3
Switzerland	92	94,6	99,6	94,9	97,6	8,7
Czech Republic	34	104,4	106,5	100,7	103,0	8,6
Germany	827	109,6	106,4	106,9	105,9	9,0
DNK/FIN/SWE	415	102,7	103,5	104,7	104,6	9,3
Spain	99	107,6	102,7	100,9	100,2	7,7
Estonia	39	101,7	96,0	94,8	93,7	5,9
France	362	103,9	101,8	102,6	101,8	7,9
UK	149	100,9	105,1	100,3	102,9	12,3
Hungary	5	110,6	106,6	103,2	103,4	5,3
Ireland	167	76,3	91,2	83,4	89,5	9,2
Israel	120	98,5	104,3	98,1	101,4	7,4
Italy	362	104,6	103,9	102,5	102,8	8,5
Japan	60	108,2	105,6	104,7	104,3	8,1
Luxembourg	8	105,8	107,3	102,3	104,1	9,5
Netherlands	754	104,4	104,1	103,8	103,8	10,0
New Zealand	721	79,3	93,2	89,2	93,9	6,9
Poland	75	102,3	100,3	99,0	98,9	7,3
Slovenia	31	93,9	89,8	88,8	88,2	7,1
USA	2828	109,0	109,4	106,0	107,2	9,2

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	30	106,0	89,5	101,1	92,1	6,2
Canada	14	104,6	93,4	98,8	93,5	15,9
DNK/FIN/SWE	98	101,6	104,6	104,6	105,6	8,7
New Zealand	344	98,4	92,0	98,7	94,5	8,1
USA	476	115,7	99,2	109,3	100,8	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	45	100,4	6,8	103,2	3,7	106,2	7,2
Germany	19	103,9	7,5	107,2	3,6	102,5	8,7
DNK/FIN/SWE	271	98,4	10,3	100,4	5,1	101,4	8,5
UK	6	108,2	6,7			108,7	7,3
Norway	69	101,9	8,9	98,4	4,6	85,1	8,4
USA	5	108,2	9,7	102,2	1,3	110,4	9,4

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	26	109,9	9,0	98,0	3,8	99,5	13,4
Belgium	30	114,4	13,6	103,9	5,0	105,7	10,3
Canada	428	117,0	10,2	101,2	5,7	112,2	9,5
Switzerland	132	111,8	9,5	99,2	5,3	108,5	9,0
Czech Republic	45	113,5	8,9	101,1	5,4	102,6	10,3
Germany	823	111,6	9,6	102,1	5,9	106,8	9,4
DNK/FIN/SWE	407	102,0	11,2	100,9	6,5	103,4	8,7
Spain	119	118,0	9,4	101,4	6,4	108,3	8,0
Estonia	37	107,1	6,9	100,0	5,7	90,5	9,8
France	307	116,1	11,4	102,2	5,7	109,5	9,0
UK	109	112,5	10,9	100,6	4,6	106,9	11,2
Hungary	6	113,8	9,1	103,2	5,9	108,0	4,7
Ireland	57	89,8	10,7	96,3	4,9	80,3	11,9
Italy	340	114,3	10,7	100,8	4,9	108,1	8,8
Japan	383	114,2	9,2	100,5	4,9	104,4	9,2
Korea	16	111,5	6,9	99,3	2,6	104,9	6,2
Luxembourg	7	109,6	4,7	102,9	4,6	105,6	8,1
Netherlands	665	110,4	9,8	103,3	6,1	104,5	9,7
New Zealand	687	85,1	9,7				
Poland	87	110,7	9,1	99,3	4,1	95,1	8,2
Slovenia	31	102,8	10,7	100,3	4,5	93,8	9,5
USA	1478	113,0	10,3	100,3	5,4	110,1	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	8	110,1	6,4	102,5	6,1	92,3	10,5
Canada	20	114,5	7,7	106,7	4,6	102,2	7,5
DNK/FIN/SWE	125	100,8	9,5	101,0	7,1	100,9	8,0
UK	5	104,0	5,1			100,8	9,9
USA	475	114,2	8,8	103,9	6,8	100,2	8,2

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	11	99,4	8,4
Canada	13	100,0	9,3
Germany	6	97,5	9,3
DNK/FIN/SWE	303	100,4	8,3
Estonia	8	97,1	11,7
Norway	191	95,9	11,5
New Zealand	68	92,5	7,4
USA	6	84,8	11,3

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

Country	No. of bulls	Average	STD
Australia	97	94,8	7,1
Belgium	29	98,8	7,9
Canada	241	96,9	7,7
Switzerland	16	94,7	4,5
Czech Republic	43	96,8	7,6
Germany	536	98,1	7,5
DNK/FIN/SWE	395	101,5	7,6
Spain	121	95,5	8,7
Estonia	38	93,2	9,8
France	319	98,4	6,8
UK	82	97,0	7,8
Hungary	6	99,3	9,0
Ireland	162	93,2	9,2
Israel	128	98,6	9,4
Italy	280	97,5	8,4
Japan	335	93,7	8,6
Korea	28	91,3	5,1
Netherlands	686	98,7	7,5
New Zealand	767	90,2	7,2
Poland	106	94,5	8,2
Slovenia	32	95,0	7,1
USA	1337	98,8	7,9

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

Country	No. of bulls	Average	STD
Australia	35	91,2	6,0
DNK/FIN/SWE	120	99,1	7,6
UK	5	91,4	5,1
New Zealand	419	93,7	6,9
USA	243	86,4	8,8

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	13,2
Canada	53	89,9	9,8
Germany	25	92,9	6,9
DNK/FIN/SWE	317	102	8,0
UK	8	81,2	5,3
Norge	288	89,3	7,9
New Zealand	24	86,0	3,8
USA	13	81,3	10,6

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

Country	No. of bulls	Average	STD
Australia	95	86,8	6,5
Austria	7	90,7	3,7
Belgium	41	99,5	7,2
Canada	739	99,0	9,0
Switzerland	164	89,4	8,4
Czech Republic	52	102,9	8,4
Germany	1110	100,3	9,1
DNK/FIN/SWE	516	102,9	8,0
Spain	150	96,8	6,9
France	507	93,4	7,9
UK	176	97,6	8,1
Hungary	10	93,7	7,7
Ireland	225	90,7	6,1
Israel	157	92,1	5,2
Italy	381	97,5	6,7
Luxembourg	11	96,8	6,5
Netherlands	1149	99,0	8,8
New Zealand	734	89,1	6,0
Poland	336	91,5	8,3
Slovenia	48	89,8	10,0
USA	3313	103,7	8,6

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

Country	No. of bulls	Average	STD
Australia	22	88,0	6,2
Canada	14	91,9	6,9
DNK/FIN/SWE	117	100,2	7,6
UK	8	87,0	5,9
New Zealand	313	92,0	5,0
USA	640	94,8	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 sufficient 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	47	95,3	7,4	25	97,1	6,5
DNK/FIN/SWE	248	100,9	7,5	247	100,5	6,3
Norway	191	99,2	7,9	191	88,6	7,3

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	122	95,8	6,2	2		
Austria	7	93,4	8,2	3		
Belgium	34	97,1	5,9	30	99,8	7,1
Canada	577	97,5	6,1	473	100,6	8,0
Switzerland	138	94,8	5,9	98	92,5	10,1
Germany	889	97,6	7,0	762	99,1	8,5
DNK/FIN/SWE	415	101,7	6,5	411	102,6	7,7
Spain	84	95,1	5,0	53	99,3	4,8
France	393	96,7	7,3	345	102,9	8,8
UK	154	98,5	5,4	50	100,3	7,1
Ireland	111	100,0	4,4	1		
Israel	49	96,8	6,2	134	95,5	6,5
Italy	369	95,9	6,7	112	99,3	6,2
Luxembourg	9	98,0	7,5	6	100,0	7,0
Netherlands	734	97,4	6,7	597	97,9	8,7
New Zealand	761	98,8	5,2	0		
USA	3076	98,5	5,3	2170	101,8	6,8

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

- Red breeds: DNK/FIN/SWE and Norway have similar genetic level for calving, direct. For calving, maternal DNK/FIN/SWE has a higher level than Norway
- Holstein: DNK/FIN/SWE are 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	7	92,1	11,5
Canada	34	96,2	7,2
Germany	8	88,4	7,8
DNK/FIN/SWE	243	100,3	8,5
Norway	180	112,9	8,8
New Zealand	24	98,7	6,9

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

Country	No. of bulls	Average	STD
Australia	56	90,7	9,6
Belgium	28	94,5	8,0
Canada	512	94,9	9,6
Switzerland	88	94,5	4,1
Czech Republic	33	96,8	2,1
Germany	736	93,4	8,9
DNK/FIN/SWE	427	101,9	10,9
Spain	49	90,6	7,0
France	292	94,8	9,3
UK	140	98,0	8,5
Ireland	166	108,4	3,3
Israel	108	97,5	2,6
Italy	305	94,1	8,0
Japan	60	90,2	6,9
Luxembourg	7	97,1	4,9
Netherlands	682	95,1	9,2
New Zealand	721	99,8	4,9
Poland	45	87,1	8,7
USA	2723	97,4	9,1

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

Country	No. of bulls	Average	STD
Australia	25	88,1	9,1
Canada	13	86,8	8,1
DNK/FIN/SWE	115	102,2	11,1
New Zealand	344	97,0	6,0
USA	450	84,7	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	5	101,2	3,3	5	102,2	3,3
Canada	45	91,9	13,6	43	93,3	11,5
Germany	18	99,1	7,2	18	98,2	5,3
DNK/FIN/SWE	264	100,3	8,0	243	100,0	10,8
Norway	146	95,4	4,5	155	96,6	6,5
New Zealand	20	101,9	6,4	20	100,5	6,4

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	56	103,2	4,4	56	102,6	4,7
Austria	5	95,0	6,7			
Belgium	20	99,5	8,4	19	100,6	10,0
Canada	357	99,4	9,6	351	104,0	8,8
Switzerland	135	94,0	7,7	135	99,8	7,4
Germany	667	99,2	9,1	534	102,7	11,2
DNK/FIN/SWE	401	100,7	8,9	307	102,5	15,0
France	272	98,3	8,5	272	103,3	9,1
UK	119	100,8	15,4	112	102,9	11,3
Italy	347	100,3	8,8	346	105,1	6,3
Luxembourg	8	102,5	9,9	6	98,6	4,7
Netherlands	563	96,9	10,1	536	102,7	9,4
New Zealand	714	103,7	4,1	714	98,5	2,9
Slovenia	32	97,0	3,4			
USA	631	100,8	10,7	614	106,1	9,7

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

Country	No. of bulls	Average	STD
Australien	34	99,1	9,3
Canada	23	93,6	9,3
DNK/FIN/SWE	152	100,1	9,7
New Zealand	461	99,4	7,2
USA	63	97,0	7,3

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	28	-15,4	9,1
Germany	13	0,4	8,1
DNK/FIN/SWE	396	5,6	8,9
UK	5	-30,8	7,8
Norway	178	-8,2	10,5
USA	6	-26,5	7,2

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

Country	No. of bulls	Average	STD
Australia	25	-11,0	9,5
Belgium	27	1,0	12,1
Canada	270	2,6	9,8
Switzerland	18	-4,8	9,7
Czech Republic	34	0,5	7,6
Germany	547	3,5	8,8
DNK/FIN/SWE	402	7,6	8,9
Spain	99	-4,4	8,9
Estonia	36	-12,7	7,3
France	295	-0,2	8,5
UK	104	2,3	10,0
Hungary	5	0	6,2
Ireland	68	-10,3	8,2
Italy	279	-1,1	9,1
Japan	60	-1,6	8,3
Netherlands	655	1,7	9,8
Poland	73	-9,7	8,7
Slovenia	31	-18,2	8,1
USA	1171	7,5	8,9

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

Country	No. of bulls	Average	STD
Canada	7	-15,7	8,2
DNK/FIN/SWE	98	6,0	8,0
USA	228	-9,0	7,0

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

- RDC in Norway may have a change in standard deviations between evaluations due to changes in the standard deviation in the rolling base
- Jersey in DFS include data from Finland, France and Norway
- Jersey in New Zealand may have bulls with drop in information due to continuous DNA parenting testing

Fertility

- Jersey in DFS include data from Finland, France and Norway
- Holstein in Germany may have bulls with change in information
- Jersey in New Zealand may have bulls with drop in information due to continuous DNA parenting testing
- Holstein from USA may have bulls with drop in herds or daughters
- RDC in Norway have rolling definition of HYS. Therefore, some bulls occasionally may lose EDC although the number of daughters stay the same

Calving

- RDC in Norway may have a change in standard deviations between evaluations due to changes in the standard deviation in the rolling base
- Holstein from USA may have bulls with drop in herds or daughters

Conformation

- RDC in Norway may have a change in standard deviations between evaluations due to changes in the standard deviation in the rolling base
- Jersey in New Zealand may have bulls with drop in information due to continuous DNA parenting testing

Udder health

- RDC in Norway may have a change in standard deviations between evaluations due to changes in the standard deviation in the rolling base
- Jersey in New Zealand may have bulls with drop in information due to continuous DNA parenting testing

Longevity

- RDC in Norway have rolling definition of HYS. Therefore, some bulls occasionally may loose EDC although the number of daughters stay the same
- Jersey in New Zealand may have bulls with drop in information due to continuous DNA parenting testing

Milking speed and temperament

- RDC in Norway may have a change in standard deviations between evaluations due to changes in the standard deviation in the rolling base
- Jersey in New Zealand may have bulls with drop 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	73	106,9	108,9	107,4	108,0	9,2
Canada	472	112,9	120,3	115,1	117,6	7,5
Switzerland	10	102,9	108,3	102,1	104,5	8,5
Czech Republic	42	113,6	114,2	113,7	114,0	6,5
Germany	514	116,1	116,8	118,7	118,5	6,9
DNK/FIN/SWE	268	105,2	114,3	112,0	114,3	7,8
Spain	75	117,2	110,5	115,2	112,9	7,9
France	366	109,7	112,7	113,5	113,9	6,5
UK	36	107,0	121,4	113,2	117,8	7,3
Hungary	87	110,6	110,1	107,3	107,8	8,6
Italy	107	114,1	116,0	116,6	116,9	6,3
Netherlands	265	109,3	116,3	114,6	116,4	7,3
Poland	79	113,4	113,1	113,7	113,5	5,5
USA	1109	114,1	122,3	116,2	119,1	6,9

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	73	113,5	8,1	102,5	4,2	111,2	6,0
Canada	472	112,8	9,9	99,8	4,1	114,6	8,2
Switzerland	10	120,9	8,5	100,4	5,9	124,8	7,9
Czech Republic	42	111,1	8,3	102,0	4,0	105,7	8,2
Germany	514	110,8	8,4	104,2	4,5	114,0	6,6
DNK/FIN/SWE	268	104,0	8,4	102,7	4,6	110,4	7,2
Spain	75	115,0	8,7	104,1	5,8	115,2	7,7
France	366	119,0	9,2	105,0	4,4	118,1	7,9
UK	36	104,0	8,6	99,4	4,4	109,0	7,4
Hungary	87	114,0	8,2	99,9	4,6	107,4	7,7
Italy	107	116,7	8,0	101,8	4,4	113,8	7,1
Netherlands	264	109,7	8,5	106,6	5,7	109,3	8,4
Poland	79	115,1	8,8	103,5	4,8	109,4	8,0
USA	1109	107,6	9,1	100,0	4,0	110,4	7,9

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	73	100,4	5,1
Canada	472	100,2	5,3
Switzerland	10	100,8	4,2
Czech Republic	25	99,1	6,0
Germany	514	103,2	6,3
DNK/FIN/SWE	268	105,6	6,5
Spain	75	104,0	8,6
France	366	107,8	6,1
UK	36	101,0	5,4
Hungary	87	94,4	7,1
Italy	107	102,8	5,5
Netherlands	264	104,0	6,1
Poland	79	103,2	6,2
USA	1107	99,7	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	73	103,6	5,6
Canada	472	108,7	5,2
Switzerland	10	103,3	6,4
Czech Republic	24	107,2	5,0
Germany	514	113,1	6,2
DNK/FIN/SWE	268	113,6	6,5
Spain	75	109,3	6,2
France	364	109,1	6,2
UK	36	111,0	4,4
Hungary	87	100,9	6,2
Italy	107	107,0	4,6
Netherlands	264	110,0	6,1
Poland	34	106,3	6,8
USA	1109	109,4	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 2017 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Belgium	73	98,7	4,8	14	105,6	5,7
Canada	465	100,8	4,3	472	107,3	4,9
Switzerland	10	96,6	4,8	10	100,7	6,3
Czech Republic	24	99,7	3,4	24	104,5	4,0
Germany	499	100,8	4,9	514	103,8	5,5
DNK/FIN/SWE	245	101,2	4,9	268	105,2	5,0
Spain	75	98,7	5,2	69	102,1	5,3
France	362	97,9	4,7	362	103,9	6,0
UK	36	102,9	4,1	36	106,8	3,5
Hungary	87	97,6	4,2	87	102,6	4,7
Italy	107	99,6	4,9	107	105,4	4,4
Netherlands	247	102,3	5,2	264	103,3	5,7
Poland	34	97,9	4,0	34	103,3	7,3
USA	1062	102,7	4,1	1109	108,1	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	73	97,1	5,1
Canada	472	101,9	7,6
Switzerland	10	94,0	9,3
Czech Republic	25	97,8	6,6
Germany	513	100,9	7,0
DNK/FIN/SWE	268	106,8	7,4
Spain	75	98,8	6,8
France	364	99,6	6,6
UK	36	104,7	6,1
Hungary	37	98,1	6,7
Italy	107	100,9	6,3
Netherlands	264	99,0	7,3
Poland	79	96,2	7,2
USA	1109	102,0	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
Belgium	14	98,5	2,3	13	104,6	1,5
Canada	472	100,7	2,3	446	105,9	3,4
Switzerland	10	101,4	3,3			
Czech Republic	23	98,5	3,6			
Germany	512	99,8	3,2	507	105,9	7,4
DNK/FIN/SWE	268	103,1	2,6	268	105,7	4,2
Spain	75	95,0	7,5	69	107,1	3,1
France	364	97,3	2,4	361	105,6	3,5
UK	36	102,8	3,6	36	106,5	1,0
Hungary	37	99,2	4,8	34	105,8	2,5
Italy	107	99,3	4,2	102	105,1	2,4
Netherlands	264	98,6	4,4	263	105,4	10,4
Poland	34	99,6	1,7	34	105,7	1,8
USA	1106	102,4	2,4	1085	106,3	4,3

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

Yield
- No change

Fertility
- No change

Calving
- No change

Conformation
- No change

Udder health
- No change

Longevity
- No change

Milking speed and temperament
- No change

Dates of publication of Interbull breeding values in 2020:

Table 32. Dates of publication in 2020

Month	Date
April	7
August	11
December	1

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

Regards
Ulrik Sander Nielsen, Anders Fogh, Emma Carlén, Terhi Vahlsten and Martha Bo Almskou