INTERBULL breeding values calculated August 2017

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 08.08.2017.

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 Changes since last routine run	**Young genomic tested Holstein 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 routine 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 NAV Interbull Search.

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 2010 or later, that have more than 60 daughters in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2010 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	14	96,1	97,7	95,4	96,2	7,3
Canada	24	85,3	85,3	79,7	80,8	10,1
Germany	15	96,9	98,5	96,5	97,2	6,6
DNK/FIN/SWE	394	102,5	103,0	103,8	103,8	7,3
Estonia	15	95,5	93,8	92,6	92,5	9,5
UK	5	81,8	81,2	74,4	75,6	5,9
Norway	255	95,9	94,6	96,3	95,7	8,4
New Zealand	21	86,1	90,3	84,7	86,8	10,7
USA	9	76,6	65,0	63,4	61,4	11,3

Table 3.Genetic level for yield traits, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	96	95,3	99,0	96,1	97,5	7,5
Belgium	32	103,6	104,2	102,2	102,8	8,0
Canada	630	107,0	107,2	104,4	105,0	8,9
Switzerland	45	99,8	100,4	97,2	98,0	7,7
Czech Republic	35	103,7	102,8	100,5	100,7	9,0
Germany	749	105,8	105,0	103,9	103,9	8,2
DNK/FIN/SWE	606	102,1	103,1	104,0	104,0	8,4
Spain	131	103,5	101,3	98,5	98,7	8,2
Estonia	63	93,8	97,1	92,1	93,8	8,6
France	605	106,2	103,2	105,3	104,3	7,3
UK	181	103,4	103,5	100,4	101,1	9,6
Ireland	162	77,0	93,5	84,7	89,8	11,4
Israel	99	96,4	101,8	96,8	98,9	7,1
Italy	666	102,6	101,5	99,4	99,6	8,2
Japan	101	108,9	102,9	104,0	102,6	8,0
Luxembourg	6	105,7	107,3	104,5	105,5	7,6
Netherlands	870	104,4	104,1	103,7	103,7	9,3
New Zealand	554	77,8	93,6	87,2	91,7	7,3
Poland	393	99,4	99,2	97,0	97,4	7,6
Slovenia	31	92,5	90,7	89,2	89,2	7,0
USA	3259	107,4	105,7	103,6	103,7	8,8

Table 4.Genetic level for yield traits, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	25	103,7	94,2	101,0	96,8	6,1
Canada	10	103,7	86,6	97,4	90,2	17,3
Denmark	127	100,8	102,4	102,0	102,6	8,3
New Zealand	361	97,8	88,5	97,6	93,0	7,3
USA	459	117,3	102,9	112,8	106,5	8,3

International comparison for yield among most important countries shows that:

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

Conformation

The international genetic evaluation is done for 16 linear traits for Holstein, Red breeds and Jersey. In addition, frame condition score and locomotion is 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 2010 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	49	105,7	5,4	101,8	3,8	108,4	7,1
Germany	21	109,4	6,8	104,0	3,4	103,6	8,9
DNK/FIN/SWE	396	98,1	8,4	98,4	5,3	101,2	8,2
Norway	255			98,1	4,6	90,7	9,0
USA	8	108,3	6,5	100,4	3,5	113,0	12,6

Table 6. Genetic level of conformation traits, Holstein. Bulls born in 2010 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	52	111,8	8,6	98,8	4,4	97,1	11,9
Belgium	34	111,8	11,6	100,9	7,5	106,7	11,7
Canada	592	116,6	10,1	101,0	5,6	108,1	10,3
Switzerland	48	116,1	10,5	99,3	6,1	103,0	9,8
Czech Republic	43	110,3	8,3	101,9	5,8	99,3	9,1
Germany	769	110,8	10,4	101,3	6,5	104,5	10,0
DNK/FIN/SWE	598	100,9	11,6	100,3	6,4	103,3	9,5
Spain	157	113,6	10,4	100,4	6,2	104,4	8,7
Estonia	59	103,8	8,8	97,3	4,8	88,0	10,9
France	589	114,4	10,7	99,5	6,0	104,2	10,1
UK	156	111,7	10,3	100,6	5,0	103,1	8,8
Hungary	5	111,4	5,8	100,8	2,6	101,2	7,9
Ireland	52	96,1	13,7	96,4	5,1	85,9	19,5
Italy	682	113,1	10,1	100,9	5,0	104,9	9,5
Japan	437	114,0	10,3	99,6	4,9	101,9	10,1
Luxembourg	8	108,1	8,4	101,5	4,5	105,5	6,1
Netherlands	831	111,6	10,9	102,1	6,4	105,1	10,4
New Zealand	505	86,9	10,0	106,5	9,0	103,6	13,1
Poland	465	106,9	9,9	99,4	4,9	95,2	9,1
Slovenia	30	102,2	9,4	98,8	7,1	91,1	9,2
USA	2131	112,9	10,3	101,6	5,3	108,9	9,1

Table 7. Genetic level of conformation traits, Jersey. Bulls born in 2010 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	12	104,9	7,0	101,8	5,6	87,7	7,9
Canada	25	114,8	5,5	111,1	7,3	98,8	7,7
Denmark	124	100,3	9,6	101,2	7,4	100,4	9,8
USA	494	112,5	7,7	103,4	7,3	96,1	8,4

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

- Red breeds: Canada and Germany have generally higher genetic level for frame, feet&legs and 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 countries. North America, Spain, France, Germany, UK, Netherlands and Italy have the highest genetic level for frame. Countries 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 countries. DNK/FIN/SWE has an average genetic level for udder. North America has the highest genetic level for udder.

- Jersey: Denmark has lower genetic level for frame than USA, but better 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 2010 or later.

Country	No. of bulls	Average	STD
Australia	5	97,3	7,7
Canada	7	93,2	6,4
Germany	15	88,6	9,4
DNK/FIN/SWE	480	100,2	8,3
Estonia	15	90,3	8,6
Norway	255	95,2	10,0
New Zealand	40	89,0	10,1
USA	18	92,2	8,3

Table 9. Genetic level for udder health, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	144	94,8	6,9
Austria	5	100,4	6,2
Belgium	34	99,8	6,7
Canada	437	96,4	8,1
Switzerland	52	93,3	7,4
Czech Republic	42	97,2	6,9
Germany	782	96,4	8,1
DNK/FIN/SWE	610	102,6	7,7
Spain	157	93,8	8,2
Estonia	59	95,8	8,3
France	566	96,5	7,0
UK	119	95,9	7,6
Hungary	5	96,7	6,0
Ireland	177	95,3	8,6
Israel	103	100,8	7,6
Italy	672	96,4	7,9
Japan	399	91,9	8,3
Luxembourg	8	93,9	10,4
Netherlands	878	97,6	7,7
New Zealand	586	92,0	8,7
Poland	533	95,5	8,4
Slovenia	31	92,1	9,5
USA	3359	100,0	8,1

Table 10. Genetic level for udder health, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	12	91,8	8,0
Canada	9	81,5	5,2
Denmark	140	101,7	8,0
UK	5	91,5	4,5
USA	542	89,0	8,7

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

- Red breeds: DNK/FIN/SWE has higher genetic level than Norway
- Holstein: DNK/FIN/SWE and USA have higher genetic level than other major European countries 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 2009 or later.

Country	No. of bulls	Average	STD
Australia	17	87,3	11,7
Canada	58	90,2	8,7
Germany	15	86,1	9,4
DNK/FIN/SWE	369	99,5	8,1
UK	9	86,6	7,4
Norway	96	89,5	6,8
New Zealand	55	87,1	6,1
USA	18	81,6	6,7

Table 12. Genetic level for longevity, Holstein. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	128	89,4	9,6
Belgium	38	97,6	9,0
Canada	719	95,5	9,5
Switzerland	69	88,4	6,8
Czech Republic	56	96,7	7,7
Germany	805	95,4	8,7
DNK/FIN/SWE	679	101,1	8,4
Spain	203	96,0	7,1
France	864	93,5	7,8
UK	189	95,6	7,3
Hungary	12	95,2	6,7
Ireland	184	93,3	6,6
Israel	140	93,5	5,6
Italy	795	97,4	7,2
Luxembourg	5	94,5	5,1
Netherlands	993	96,7	8,4
New Zealand	765	91,5	6,0
Poland	728	92,9	7,3
Slovenia	43	91,8	9,0
USA	3567	101,8	9,6

Table 13. Genetic level for longevity, Jersey. Bulls born in 2009 or later.

Country	No	Average	STD
Australia	43	87,8	4,9
Canada	33	88,5	6,9
Denmark	112	100,2	7,3
UK	7	86,8	4,2
Ireland	6	84,2	4,6
New Zealand	499	89,6	5,3
USA	490	93,1	7,1

International comparison for longevity among most important countries shows that:

- Red breeds: DNK/FIN/SWE has higher level than the other countries
- Holstein: Canada, Germany and France have 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 2010 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 2010 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	49	94,7	9,2	12	96,2	6,4
DNK/FIN/SWE	434	101,4	9,4	307	101,3	8,0
Norway	255	100,1	10,2	255	91,9	7,8
USA	6	97,8	7,7	0		

Table 15. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2010 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	177	94,8	7,4	7	98,9	5,2
Austria	6	94,8	2,8	5	97,0	5,7
Belgium	32	99,8	5,1	30	99,0	7,5
Canada	691	97,2	6,5	623	98,4	7,8
Switzerland	55	95,2	5,5	42	97,6	5,3
Germany	767	96,8	6,5	704	97,4	7,6
DNK/FIN/SWE	614	101,5	7,5	578	101,8	7,3
France	641	97,4	7,4	547	99,6	9,3
UK	166	99,2	5,8	47	98,5	7,6
Hungary	5	96,2	3,5	4	100,8	4,2
Ireland	188	99,6	5,0	9	104,1	8,2
Israel	21	97,3	7,3	105	95,7	5,1
Italy	678	95,7	7,2	262	97,6	6,0
Luxembourg	9	92,3	6,7	7	98,4	8,4
Netherlands	783	97,5	6,2	685	98,0	7,0
New Zealand	598	99,6	5,1	8	94,0	8,5
USA	3597	98,2	6,1	3144	102,7	6,5

International comparison for calving traits among most important countries 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 2010 or later.

Country	No. of bulls	Average	STD
Australia	13	96,2	5,7
Canada	24	97,4	6,8
Germany	15	95,2	6,6
DNK/FIN/SWE	339	98,9	8,8
UK	5	96,8	6,9
Norway	255	104,3	8,5
New Zealand	21	98,5	4,3
USA	9	95,0	10,5

Table 17. Genetic level for female fertility, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	93	92,8	8,7
Belgium	30	99,3	8,2
Canada	603	93,4	9,9
Switzerland	45	94,5	3,0
Czech Republic	29	95,0	3,4
Germany	690	95,4	8,0
DNK/FIN/SWE	573	102,1	9,7
Spain	69	93,4	6,5
France	512	94,7	4,4
UK	174	95,5	7,7
Ireland	124	107,5	5,8
Israel	92	98,7	2,5
Italy	642	94,3	6,8
Luxembourg	6	94,3	8,0
Netherlands	758	94,9	8,7
New Zealand	554	104,0	5,1
Poland	251	92,9	7,1
USA	3165	98,7	9,5

Table 18. Genetic level for female fertility, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	25	94,5	9,8
Canada	10	92,2	10,3
Denmark	133	101,4	10,2
New Zealand	361	99,7	6,9
USA	441	89,9	10,4

International comparison for female fertility among most important countries shows that:

- Red breeds: DNK/FIN/SWE has a lower level than Norway
- Holstein: DNK/FIN/SWE is among the countries with the highest genetic level. However Ireland and New Zealand have by far the highest genetic levels
- Jersey: Genetic level is higher in Denmark and New Zealand than the other major countries

Milking speed and temperament

In Tables 19-21, the genetic level for bulls from different countries, born in 2010 or later are shown for Holstein, Red breeds and Jersey.

Table 19. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2010 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	16	93,9	3,1	16	101,7	4,1
Canada	48	92,2	9,4	48	89,3	7,0
Germany	21	102,9	6,5	21	102,0	5,3
DNK/FIN/SWE	445	101,6	7,3	332	101,3	8,2
Norway	208	97,8	1,3	203	100,1	1,9
New Zealand	24	98,8	5,0	24	96,8	4,0

Table 20. Genetic level for milking speed and temperament, Holstein. Bulls born in 2010 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	134	104,2	5,5	134	101,5	6,0
Austria	5	92,8	4,3			
Belgium	27	93,6	6,5	23	101,7	7,4
Canada	492	97,3	7,6	483	102,9	6,8
Switzerland	49	99,1	4,6	48	99,6	4,2
Germany	639	97,4	8,6	471	101,1	10,1
DNK/FIN/SWE	581	98,1	10,2	345	101,0	13,2
France	480	97,1	8,5	470	104,6	9,2
UK	153	97,7	12,6	140	99,3	7,6
Ireland	9	91,0	6,3			
Italy	45	93,9	9,1	43	99,5	8,4
Luxembourg	6	102,1	6,3			
Netherlands	639	97,8	9,7	559	101,0	8,5
New Zealand	526	102,9	6,2	526	95,0	3,6
Slovenia	32	96,9	4,4			
USA	518	98,4	10,2	499	105,1	9,2

Table 21. Genetic level for milking speed, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australien	32	100,7	5,3
Canada	20	95,7	8,1
Denmark	128	97,8	11,2
New Zealand	329	97,5	7,9
USA	41	99,0	7,7

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 than Norway. For temperament the levels are similar
- Holstein: DNK/FIN/SWE has similar level as other countries for milking speed. For temperament DNK/FIN/SWE are among the best populations
- Jersey: Denmark has similar genetic level as New Zealand and USA

NTM for Nordic and foreign bulls

NTM index is calculated for all bulls (Nordic and others) that have official breeding values (NAV breeding values or international EBVs) for yield, udder health and conformation.

Interbull NTM is calculated by weighing the Interbull / NAV breeding values for yield, female fertility, calving (maternal and direct), udder health, longevity, feet&legs, udder, milking speed and temperament. The same economic weight factors are used as for NAV breeding values.

Rules for calculation of NTM based partly or entirely on international breeding values are stated below in order of priority.

1. **Bull has NAV breeding value for a trait**

If the bull has NAV breeding value for a specific trait, this is used in the calculation of NTM - no matter if the bull also has international breeding value for that trait.

2. **Bull has no NAV breeding value, but has an international breeding value for a trait**

If the bull does not have NAV breeding value for the trait, the international breeding value is used, provided that Interbull calculates international breeding values for that trait and the bull comes from a country which provides data for that trait.

3. **Bull has no NAV or no international breeding value for a trait**

For traits where no Interbull EBV is available or the bull has no Interbull EBV, and at the same time it is not tested in the Nordic countries, a pedigree index is used. Pedigree index is calculated as ½ (EBV_{sire} -100) +1/4 ($EBV_{maternal\ grand\ sire}$-100) +100. The contributions from the sire and maternal grand sire can be based on either NAV breeding values or international breeding values. If EBV_{sire} or $EBV_{maternal\ grand\ sire}$ are unofficial the pedigree index is set to 100.

Publication rules for NTM

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

Genetic level for Interbull NTM

In tables 22-24 genetic level for Interbull NTM for Jersey, Red breeds and Holstein are shown. Bulls included are born in 2010 or later.

Table 22. Genetic level for NTM, Red breeds. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Canada	11	-24,2	13,3
Germany	15	-7,5	8,0
DNK/FIN/SWE	394	5,2	7,8
Norway	255	-8,9	8,4

Table 23. Genetic level for NTM, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	43	-4,4	9,2
Belgium	31	2,4	7,2
Canada	420	0,0	9,4
Switzerland	45	-8,5	7,3
Czech Republic	35	-2,2	6,8
Germany	736	-0,4	8,2
DNK/FIN/SWE	602	7,5	7,6
Spain	131	-6,1	8,3
Estonia	55	-10,6	7,9
France	530	-0,8	6,6
UK	167	-2,4	8,1
Ireland	62	-9,4	10,3
Italy	655	-4,2	8,0
Japan	101	-2,8	7,4
Luxembourg	6	0,5	7,8
Netherlands	816	0,9	8,3
Poland	393	-8,4	8,1
Slovenia	31	-15,1	8,3
USA	2313	4,7	8,4

Table 24. Genetic level for NTM, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	12	-11,0	4,8
Canada	8	-19,0	14,6
Denmark	126	4,1	8,9
USA	403	-4,2	8,9

International comparison of NTM among most important countries 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 8 index points better than USA

Changes since last routine run

In the routine evaluation in August 2017 the following changes are done compared to April 2017 routine evaluation:

Yield

- Holstein from France have some animals changing from official to unofficial
- RDC from Norway have some animals changing reliability due to rolling definition of Herd x Year x Season
- Holstein from Germany have some bulls that loose daughters due to change of data/pedigree
- Jersey from New Zealand has change in daughters per bull due to DNA parentage testing
- Holstein from Spain has base change

Fertility

- RDC from Norway have fixed an error resulting in more daughters being included
- Jersey from New Zealand has change in daughters per bull due to DNA parentage testing
- Holstein from Spain has base change
- Holstein from USA have decreasing number of daughters due to data edit

Calving

- Holstein from France have some animals changing from official to unofficial
- RDC from Norway have some animals changing reliability due to rolling definition of Herd x Year x Season
- Holstein from Germany have some bulls that loose daughters due to change of data/pedigree
- Holstein from Italy have few changes due to pedigree correction
- Jersey from New Zealand has change in daughters per bull due to DNA parentage testing
- Holstein from USA have changed data edit procedure

Conformation

- Holstein from France have some animals changing from official to unofficial
- RDC from Norway have some animals changing reliability due to rolling definition of Herd x Year x Season
- Holstein from Germany have some bulls that loose daughters due to change of data/pedigree
- Holstein from USA have a decrease in some information due to parentage verification corrections

Udder health

- Holstein from France have some animals changing from official to unofficial
- Holstein from Germany have some bulls that loose daughters due to change of data/pedigree
- Jersey from New Zealand has change in daughters per bull due to DNA parentage testing
- Holstein from Holland has changed procedure for handling SCC which results in changed standard deviation

Longevity

- RDC from Norway have fixed an error resulting in more daughters being included
- Jersey from New Zealand has change in daughters per bull due to DNA parentage testing
- Holstein from Germany has used the rule that cows without culling date and with last calving date over 750 days ago are excluded resulting in decrease of information
- Holstein from Spain introduced changed tested in January testrun – change in editing and fixed and random effects

Milking speed and temperament

- Holstein from France have some animals changing from official to unofficial
- Holstein from Germany have some bulls that loose daughters due to change of data/pedigree
- Holstein from Italy has made a one-year data cut-off
- Jersey from New Zealand has change in daughters per bull due to DNA parentage 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 2014 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Belgium	100	106,8	106,9	104,8	105,3	7,7
Canada	394	116,8	117,5	116,2	116,6	7,6
Germany	445	114,6	115,8	115,6	115,9	5,9
DNK/FIN/SWE	187	107,5	113,5	112,7	114,1	5,6
Spain	80	113,3	111,3	110,0	109,9	5,9
France	527	109,8	111,5	111,1	111,6	6,2
UK	69	100,4	107,3	101,5	104,0	23,6
Italy	220	113,0	114,5	113,3	113,9	6,3
Netherlands	263	113,3	115,8	114,6	115,3	6,1
Poland	127	107,4	109,0	107,0	107,7	7,2
USA	1292	115,7	118,4	115,5	116,7	5,8

International comparison for yield among most important countries shows that DNK/FIN/SWE, Canada, Germany, USA, and Netherlands have similar genetic level

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 2014 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Belgium	100	113,9	8,5	102,2	4,4	110,2	7,2
Canada	394	119,7	8,4	104,7	3,7	117,5	8,3
Germany	445	115,5	8,1	106,0	4,9	117,2	8,5
DNK/FIN/SWE	187	105,6	9,8	104,1	5,1	115,4	8,4
Spain	80	120,7	9,3	104,2	5,8	116,3	7,8
France	527	119,0	9,1	104,9	4,9	118,5	8,0
UK	69	105,3	18,4	102,3	4,2	106,1	19,3
Italy	221	116,8	7,5	104,2	4,1	114,5	7,5
Netherlands	263	115,0	8,9	106,9	4,8	114,3	8,7
Poland	127	112,3	8,4	100,9	4,9	105,5	8,6
USA	1294	113,9	8,2	104,0	3,8	113,6	7,3

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

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 2014 or later.

Country	No. of bulls	Average	STD
Belgium	101	99,0	4,9
Canada	394	101,2	5,4
Germany	445	104,0	6,8
DNK/FIN/SWE	187	108,2	6,5
Spain	80	101,6	5,9
France	525	106,3	6,3
UK	69	102,5	5,3
Italy	220	101,5	6,3
Netherlands	263	104,9	7,0
Poland	127	100,2	7,2
USA	1292	101,1	5,1

International comparison for udder health among most important countries show that DNK/FIN/SWE and France have higher genetic level than other major European and North American countries

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 2014 or later.

Country	No. of bulls	Average	STD
Belgium	101	100,8	5,9
Canada	394	108,4	5,7
Germany	445	110,9	6,4
DNK/FIN/SWE	187	113,1	5,6
Spain	80	105,8	6,3
France	519	106,6	5,9
UK	68	105,2	9,5
Italy	220	107,3	5,6
Netherlands	263	110,0	5,6
Poland	82	102,2	6,9
USA	1293	110,0	5,0

International comparison for longevity among most important countries shows that DNK/FIN/SWE, Germany, Canada, Netherlands and USA have the highest level

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 2014 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Belgium	100	97,4	4,5	100	97,4	4,5
Canada	394	100,1	7,2	394	100,1	7,2
Germany	445	99,5	7,3	445	99,5	7,3
DNK/FIN/SWE	187	108,1	8,5	187	108,1	8,5
Spain	80	97,5	8,7	80	97,5	8,7
France	524	99,5	7,3	524	99,5	7,3
UK	69	106,4	12,9	69	106,4	12,9
Italy	221	98,2	7,1	221	98,2	7,1
Netherlands	263	98,7	7,1	263	98,7	7,1
Poland	126	95,0	6,9	126	95,0	6,9
USA	1294	100,9	6,5	1294	100,9	6,5

International comparison for calving traits among most important countries shows that DNK/FIN/SWE is the absolute best population for both calving, direct and calving, maternal.

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 2014 or later.

Country	No. of bulls	Average	STD
Belgium	98	97,0	3,8
Canada	362	100,0	4,7
Germany	425	100,4	4,9
DNK/FIN/SWE	162	104,6	5,1
Spain	78	100,6	5,3
France	489	99,7	4,9
UK	67	100,1	4,2
Italy	213	99,6	5,2
Netherlands	250	101,5	5,4
Poland	75	99,6	5,0
USA	1129	101,2	4,5

International comparison for female fertility among most important countries shows that DNK/FIN/SWE is the best country

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 2014 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	394	101,6	4,2			
Germany	426	99,0	4,2	400	107,4	7,9
DNK/FIN/SWE	185	104,1	2,8	183	104,9	5,1
Spain	78	97,5	2,4	77	106,2	2,0
France	517	98,3	3,6	470	107,3	4,4
UK	68	101,2	4,3	47	108,9	8,1
Italy	220	100,8	2,9			
Netherlands	261	98,1	5,1	244	107,2	8,6
Poland	77	98,5	3,1	75	106,2	4,7
USA	1289	103,1	4,0			

International comparison for milking speed and temperament among most important countries show that for milking speed DNK/FIN/SWE and USA are the superior populations. For temperament DNK/FIN/SWE are among the populations with the lowest level

Changes since last routine run
In the routine evaluation in August 2017 the following changes are done compared to April 2017 routine evaluation:

Yield
- Holstein from Canada has corrected proof types to better reflect the information included in the GEBV calculations for each bull

Fertility
- Holstein from Canada has corrected proof types to better reflect the information included in the GEBV calculations for each bull

Calving
- Holstein from Canada has corrected proof types to better reflect the information included in the GEBV calculations for each bull

Conformation
- Holstein from Canada has corrected proof types to better reflect the information included in the GEBV calculations for each bull

Udder health
- Holstein from Canada has corrected proof types to better reflect the information included in the GEBV calculations for each bull

Longevity
- Holstein from Canada has corrected proof types to better reflect the information included in the GEBV calculations for each bull
- Holstein from Spain has EBVs based on new traditional model

Milking speed and temperament
- Holstein from Canada has corrected proof types to better reflect the information included in the GEBV calculations for each bull
- Holstein from Great Britain has implemented new method for calculation reliabilities. Further correction of proof type

Dates of publication of Interbull breeding values in 2017:

Table 32. Dates of publication in 2017

Month	Date
August	8
December	5

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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