INTERBULL breeding values calculated April 2018

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 03.04.2018.

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 routine **run**	**Young genomic tested bulls:** **Yield** Conformation Somatic cell count and udder health Longevity Calving – maternal and direct Female fertility Milking speed and temperament 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 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 2011 or later, that have more than 60 daughters in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2011 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	14	99,1	96,4	97,5	96,8	12,2
Canada	15	88,9	89,5	83,9	85,1	7,3
Germany	9	92,2	99,2	94,3	96,4	5,4
DNK/FIN/SWE	319	102,0	102,5	103,5	103,4	7,3
Estonia	13	99,6	98,7	97,8	97,8	10,0
UK	5	84,6	87,2	79,6	81,8	7,0
Norway	211	96,9	95,1	97,7	96,8	8,7
New Zealand	20	86,8	91,6	86,8	88,7	8,6

Table 3.Genetic level for yield traits, Holstein. Bulls born in 2011 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	69	97,3	100,1	97,2	98,3	6,3
Belgium	36	105,9	104,2	102,3	102,4	7,9
Canada	586	108,0	108,3	105,5	106,1	8,6
Switzerland	33	99,9	102,3	98,2	99,5	7,9
Czech Republic	26	105,2	103,4	101,8	101,7	7,6
Germany	634	107,3	105,8	104,6	104,6	8,8
DNK/FIN/SWE	509	102,6	103,4	104,3	104,3	8,8
Spain	74	107,1	103,5	102,4	101,8	7,7
Estonia	39	97,1	98,8	93,2	94,7	7,2
France	459	105,8	103,4	105,0	104,2	7,7
UK	151	102,3	103,1	99,1	100,1	10,9
Ireland	137	78,8	95,4	86,1	91,3	9,1
Israel	86	98,9	106,7	99,2	102,2	6,8
Italy	439	103,6	103,8	101,2	101,8	8,3
Japan	75	110,9	105,8	106,0	104,9	7,6
Netherlands	715	105,6	105,6	104,4	104,6	9,8
New Zealand	604	79,7	95,3	89,1	93,4	7,1
Poland	316	100,1	100,2	97,8	98,3	7,2
Slovenia	31	94,3	90,7	89,2	88,7	9,0
USA	2789	108,6	108,2	105,4	105,8	8,9

Table 4. Genetic level for yield traits, Jersey. Bulls born in 2011 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	19	105,4	92,9	103,4	97,5	6,8
Canada	7	108,6	100,4	105,4	102,1	18,3
DNK/FIN/SWE	101	101,7	104,3	103,6	104,6	7,8
New Zealand	388	99,1	90,7	99,1	94,9	7,1
USA	397	117,8	104,2	113,4	107,6	8,9

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, 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 2011or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	5	97,4	7,9	99,8	5,8	85,4	4,7
Canada	43	105,1	5,2	101,7	4,0	108,2	7,6
Germany	17	109,7	6,1	104,6	4,3	103,6	8,7
DNK/FIN/SWE	342	97,4	8,4	99,1	5,3	100,2	8,0
Norway	211			98,3	4,8	89,5	8,6

Table 6. Genetic level of conformation traits, Holstein. Bulls born in 2011 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	50	112,4	9,1	98,2	5,2	96,4	12,3
Belgium	33	110,1	11,6	100,7	8,3	107,1	11,9
Canada	544	116,8	10,2	101,4	5,4	109,4	10,4
Switzerland	38	119,2	9,8	100,3	5,4	106,6	11,2
Czech Republic	36	114,1	9,3	102,6	5,1	96,8	8,9
Germany	657	111,4	10,4	101,4	6,4	106,0	9,6
DNK/FIN/SWE	487	100,7	11,7	100,6	6,4	103,3	9,6
Spain	88	114,9	10,5	100,5	6,0	103,9	8,7
Estonia	42	106,1	7,1	98,0	5,5	88,9	11,5
France	446	115,1	11,2	100,0	6,1	106,1	9,7
UK	118	112,1	11,2	100,0	5,1	103,7	11,9
Hungary	5	107,4	10,2	100,0	4,1	103,4	8,8
Ireland	36	92,8	12,8	96,4	5,0	79,4	15,3
Italy	439	114,4	10,1	100,7	5,2	106,2	9,8
Japan	352	114,8	10,0	99,6	4,9	102,7	10,1
Luxembourg	5	110,4	10,4	101,4	4,4	105,4	6,0
Netherlands	667	112,4	10,3	102,4	6,4	105,9	10,3
New Zealand	565	86,8	9,9	106,7	12,7	105,7	8,1
Poland	400	108,5	9,9	99,1	4,8	95,3	9,3
Slovenia	28	102,4	10,7	98,3	7,2	93,9	8,1
USA	1626	113,2	10,7	101,5	5,3	109,5	9,3

Table 7. Genetic level of conformation traits, Jersey. Bulls born in 2011 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	7	104,9	4,5	100,3	5,0	88,4	7,3
Canada	20	114,1	5,8	107,4	7,4	98,7	8,1
DNK/FIN/SWE	109	101,0	9,0	101,1	7,0	101,0	9,3
UK	6	104,5	5,0	100,0	4,0	100,0	8,6
USA	422	113,2	7,9	103,6	7,5	97,7	8,8

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

- Red breeds: Canada 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 populations. North America, Spain, France, Germany, UK, Netherlands 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 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 2011 or later.

Country	No. of bulls	Average	STD
Australia	6	92,2	12,2
Germany	10	92,5	10,1
DNK/FIN/SWE	374	101,1	7,9
Estonia	11	85,5	8,4
Norway	211	94,8	9,6
New Zealand	29	91,5	8,6
USA	5	88,9	8,1

Table 9. Genetic level for udder health, Holstein. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Australia	124	93,7	7,6
Belgium	38	98,6	8,1
Canada	394	97,0	8,1
Switzerland	41	96,2	6,3
Czech Republic	34	94,9	6,0
Germany	677	96,7	7,8
DNK/FIN/SWE	490	102,2	7,8
Spain	96	92,6	8,1
Estonia	38	94,9	5,8
France	428	96,5	6,8
UK	90	95,8	7,9
Hungary	5	97,5	7,0
Ireland	148	94,4	9,1
Israel	89	99,6	8,4
Italy	416	96,1	7,8
Japan	305	92,2	7,8
Korea	8	93,5	5,0
Luxembourg	5	93,0	6,0
Netherlands	714	98,1	7,3
New Zealand	649	91,0	8,9
Poland	438	94,3	8,2
Slovenia	32	92,8	9,3
USA	2856	100,0	8,1

Table 10. Genetic level for udder health, Jersey. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Australia	9	87,4	8,5
Canada	9	83,0	7,3
DNK/FIN/SWE	108	101,5	7,6
New Zealand	396	95,4	8,4
USA	451	90,0	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 and USA have higher genetic level than other major European populations 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 2010 or later.

Country	No. of bulls	Average	STD
Australia	10	93,1	9,9
Canada	44	90,0	9,5
Germany	24	90,7	8,9
DNK/FIN/SWE	287	101,2	7,9
UK	8	83,8	9,3
Norge	170	90,9	6,8
New Zealand	54	86,0	6,4
USA	18	81,6	8,1

Table 12. Genetic level for longevity, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	94	88,6	9,3
Austria	6	97,2	5,0
Belgium	36	102,4	10,0
Canada	703	97,6	8,9
Switzerland	62	88,6	7,2
Czech Republic	22	97,9	8,5
Germany	918	99,2	8,8
DNK/FIN/SWE	543	101,6	8,1
Spain	152	98,0	6,6
France	670	94,2	7,6
UK	171	97,2	7,4
Hungary	7	100,7	6,7
Ireland	140	93,7	7,0
Israel	127	94,2	5,2
Italy	652	97,6	6,7
Luxembourg	8	98,0	13,3
Netherlands	898	98,9	8,6
New Zealand	829	91,8	6,0
Poland	609	93,4	7,4
Slovenia	45	90,7	9,4
USA	3261	103,3	9,1
South Africa	5	97,0	7,0

Table 13. Genetic level for longevity, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	26	88,1	5,0
Canada	17	89,7	10
DNK/FIN/SWE	92	100,3	6,5
UK	6	85,2	5,0
New Zealand	507	90,6	5,8
USA	494	93,8	7,4

International comparison for longevity among most important populations shows that:

- Red breeds: DNK/FIN/SWE has higher level than the other populations
- Holstein: Canada 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 2011 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 2011 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	42	95,1	8,2	6	96,5	9,5
DNK/FIN/SWE	341	101,9	9,5	300	103,2	8,6
Norway	211	100,3	10,2	211	91,7	7,1

Table 15. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2011 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	128	95,5	6,4			
Austria	6	100,5	6,0	5	100,4	5,5
Belgium	36	99,8	5,3	29	98,8	7,9
Canada	638	98,1	6,9	583	99,2	8,5
Switzerland	46	96,3	5,7	30	100,0	7,1
Germany	689	98,3	7,1	602	98,1	9,5
DNK/FIN/SWE	509	101,8	7,7	501	101,9	7,5
Spain	71	97,0	4,3	6	98,7	2,3
France	510	98,1	7,5	420	100,5	9,4
UK	153	99,1	6,1	54	99,4	8,5
Hungary	5	96,8	5,2			
Ireland	161	99,8	4,6			
Israel	29	98,4	7,0	100	96,0	4,5
Italy	452	96,0	7,0	160	98,6	6,5
Luxembourg	7	91,6	6,2			
Netherlands	701	98,3	6,4	558	98,5	7,9
New Zealand	659	99,4	5,0			
USA	3051	99,0	6,0	2573	104,1	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 2011 or later.

Country	No. of bulls	Average	STD
Australia	12	97,8	11,2
Canada	14	100,2	8,7
Germany	9	93,0	10,1
DNK/FIN/SWE	271	100,4	8,7
UK	5	98,2	2,9
Norway	211	104,0	7,9
New Zealand	20	98,0	5,0

Table 17. Genetic level for female fertility, Holstein. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Australia	66	93,0	5,9
Belgium	29	99,5	9,7
Canada	571	92,7	10,0
Switzerland	33	94,2	4,7
Czech Republic	24	95,0	2,7
Germany	573	94,9	9,6
DNK/FIN/SWE	465	101,7	9,7
Spain	23	93,4	6,0
France	363	93,8	8,7
UK	144	96,0	8,1
Ireland	131	108,7	3,8
Israel	83	98,7	2,4
Italy	405	93,2	6,9
Netherlands	613	94,5	9,4
New Zealand	604	102,7	4,9
Poland	171	93,9	5,9
USA	2672	97,6	9,4

Table 18. Genetic level for female fertility, Jersey. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Australia	19	95,8	8,5
Canada	8	90,0	13,8
DNK/FIN/SWE	98	100,6	12,0
New Zealand	388	99,1	7,0
USA	386	88,1	10,5

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 and USA are the populations with the highest genetic level. However Ireland and New Zealand have the highest genetic levels
- 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 2011 or later are shown for Holstein, Red breeds and Jersey.

Table 19. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2011 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	16	96,6	5,1	16	102,7	6,2
Canada	42	92,2	6,4	40	90,8	3,4
Germany	17	100,8	7,1	17	103,5	4,6
DNK/FIN/SWE	356	101,8	7,6	287	101,4	8,4
Norway	186	96,6	1,6	180	100,6	2,1
New Zealand	21	101,7	5,7	21	100,2	4,6

Table 20. Genetic level for milking speed and temperament, Holstein. Bulls born in 2011 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	111	103,9	5,7	111	102,4	5,5
Austria	6	97,6	6,6			
Belgium	24	93,4	7,5	20	100,0	7,8
Canada	461	97,6	8,1	447	103,8	6,9
Switzerland	38	95,2	5,8	37	100,0	5,3
Germany	556	97,9	8,9	404	101,7	10,0
DNK/FIN/SWE	441	98,4	9,3	274	102,5	13,0
France	355	96,4	9,1	346	104,4	9,7
UK	118	99,4	14,3	101	100,4	9,9
Italy	352	96,6	6,7	288	101,0	5,3
Luxembourg	5	103,3	5,7			
Netherlands	542	98,2	10,1	478	101,9	8,9
New Zealand	585	104,0	5,4	585	99,7	3,2
Slovenia	31	97,0	5,3			
USA	491	98,9	10,2	464	106,1	8,7

Table 21. Genetic level for milking speed, Jersey. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Australien	25	101,8	5,4
Canada	16	97,2	7,9
DNK/FIN/SWE	84	98,6	11,5
New Zealand	326	98,6	8,0
USA	36	97,1	8,7

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 populations for milking speed and temperament.
- 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 2011 or later.

Table 22. Genetic level for NTM, Red breeds. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Canada	5	-7,0	15,0
Germany	9	-6,9	9,2
DNK/FIN/SWE	319	5,8	7,8
Norway	211	-8,7	8,6

Table 23. Genetic level for NTM, Holstein. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Australia	37	-6,8	7,4
Belgium	35	2,2	7,2
Canada	371	2,0	8,6
Switzerland	33	-6,0	7,8
Czech Republic	26	-1,7	6,2
Germany	617	1,1	8,6
DNK/FIN/SWE	501	8,1	7,4
Spain	74	-3,6	7,2
Estonia	35	-9,7	6,4
France	391	-0,2	6,9
UK	123	-1,3	8,4
Ireland	42	-8,7	8,2
Italy	410	-2,9	7,6
Japan	75	-1,7	7,5
Netherlands	667	2,4	8,2
Poland	314	-7,7	7,6
Slovenia	30	-14,2	7,5
USA	1786	6,8	8,1

Table 24. Genetic level for NTM, Jersey. Bulls born in 2011 or later.

Country	No. of bulls	Average	STD
Australia	5	-13,8	9,3
Canada	5	-5,4	13,2
DNK/FIN/SWE	100	5,4	8,1
USA	344	-2,5	9,2

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 8 index points better than USA

Changes since last routine run
In the routine evaluation in April 2018 the following changes are done compared to December 2017 routine evaluation:

Yield
- Base change introduced:
    - All French breeds
    - All German breeds
    - Holstein from Italy
    - All Canadian breeds
- Holstein from Italy has cut off one year of data
- All breeds from New Zealand correct parentage by DNA test

Fertility
- Base change introduced:
    - All French breeds
    - Holstein from Italy
    - All Canadian breeds
- Holstein from Italy has cut off one year of data
- Holstein from France have changed data editing
- Holstein from France participate for the first time with interval trait
- All breeds from New Zealand correct parentage by DNA test

Calving
- Base change introduced:
    - Holstein from Germany
    - Holstein from Italy
    - All Canadian breeds
- Holstein from Italy has cut off one year of data
- Holstein from Germany has changed editing
- All breeds from New Zealand correct parentage by DNA test

Conformation
- Base change introduced:
    - Holstein from France
    - Holstein from Germany
    - Holstein from Italy
    - All Canadian breeds
- Holstein from Italy has cut off one year of data
- All breeds from New Zealand correct parentage by DNA test

Udder health
- Base change introduced:
    - Holstein from France
    - Holstein from Germany
    - Holstein from Italy
    - All Canadian breeds
- Holstein from Italy has cut off one year of data
- All breeds from Holland adjust calculation of EDC
- All breeds from New Zealand correct parentage by DNA test

Longevity

- Base change introduced:
    - Holstein from France
    - Holstein from Italy
    - All Canadian breeds
- Holstein from Italy has cut off one year of data
- Holstein from Germany introduces new model
- Holstein from Holland introduces new model
- All breeds from New Zealand correct parentage by DNA test

Milking speed and temperament

- Base change introduced:
    - Holstein from France
    - Holstein from Germany
    - Holstein from Italy
    - All Canadian breeds
- Holstein from Italy has cut off one year of data
- All breeds from New Zealand correct parentage by DNA test

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 2015 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Belgium	42	106,6	107,0	105,5	105,8	7,4
Canada	345	118,6	119,4	118,7	118,9	7,9
Switzerland	5	104,4	107,8	106,4	107,6	3,3
Germany	388	115,5	117,1	117,6	117,9	6,2
DNK/FIN/SWE	123	107,6	115,0	114,0	115,6	6,0
Spain	51	115,6	111,3	113,4	112,1	6,2
France	403	111,2	112,9	113,8	114,0	6,0
UK	28	110,8	117,9	113,8	116,0	12,1
Italy	144	115,0	117,2	116,9	117,4	6,2
Luxembourg	9	125,4	120,9	122,7	121,3	4,3
Netherlands	203	113,6	117,4	117,0	117,9	7,1
Poland	77	110,9	112,5	112,0	112,4	6,5
USA	818	116,9	120,1	117,5	118,7	6,3

International comparison for yield shows that DNK/FIN/SWE, has similar level as 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 2015 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Belgium	40	116,1	6,7	102,8	4,1	112,2	6,5
Canada	257	119,1	8,1	104,0	3,5	116,4	8,1
Germany	280	115,5	8,3	106,5	4,5	117,7	8,0
DNK/FIN/SWE	93	106,3	10,0	104,8	5,2	116,3	8,0
Spain	45	118,3	11,1	105,4	4,9	117,3	8,6
France	308	119,9	9,2	105,3	5,0	119,6	7,7
UK	21	109,0	10,2	101,9	2,8	110,3	12,6
Italy	102	118,2	8,5	104,2	4,3	114,1	8,5
Netherlands	147	114,8	9,4	107,3	5,3	114,6	9,3
Poland	61	114,0	9,0	101,5	5,3	108,2	8,8
USA	593	113,0	9,0	103,3	3,6	113,7	8,0

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

Somatic cell count and udder health

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

Table 27. Genetic level for udder health, Holstein. Bulls born in 2015 or later.

Country	No. of bulls	Average	STD
Belgium	40	99,1	5,2
Canada	255	100,2	4,4
Germany	273	105,2	6,8
DNK/FIN/SWE	92	109,3	5,9
Spain	43	102,6	6,6
France	304	107,6	6,2
UK	17	103,6	4,1
Italy	48	104,1	6,9
Netherlands	143	107,0	6,9
Poland	61	101,9	6,8
USA	592	99,8	4,4

International comparison for udder health among most important populations show that DNK/FIN/SWE, Netherlands 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 2015 or later.

Country	No. of bulls	Average	STD
Belgium	42	103,7	6,2
Canada	345	107,8	4,9
Switzerland	5	105,0	3,9
Germany	388	113,1	6,2
DNK/FIN/SWE	122	114,4	5,9
Spain	51	106,6	6,4
France	402	107,8	6,3
UK	28	110,4	6,3
Italy	144	107,6	6,1
Luxembourg	9	111,9	5,8
Netherlands	203	111,5	7,0
Poland	45	105,1	6,9
USA	824	109,2	5,0

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

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 2015 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Belgium	42	97,7	4,1	5,0	104,0	5,6
Canada	341	100,3	4,7	344,0	108,4	5,2
Switzerland	5	101,0	5,2	5,0	101,6	7,2
Germany	382	100,9	5,0	382,0	105,7	5,6
DNK/FIN/SWE	121	104,2	5,1	121,0	106,0	4,7
Spain	49	100,8	4,9	49,0	104,3	5,0
France	373	99,2	4,6	373,0	104,3	5,6
UK	28	102,6	4,7	28,0	106,2	5,9
Italy	144	100,1	4,9	144,0	104,8	4,9
Luxembourg	9	101,2	6,1	9,0	107,1	7,2
Netherlands	200	102,0	5,2	202,0	105,0	5,9
Poland	42	99,7	5,1	42,0	101,7	6,7
USA	800	102,1	4,7	817,0	109,6	4,7

International comparison for calving traits shows that DNK/FIN/SWE is the best population for calving and have a similar level as most other countries for 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 2015 or later.

Country	No. of bulls	Average	STD
Belgium	42	97,2	4,7
Canada	345	100,6	6,7
Switzerland	5	97,4	7,8
Germany	388	100,3	6,9
DNK/FIN/SWE	123	106,7	8,1
Spain	51	97,9	5,9
France	383	98,9	7,2
UK	28	103,8	6,4
Italy	144	99,6	6,9
Luxembourg	9	100,6	5,2
Netherlands	203	99,2	7,4
Poland	77	94,4	7,7
USA	816	102,0	6,3

International comparison for female fertility among most important populations 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 2015 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Belgium	5	101,3	3,4			
Canada	344	101,4	3,2	319	108,9	5,1
Switzerland	5	100,5	1,0			
Germany	368	100,0	4,9	363	107,5	8,0
DNK/FIN/SWE	117	102,1	2,9	114	105,7	3,8
Spain	49	100,0	3,5	49	107,9	3,9
France	398	97,3	3,1	367	107,2	4,4
UK	28	102,8	2,1	27	108,4	1,3
Italy	144	99,6	6,5	125	106,8	10,3
Luxembourg	9	98,7	2,2	9	105,3	0,9
Netherlands	201	97,9	5,0	200	106,7	10,0
Poland	44	97,6	3,7	39	104,7	3,1
USA	795	102,8	3,4	755	108,8	5,0

International comparison for milking speed and temperament show that for milking speed DNK/FIN/SWE, UK and USA are the superior populations. For temperament populations have a similar level

Changes since last routine run
In the routine evaluation in April 2018 the following changes are done compared to December 2017 routine evaluation:

Yield
- None

Fertility
- None

Calving
- None

Conformation
- None

Udder health
- None

Longevity
- None

Milking speed and temperament
- None

Dates of publication of Interbull breeding values in 2018:

Table 32. Dates of publication in 2018

Month	Date
April	3
August	7
December	4

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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