INTERBULL breeding values calculated August 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.

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International breeding values for the traits and breeds shown in table 1 have been published 07.08.2018.

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	16	98,0	95,7	96,6	95,9	11,3
Canada	17	87,6	88,1	82,8	84,1	7,3
Germany	11	94,1	99,7	94,9	96,9	5,9
DNK/FIN/SWE	381	101,7	102,5	103,2	103,2	7,6
Estonia	14	99,2	97,7	97,6	97,4	9,4
UK	7	86,0	87,9	80,3	82,0	6,6
Norway	261	96,9	95,1	97,7	96,8	8,8
New Zealand	22	86,1	91,2	86,5	88,4	10,3
USA	5	71,6	65,0	62,4	61,8	5,5

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	79	96,7	99,6	96,5	97,6	6,6
Austria	6	105,3	102,3	98,0	98,2	8,7
Belgium	40	105,9	103,6	101,6	101,5	8,0
Canada	660	107,7	107,7	104,9	105,4	8,6
Switzerland	39	99,0	101,5	97,5	98,8	7,7
Czech Republic	31	105,7	104,5	101,7	102,1	8,1
Germany	742	107,3	105,4	104,3	104,2	8,7
DNK/FIN/SWE	588	102,2	103,0	104,0	103,9	8,7
Spain	115	107,0	102,9	101,6	101,0	7,1
Estonia	48	97,2	98,6	93,3	94,6	7,2
France	525	105,4	102,7	104,2	103,4	7,7
UK	186	101,1	102,5	97,6	98,8	11,4
Hungary	5	107,2	110,6	103,0	105,2	9,6
Ireland	148	78,1	94,6	85,2	90,4	8,9
Israel	103	99,7	106,6	99,6	102,4	6,4
Italy	469	103,1	103,0	100,6	101,1	8,2
Japan	86	110,2	104,7	104,9	103,8	7,9
Luxembourg	5	109,0	109,2	111,0	110,6	11,8
Netherlands	1061	103,0	104,2	102,8	103,3	9,5
New Zealand	611	79,4	94,8	88,4	92,8	7,2
Poland	343	99,6	99,4	96,6	97,1	8,6
Slovenia	33	93,6	89,8	88,6	88,1	8,4
USA	3100	108,2	107,8	104,6	105,2	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	22	104,7	91,7	102,5	96,5	6,5
Canada	8	106,1	97,0	101,9	98,1	17,9
DNK/FIN/SWE	118	101,0	103,8	102,9	103,9	8,6
New Zealand	391	98,4	90,1	98,3	94,2	7,4
USA	440	117,6	103,2	112,7	106,5	9,2

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, 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	97,2	8,0	99,4	5,1	84,8	5,0
Canada	49	104,9	5,1	101,7	3,8	108,1	7,9
Germany	23	109,0	6,1	104,7	4,0	103,0	9,0
DNK/FIN/SWE	382	97,4	8,5	99,1	5,3	100,1	8,1
UK	8	99,6	11,0			105,3	7,1
Norway	260			98,3	4,6	88,7	8,3

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	51	112,2	9,0	97,9	5,0	95,6	12,4
Belgium	38	111,7	13,2	101,5	8,6	106,5	11,9
Canada	594	116,7	10,2	101,3	5,5	109,0	10,4
Switzerland	46	119,8	9,4	101,0	6,0	106,4	11,4
Czech Republic	43	114,4	8,8	102,3	4,9	97,8	9,1
Germany	774	111,7	10,6	101,3	6,3	105,6	9,7
DNK/FIN/SWE	585	101,1	11,6	100,3	6,3	103,4	9,4
Spain	146	115,7	10,2	100,4	6,0	105,2	9,5
Estonia	46	106,1	7,1	97,9	5,2	88,3	11,2
France	502	115,2	11,2	99,9	6,1	106,0	9,8
UK	144	112,4	11,7	99,8	5,2	103,8	12,3
Hungary	8	109,3	8,8	99,3	3,6	101,6	9,8
Ireland	55	93,2	13,2	95,3	5,7	80,1	14,4
Italy	464	114,3	9,9	100,5	5,1	105,9	9,8
Japan	432	114,9	10,0	99,6	4,8	102,8	10,0
Luxembourg	6	111,0	9,0	101,2	3,7	106,0	6,0
Netherlands	988	111,3	10,9	102,1	6,6	104,7	10,5
New Zealand	565	86,8	9,9	106,7	11,9	105,0	8,9
Poland	440	108,6	10,1	99,0	4,7	94,7	9,4
Slovenia	32	102,8	11,5	98,7	7,2	92,8	8,0
USA	1672	113,3	10,6	101,2	5,3	109,0	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	8	104,2	4,2	100,4	4,7	88,8	7,9
Canada	22	114,1	6,1	106,7	7,3	98,0	8,1
DNK/FIN/SWE	136	101,0	9,3	100,6	7,0	100,0	9,4
UK	6	104,0	5,1	100,0	4,7	100,2	7,2
USA	493	112,6	7,9	103,3	7,8	97,9	8,7

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	7	92,9	11,2
Germany	14	92,7	9,2
DNK/FIN/SWE	470	100,8	8,0
Estonia	13	86,0	7,7
Norway	261	93,9	9,7
New Zealand	41	91,4	8,8
USA	6	91,1	9,0

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

Country	No. of bulls	Average	STD
Australia	135	93,4	7,8
Austria	6	98,0	6,3
Belgium	40	98,3	8,2
Canada	457	96,8	8,2
Switzerland	49	95,9	7,4
Czech Republic	39	94,9	6,1
Germany	775	96,6	8,0
DNK/FIN/SWE	585	102,0	7,8
Spain	146	93,9	8,4
Estonia	46	94,6	6,3
France	494	96,7	7,0
UK	123	95,2	7,7
Hungary	8	97,6	6,6
Ireland	149	93,7	9,1
Israel	104	98,9	8,4
Italy	452	96,2	8,1
Japan	390	92,2	7,7
Korea	12	92,5	5,6
Luxembourg	7	94,2	4,8
Netherlands	1059	98,2	7,4
New Zealand	663	90,9	8,8
Poland	464	94,0	8,2
Slovenia	34	91,6	9,7
USA	3190	99,9	8,2

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

Country	No. of bulls	Average	STD
Australia	12	87,7	7,1
Canada	10	84,3	7,8
DNK/FIN/SWE	129	101,3	7,2
UK	7	88,9	8,3
New Zealand	411	95,4	8,3
USA	526	90,2	8,5

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	15	91,8	8,8
Canada	54	89,1	9,7
Germany	26	90,2	8,5
DNK/FIN/SWE	355	101,2	8,3
UK	12	83,9	8,8
Norge	100	90,3	7,0
New Zealand	54	85,8	6,4
USA	20	81,3	8,0

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

Country	No. of bulls	Average	STD
Australia	127	88,6	8,6
Austria	8	95,9	5,0
Belgium	38	102,1	10,1
Canada	788	97,1	8,9
Switzerland	67	88,7	7,5
Czech Republic	22	97,3	8,1
Germany	1004	98,7	9,0
DNK/FIN/SWE	627	101,5	8,3
Spain	179	97,2	6,3
France	738	93,5	7,7
UK	212	97,2	7,9
Hungary	10	98,0	5,8
Ireland	140	93,3	7,3
Israel	144	93,7	5,3
Italy	695	97,0	6,7
Luxembourg	10	97,1	11,9
Netherlands	1311	97,7	8,4
New Zealand	842	91,6	6,3
Poland	641	92,9	7,5
Slovenia	47	90,1	9,1
USA	3587	103	9,1
South Africa	5	96,4	6,9

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

Country	No. of bulls	Average	STD
Australia	34	88,8	5,0
Canada	19	90,0	9,1
DNK/FIN/SWE	117	100,4	6,6
UK	7	85,2	4,4
New Zealand	511	90,8	6,0
USA	572	94,1	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: 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	48	95,3	8,2	9	95,4	8,8
DNK/FIN/SWE	408	101,7	9,5	360	102,8	8,5
Norway	261	99,7	10,2	261	90,7	7,6

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	138	95,3	6,3	5	96,2	7,8
Austria	6	100,5	6,0	6	100,5	5,2
Belgium	38	99,1	5,5	35	99,3	7,6
Canada	710	98,3	6,9	639	99,0	8,6
Switzerland	54	96,6	5,7	35	100,3	7,1
Germany	786	98,2	7,1	675	98,0	9,6
DNK/FIN/SWE	597	101,9	7,5	589	102,0	7,5
Spain	91	96,3	4,7	17	98,9	4,4
France	555	98,1	7,5	465	100,1	9,3
UK	183	99,0	6,1	68	99,3	8,3
Hungary	7	96,3	5,7	4	94,3	7,4
Ireland	161	99,5	4,7	2	113,0	8,5
Israel	32	98,0	6,7	108	96,3	4,7
Italy	478	96,1	7,0	186	97,9	6,8
Luxembourg	7	91,6	6,3	6	96,0	7,7
Netherlands	1038	98,2	6,6	878	97,6	8,0
New Zealand	661	99,2	5,0	3	104,0	4,6
USA	3393	98,9	6,0	2829	103,7	6,9

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	15	99,5	10,4
Canada	16	100,4	9,0
Germany	11	93,0	9,3
DNK/FIN/SWE	344	100,4	8,9
UK	7	101,6	3,9
Norway	261	104,9	8,0
New Zealand	22	97,5	5,1
USA	5	91,8	9,0

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

Country	No. of bulls	Average	STD
Australia	75	92,0	6,7
Austria	5	95,0	4,1
Belgium	32	98,3	9,9
Canada	642	93,2	10,2
Switzerland	38	94,0	4,9
Czech Republic	27	94,7	2,8
Germany	665	94,4	9,5
DNK/FIN/SWE	572	101,9	10,0
Spain	56	92,9	6,7
France	429	93,7	8,4
UK	182	96,3	9,0
Ireland	146	108,7	3,5
Israel	97	98,3	2,4
Italy	450	93,0	7,1
Luxembourg	5	90,4	11,1
Netherlands	948	94,0	9,2
New Zealand	611	102,6	5,0
Poland	244	93,6	6,4
USA	2999	98,9	9,6

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

Country	No. of bulls	Average	STD
Australia	21	97,8	7,6
Canada	8	92,0	13,2
DNK/FIN/SWE	115	100,5	11,8
New Zealand	391	98,6	6,9
USA	423	90,0	11,0

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	96,3	4,5	16	102,5	6,0
Canada	48	93,0	7,8	47	91,0	3,9
Germany	20	101,8	7,6	20	102,6	5,0
DNK/FIN/SWE	433	102,0	7,3	327	101,1	8,5
Norway	224	96,3	1,6	215	100,4	2,3
New Zealand	21	101,9	5,7	21	100,1	4,5

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	110	103,9	5,7	110	102	5,6
Austria	6	96,4	2,9			
Belgium	26	94,8	7,0	21	99,7	7,6
Canada	506	98,0	8,1	493	103,7	7,1
Switzerland	48	93,5	6,9	47	100,2	6,4
Germany	660	97,9	8,9	467	101,9	10,4
DNK/FIN/SWE	583	98,8	8,9	349	102,2	13,6
France	402	96,7	8,8	393	104,1	9,4
UK	152	99,9	14,5	133	101,1	9,8
Italy	436	97,2	6,7	292	100,8	5,4
Luxembourg	6	101,7	4,7			
Netherlands	839	97,5	9,8	736	102,1	8,8
New Zealand	595	103,7	5,4	595	99,4	3,3
Slovenia	34	97,5	4,2			
USA	579	99,2	11,0	539	106,2	9,6

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

Country	No. of bulls	Average	STD
Australien	27	99,9	6,5
Canada	18	95,3	8,0
DNK/FIN/SWE	119	99,3	10,8
New Zealand	326	98,1	8,1
USA	42	97,2	8,6

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
Australia	5	-6,8	13,5
Canada	7	-17,6	7,2
Germany	11	-6,5	9,6
DNK/FIN/SWE	381	5,7	8,1
Norway	260	-9,1	8,8

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

Country	No. of bulls	Average	STD
Australia	39	-8,2	7,5
Austria	5	-7,2	6,8
Belgium	40	1,3	7,4
Canada	421	1,1	8,8
Switzerland	39	-6,3	8,0
Czech Republic	31	-1,8	6,3
Germany	726	0,5	8,7
DNK/FIN/SWE	582	7,7	7,7
Spain	115	-4,0	7,3
Estonia	42	-9,8	6,9
France	455	-1,5	7,2
UK	157	-2,2	8,3
Hungary	5	0,6	4,4
Ireland	54	-9,5	7,7
Italy	446	-3,5	8,0
Japan	86	-2,5	7,8
Luxembourg	5	2,6	9,2
Netherlands	992	0,5	8,5
New Zealand	339	-8,9	7,8
Poland	32	-15,4	6,7
USA	1835	6,1	8,2

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

Country	No. of bulls	Average	STD
Australia	7	-11,6	9,2
Canada	6	-5,3	12,8
DNK/FIN/SWE	117	4,7	8,4
USA	384	-3,2	9,3

International comparison of NTM among most important populations shows that:

- Red breeds: DNK/FIN/SWE is better than Canada and Norway
- Holstein: DNK/FIN/SWE and USA have the highest level
- Jersey: Denmark's average NTM is 8 index points better than USA

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

Yield
- Holstein from Spain have introduced base change
- RDC from Norway may have bull that changes EDC og reliability per due to rolling herd-year-season

Fertility
- Holstein from Spain have introduced base change
- RDC from Norway may have bull that changes EDC og reliability per due to rolling herd-year-season
- Holstein from Germany changes publication rules
- Holstein from Italy changes editing system which can change number of daughters per bull
- All breeds from USA has editing where data shall fulfill criteria on herd level to be included. New data can have the effect that older data for some herds are deletes – if they are below a certain threshold

Calving
- RDC from Norway may have bull that changes EDC og reliability per due to rolling herd-year-season
- Holstein from Germany have corrected data which can lead to decrease in information
- Holstein from Italy have decrease in information due to editing system applied
- Holstein from Spain have edits that can cause decrease in information
- Holstein from Nederland's have included all data from CRV
- All breeds from USA has changed editing procedure which can cause decrease in information

Conformation
- Holstein from Spain have introduced base change
- RDC from Norway may have bull that changes EDC og reliability per due to rolling herd-year-season

Udder health
- Holstein from Spain have introduced base change
- RDC from Norway may have bull that changes EDC og reliability per due to rolling herd-year-season
- Holstein from Nederland's no longer have the data from one of the Dutch management systems.

Longevity
- RDC from Norway may have bull that changes EDC og reliability per due to rolling herd-year-season
- Holstein from Germany have corrected data which can lead to decrease in information
- Holstein from Italy have decrease in information due to editing system applied
- Holstein from Spain have changed editing procedure which can cause decrease in information
- Holstein from Nederland's has changed how reliability is calculated. This results for some bulls in lower EDC

Milking speed and temperament
- RDC from Norway may have bull that changes EDC og reliability per due to rolling herd-year-season
- Holstein from Italy have decrease in information due to editing system applied

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
Australia	31	115,4	113,2	111,3	111,4	6,8
Belgium	67	107,1	107,7	105,9	106,4	6,7
Canada	480	118,2	119,8	118,2	118,8	7,9
Switzerland	11	104,9	107,0	104,7	105,7	6,4
Germany	467	115,5	116,5	117,3	117,4	6,3
DNK/FIN/SWE	171	107,5	114,4	113,2	114,8	6,5
Spain	72	114,7	110,0	111,4	110,2	7,1
France	461	110,6	112,0	112,9	113,0	6,2
UK	41	103,5	110,7	105,3	107,9	21,2
Italy	168	114,3	116,9	115,9	116,6	6,6
Luxembourg	10	124,7	119,1	121,3	119,8	4,8
Netherlands	324	111,0	115,8	115,0	116,0	7,1
Poland	85	110,7	111,7	111,0	111,4	6,4
USA	1092	116,3	120,2	116,7	118,2	6,8

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
Australia	31	114,3	8,1	98,6	3,8	111,1	8,7
Belgium	67	115,5	6,3	102,2	4,2	111,6	6,4
Canada	481	118,0	8,7	102,9	3,5	115,7	8,6
Switzerland	11	116,3	7,9	100,5	4,6	115,3	7,5
Germany	481	114,7	8,5	104,5	4,7	116,5	7,9
DNK/FIN/SWE	171	105,5	10,3	103,3	5,0	115,0	7,4
Spain	72	119,5	11,7	104,3	5,2	117,6	8,1
France	466	119,9	9,4	104,0	4,8	119,5	7,9
Italy	168	117,9	9,2	103,3	4,4	113,7	8,4
Luxembourg	11	115,3	7,0	101,9	3,4	113,0	6,8
Netherlands	324	112,0	9,8	106,2	5,0	112,3	8,7
Poland	85	114,6	9,3	100,7	4,8	108,0	8,2
USA	1092	113,0	9,4	102,2	3,8	112,9	8,4

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
Australia	31	97,4	3,8
Belgium	67	99,3	5,1
Canada	480	101,5	5,5
Switzerland	11	97,4	4,4
Germany	467	103,5	6,7
DNK/FIN/SWE	171	107,7	5,6
Spain	72	102,7	6,4
France	461	106,8	6,1
UK	41	103,1	5,1
Italy	168	103,1	6,8
Luxembourg	10	100,0	5,4
Netherlands	322	105,3	6,5
Poland	85	101,0	6,5
USA	1099	100,8	5,3

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
Australia	31	102,7	3,6
Belgium	67	102,0	6,4
Canada	480	108,3	4,9
Switzerland	11	104,1	2,6
Germany	467	113,3	6,4
DNK/FIN/SWE	169	115,7	6,2
Spain	72	106,2	7,1
France	460	109,2	6,2
UK	41	107,6	9,3
Italy	168	108,0	6,2
Luxembourg	10	113,6	5,1
Netherlands	324	111,0	7,0
Poland	47	105,5	6,4
USA	1099	109,0	5,1

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
Australia	31	100,3	4,4	31	101,1	8,2
Belgium	67	98,2	3,4	8	105,6	6,5
Canada	457	101,3	4,7	481	108,9	5,2
Switzerland	11	100,5	3,7	11	103,4	7,4
Germany	456	100,8	5,1	475	105,9	5,4
DNK/FIN/SWE	128	104,2	4,8	151	106,5	4,9
Spain	50	100,7	4,9	50	104,0	5,1
France	418	99,3	4,8	418	104,7	5,6
UK	41	101,9	4,5	37	105,8	6,3
Italy	167	100,3	4,7	168	105,2	5,1
Luxembourg	10	102,1	4,7	11	107,2	6,1
Netherlands	299	102,6	4,9	324	104,6	6,2
Poland	44	99,8	5,0	44	102,4	6,7
USA	968	102,5	4,8	1092	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
Australia	31	95,9	6,7
Belgium	67	97,4	3,7
Canada	481	102,2	6,9
Switzerland	11	100,6	6,4
Germany	481	100,9	6,9
DNK/FIN/SWE	171	107	7,4
Spain	72	96,9	7
France	464	99,5	7,1
UK	40	108,2	10,1
Italy	168	100,9	6,5
Luxembourg	11	98,7	7
Netherlands	324	99,8	7,3
Poland	85	95,1	7,4
USA	1091	102,3	6

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 2015 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	31	100,6	2,1	31	106,7	1,6
Belgium	8	99,6	3,6	6	106,2	7,2
Canada	479	101,2	3,2	441	108,5	4,8
Switzerland	11	101,0	1,8			
Germany	456	100,0	4,9	451	107,2	8,4
DNK/FIN/SWE	170	101,9	3,3	167	105,3	3,9
Spain	64	99,5	2,9	64	107,5	2,0
France	458	97,7	3,1	435	107,0	4,5
UK	38	102,1	2,0	33	108,4	1,1
Italy	168	99,8	6,4	156	107,0	9,9
Luxembourg	10	98,1	2,1	10	105,0	1,1
Netherlands	324	97,9	5,1	324	106,1	10,4
Poland	46	97,7	4,0	39	104,5	2,9
USA	1065	102,3	3,4	1015	108,3	5,1

For temperament and milking speed there are only small differences between populations.

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

Yield
- Holstein from Holland change deregression procedure
- Holstein from Spain have base change

Fertility
- Holstein from Holland change deregression procedure
- Holstein from Spain have base change

Calving
- Holstein from Holland change deregression procedure

Conformation
- Holstein from Holland change deregression procedure
- Holstein from Spain have base change

Udder health
- Holstein from Holland change deregression procedure
- Holstein from Spain have base change
- Holstein from Italy participate for the first time

Longevity
- Holstein from Holland change deregression procedure

Milking speed and temperament
- Holstein from Holland change deregression procedure

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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