INTERBULL breeding values calculated December 2016

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 06.12.2016.

Current evaluation
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 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.

Yield

In tables 2-5 is a comparison of the genetic level of yield for bulls from different countries. The analysis includes bulls born in 2009 or later, that have more than 60 daughters (Tables 2, 3 and 4) or 40 daughters (Table 5) in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2009 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	16	93,3	95,9	91,6	93,1	8,9
Canada	33	88,6	87,6	82,6	83,4	8,8
Germany	14	96,1	96,7	94,4	95,1	7,4
Denmark	44	101,5	107,6	105,0	106,8	7,0
Estonia	22	96,8	95,9	93,5	93,9	10,3
Finland	214	104	101,9	103,3	102,6	7,5
Norway	291	95,1	94,0	95,2	94,8	9,0
New Zealand	30	87,1	91,1	86,4	88,1	8,6
Sweden	171	99,6	102,3	101,9	102,5	7,0
USA	9	77,6	70,3	67,7	66,8	8,6

Table 3.Genetic level for yield traits, Holstein. Bulls born in 2009 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	109	97,0	99,0	97,3	98,0	7,2
Belgium	40	103,9	105,1	103,7	104,2	7,8
Canada	656	106,2	105,9	103,1	103,6	9,4
Switzerland	58	98,3	97,6	94,4	94,8	7,9
Czech Republic	51	103,7	100,3	99,0	98,5	9,1
Germany	828	105,1	103,7	103,0	102,9	8,5
Denmark	519	102,9	103,5	104,2	104,2	8,1
Spain	177	102,8	100,6	97,4	97,6	8,7
Estonia	81	95,5	99,8	94,0	96,0	8,6
Finland	79	101,2	100,8	101,5	101,3	7,7
France	794	107,0	103,1	105,8	104,5	7,2
UK	218	103,2	104,6	100,1	101,3	9,2
Hungary	8	105,1	106,1	102,6	103,5	9,2
Ireland	150	77,1	92,7	83,3	88,3	12,2
Israel	123	95,8	101,1	96,1	98,1	7,6
Italy	828	102,4	100,4	98,3	98,4	8,5
Japan	96	108,3	102,9	104,0	102,6	7,8
Luxembourg	5	104,8	107,4	106,2	107,0	7,5
Netherlands	972	103,6	103,2	102,9	102,9	9,5
New Zealand	677	78,0	93,4	87,1	91,4	7,6
Poland	489	99,0	99,2	97,3	97,8	7,6
Portugal	7	88,7	87,7	84,9	85,3	12,1
Slovenia	35	93,2	91,0	89,9	89,7	5,5
Sweden	115	101,3	102,7	104,2	104,1	7,7
USA	3355	106,7	104,9	102,7	102,8	8,5

Table 4.Genetic level for yield traits, Jersey. Bulls born in 2009 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	38	102,3	93,2	101,2	96,7	6,0
Canada	17	98,9	83,2	90,9	84,8	11,3
Denmark	150	100,7	102,2	102,0	102,6	8,1
UK	6	99,3	87,3	95,2	89,7	9,1
New Zealand	462	96,3	88,4	96,0	92,1	7,3
USA	436	116,1	102,2	111,6	105,6	8,8

In table 5 bulls are divided according to whether they are marked as Red Holstein or Holstein in Interbull.

In the Nordic test day model Red Holstein and Holstein are calculated simultaneously, but when published in Denmark, Red Holstein is on a separate base. To translate breeding values for bulls from NAV's Holstein base to Red Holstein base approximately 12, 6, 11 and 11 units should be added to Milk, Fat, Protein and Y- index.

Table 5. Genetic level of yield traits in NAV index units on Red Holstein base. Bulls born in 2009 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Holstein on Red Holstein base						
Canada	884	117,4	110,4	112,7	113,0	9,5
Germany	1444	116,0	107,9	112,3	112,0	8,9
Denmark	747	114,2	108,7	114,3	114,2	8,4
Netherlands	1416	115,2	108,6	113,4	113,3	9,3
USA	4563	118,2	110,1	112,9	112,9	8,5
Red Holstein on Red Holstein base						
Belgium	20	110,8	102	113,8	110,1	9,4
Switzerland	172	99,2	94,9	97,1	96,2	7,7
Germany	249	108,2	97,8	105,5	102,3	8,5
Denmark	13	104,2	100,1	103,9	102,8	8,9
Spain	10	105,6	95,6	101,9	99,1	7,1
Italy	35	107,4	97,6	104,5	101,6	8,9
Netherlands	346	105,3	101,5	108,5	106,7	9,1

International comparison for yield among most important countries shows that:

- Red breeds: Denmark, Finland and Sweden have similar genetic level, while the genetic levels of Norway and Canada is much lower
- Holstein: Denmark, Sweden, Finland, Canada, France, Germany, USA, UK and Netherlands have similar genetic level
- Jersey: Denmark has similar genetic level as USA and higher genetic level than New Zealand
- Red Holstein: Holland has higher genetic level for yield than the red and white in Germany and Denmark. As expected the genetic level for yield for Red Holstein is significantly lower than for the Holstein populations that Red Holstein is normally compared to.

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 6-8 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 6.Genetic level for conformation traits, Red breeds. Bulls born in 2009 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	60	106,9	5,1	102,2	3,5	110,7	7,0
Germany	22	109,2	6,3	104,1	3,5	105,8	8,8
Denmark	109	103,3	8,6	102,3	4,6	102,7	8,7
Finland	214	97,2	7,4	96,6	4,8	101,3	8,1
UK	5	100,4	13			104,8	8,8
Norway	291			98,4	4,3	90,0	9,0
Sweden	176	97,3	7,6	97,8	5,0	100,4	7,5
USA	10	111,9	6,0	101,9	4,2	117,4	9,5

Table 7. Genetic level of conformation traits, Holstein. Bulls born in 2009 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	54	107,4	8,1	98,3	3,8	96,6	11,2
Belgium	40	111,9	11,8	100,5	6,6	103,8	10,7
Canada	624	116,4	10,5	100,8	5,8	107,8	10,1
Switzerland	68	115,0	10,2	100,0	6,4	103,1	9,5
Czech Republic	65	109,6	9,2	101,1	5,7	99,7	9,1
Germany	905	109,9	10,6	100,9	6,4	103,8	10,6
Denmark	513	102,3	11,7	100,4	6,1	103,3	10,5
Spain	194	113,7	10,5	100,4	5,9	104,5	8,7
Estonia	74	103,0	8,2	97,5	4,6	89,3	10,6
Finland	78	98,8	8,7	99,8	6,1	104,4	9,1
France	726	112,9	10,4	99,1	5,6	102,0	10,3
UK	199	110,7	11,2	100,6	5,2	102,4	10,1
Hungary	10	107,6	4,6	100,8	5,4	106,3	8,1
Ireland	40	95,2	15,7	96,6	5,3	89,6	20,0
Italy	841	112,2	9,8	101,0	5,1	104,5	9,6
Japan	436	112,9	9,9	99,4	4,7	100,5	10,3
Luxembourg	6	109,8	6,0	102,3	4,5	107,8	6,2
Netherlands	931	110,1	10,9	102,1	6,2	104,5	10,7
New Zealand	510	86,6	10,3	102,8	9,5	98,2	14,9
Poland	539	106,4	10,2	99,1	4,9	95,3	9,5
Portugal	10	108,1	3,7	95,4	4,7	93,4	8,3
Slovenia	31	102,5	7,5	98,4	5,9	92,3	9,6
Sweden	113	97,6	9,1	98,7	6,4	101,3	7,9
USA	2338	112,2	10,2	101,8	5,2	108,3	9,4

Table 8. Genetic level of conformation traits, Jersey. Bulls born in 2009 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	25	102,7	6,5	99,8	5,4	85,2	7,2
Canada	39	112,3	6,4	110,7	8,1	99,9	7,6
Denmark	150	100,4	9,0	101,0	7,3	100,5	10,0
USA	466	111,4	7,6	103,0	7,4	94,7	8,9

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

- Red breeds: Denmark has a higher genetic level for frame and feet&legs than Sweden and Finland. For udder, Denmark, Finland and Sweden have similar genetic level. Canada and Germany has highest level for frame and udder. Norway has the lowest level for udder.

- Holstein: Denmark, Sweden and Finland have 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. Denmark, Sweden and Finland have an average genetic level for udder. North America has the highest genetic level for udder.

- Jersey: Denmark has lower genetic level for the 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 9-11 is a comparison of genetic level of udder health for bulls from different countries.

Table 9. Genetic level for udder health, Red breeds. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	6	95,2	8,1
Canada	5	94,9	9,2
Germany	15	91,2	10,2
Denmark	85	98,5	9,7
Estonia	21	91,7	10,3
Finland	259	99,6	8,3
UK	5	97,9	9,2
Lithuania	6	99,0	4,8
Norway	291	95,3	10,1
New Zealand	47	89,5	9,5
Sweden	168	100,9	8,2
USA	14	88,9	8,2

Table 10. Genetic level for udder health, Holstein. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	163	95,1	7,1
Belgium	39	99,3	7,7
Canada	442	95,8	8,6
Switzerland	67	95,2	7,0
Czech Republic	62	95,2	10
Germany	908	96,4	8,3
Denmark	524	102,1	8,3
Spain	200	94,3	8,0
Estonia	79	95,1	8,1
Finland	78	101,6	8,2
France	731	96,1	7,1
UK	235	96,4	8,4
Hungary	10	98,4	6,5
Ireland	172	95,9	8,2
Israel	125	100,1	8,0
Italy	837	96,2	8,1
Japan	414	91,5	8,6
Luxembourg	6	92,5	12,1
Netherlands	983	97,6	8,0
New Zealand	574	93,6	8,3
Poland	579	94,9	9,2
Portugal	10	91,4	6,2
Slovenia	38	92,1	8,7
Sweden	114	102,5	7,4
USA	3419	99,9	8,3

Table 11. Genetic level for udder health, Jersey. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	18	89,1	5,5
Canada	17	87,8	7,4
Denmark	151	101,3	7,7
UK	6	90,2	4,4
USA	500	88,0	8,8

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

- Red breeds: Sweden, Denmark and Finland have higher genetic level than Norway
- Holstein: Denmark, Sweden, Finland and USA have higher genetic level than other major European countries and Canada
- Jersey: Denmark is substantially better than USA

Longevity

In tables 12-14 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 12. Genetic level for longevity, Red breeds. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	24	86,4	9,0
Canada	70	92,0	7,2
Germany	21	88,8	10,5
Denmark	44	98,7	7,8
Finland	193	86,6	14,3
UK	11	86,2	4,8
New Zealand	73	85,8	6,4
Sweden	62	99,2	7,7
USA	22	85,8	8,8

Table 13. Genetic level for longevity, Holstein. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	173	89,0	8,3
Belgium	37	96,4	9,8
Canada	757	93,8	9,5
Switzerland	88	87,9	7,3
Czech Republic	95	94,2	8,6
Germany	1161	93,4	9,4
Denmark	358	98,3	9,2
Spain	275	95,2	7,2
Finland	62	97,7	8,7
France	1168	92,7	8,0
UK	251	95,0	7,8
Hungary	19	92,3	8,3
Ireland	155	92,8	7,3
Israel	172	92,7	5,9
Italy	1029	96,7	7,7
Luxembourg	9	93,9	7,6
Netherlands	1170	95,7	8,7
New Zealand	906	91,6	6,3
Poland	771	92,3	7,9
Slovenia	45	91,5	9,3
Sweden	57	103,3	8,6
USA	3704	101,1	9,5
South Africa	5	96,8	3,5

Table 14. Genetic level for longevity, Jersey. Bulls born in 2006 or later.

Country	No	Average	STD
Australia	49	87,8	4,5
Canada	41	88,5	6,7
Denmark	65	98,8	9,2
UK	9	89,5	4,1
Ireland	12	84,0	4,2
New Zealand	663	88,1	5,1
USA	507	92,1	6,7
South Africa	7	87,1	5,1

International comparison for longevity among most important countries shows that:

- Red breeds: Denmark and Sweden have higher level than the other countries. The level in Finland is lower
- Holstein: Canada, Germany and France have the lowest level, while USA and the Nordic countries 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 15 and 16 the average genetic level for Red breed and Holstein bulls is shown for different countries. Only bulls born in 2009 or later are included. Bulls need to have breeding values for yield to be included.

Table 15. Genetic level for calving, maternal and calving, direct, Red breeds. Bulls born in 2009 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	60	94,6	9,2	21	97,3	6,4
Denmark	68	98,9	11,1	65	101,9	8,4
Finland	222	101,7	9,9	166	99,9	9,5
Norway	291	101,1	9,8	291	90,8	7,4
Sweden	180	101,3	8,0	160	102,6	7,0
USA	6	92,8	9,5	1	101,0	

Table 16. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2009 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	194	93,9	6,5	6	101,8	5,8
Austria	6	99,2	7,2	5	96,0	2,7
Belgium	39	99,8	7,0	38	99,1	6,6
Canada	703	96,3	6,9	654	98,0	7,6
Switzerland	70	95,2	5,4	58	96,4	6,2
Germany	896	95,8	6,9	842	97,6	7,3
Denmark	520	100,9	7,6	506	101,6	7,5
Finland	80	100,9	9,7	66	101,3	7,5
France	824	96,9	7,4	741	98,9	8,6
UK	179	97,5	6,8	59	97,5	8,2
Hungary	10	93,8	5,0	9	99,4	6,1
Ireland	186	100,5	5,3	9	103,3	6,3
Israel	21	99,7	6,7	129	95,9	5,4
Italy	846	95,0	7,4	370	97,5	6,0
Luxembourg	6	94,8	6,0	6	100,0	7,6
Netherlands	872	97,1	6,5	783	97,6	7,3
New Zealand	758	100,1	5,2	12	92,2	9,2
Sweden	114	102,4	8,6	115	100,4	7,8
USA	3612	97,2	6,5	3305	102,0	6,5

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

- Red breeds: Finland, Sweden and Norway have similar genetic level for calving, direct. Denmark is a bit lower. For calving, maternal Denmark, Sweden and Finland have a similar level, while Norway is at a lower level

- Holstein: Denmark, Sweden and Finland are among the best countries 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 17. Genetic level for female fertility, Red breeds. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	15	96,3	10,3
Canada	33	94,9	6,7
Germany	14	96,1	7,4
Denmark	43	97,8	9,9
Finland	194	95,7	8,9
Norway	291	104,7	8,6
New Zealand	30	98,4	4,3
Sweden	150	101,8	8,2
USA	9	97,4	8,7

Table 18. Genetic level for female fertility, Holstein. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	107	91,5	8,0
Belgium	37	98,6	6,9
Canada	633	92,7	9,7
Switzerland	57	94,1	2,9
Czech Republic	50	95,2	2,8
Germany	766	94,9	8,7
Denmark	495	101,5	10,2
Spain	99	91,2	6,6
Finland	78	102,4	12,7
France	691	93,7	4,9
UK	209	95,3	7,8
Hungary	5	93,0	8,7
Ireland	104	108,0	6,9
Israel	114	98,8	2,6
Italy	794	94,1	7,2
Luxembourg	5	93,0	7,2
Netherlands	856	95,6	9,3
New Zealand	675	105,1	5,5
Poland	351	91,7	7,7
Sweden	104	102,5	9,1
USA	3217	98,4	9,9

Table 19. Genetic level for female fertility, Jersey. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	58	99,4	9,1
Canada	26	95,7	10,5
Denmark	197	102,0	11,1
UK	8	100,5	6,2
Ireland	7	98,0	10,5
New Zealand	602	99,8	6,7
USA	545	93,3	10,5

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

- Red breeds: Denmark and especially Finland has lower level than Sweden. Norway is at a higher level than Sweden
- Holstein: Denmark, Sweden and Finland are 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 20-22, the genetic level for bulls from different countries, born in 2009 or later are shown for Holstein, Red breeds and Jersey.

Table 20. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2009 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	20	95,7	5,6	20	99,2	6,7
Canada	60	92,1	7,7	60	89,0	5,9
Germany	22	102,7	5,4	22	101,6	5,4
Denmark	86	105,2	8,6	40	106,3	14,4
Finland	215	98,3	6,7	205	99,8	7,5
Norway	228	99,0	1,9	227	99,7	2,5
New Zealand	28	99,4	6,9	28	95,6	4,8
Sweden	172	101,5	4,5	167	100,1	6,0

Table 21. Genetic level for milking speed and temperament, Holstein. Bulls born in 2009 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	150	103,9	5,3	150	101,8	5,7
Austria	6	97,0	7,9			
Belgium	32	94,1	7,1	29	100,0	6,9
Canada	517	97,2	6,7	510	102,7	5,6
Switzerland	64	98,8	4,2	63	101,2	3,4
Germany	735	97,1	8,2	520	100,3	9,0
Denmark	502	99,0	10,9	257	100,3	13,5
Finland	75	98,9	6,7	73	100,5	8,2
France	599	96,8	8,0	585	105,1	8,6
UK	197	97,6	11,9	187	98,9	6,9
Ireland	9	91,2	6,4			
Italy	37	96,3	10,1	34	100,9	8,1
Luxembourg	6	103,0	6,8			
Netherlands	717	98,1	9,4	635	101,2	8,2
New Zealand	606	103,2	7,4	606	94,9	4,5
Slovenia	37	96,3	7,5			
Sweden	113	100,2	4,7	109	100,2	7,5
USA	507	97,8	9,5	493	104,4	8,7

Table 22. Genetic level for milking speed, Jersey. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australien	68	101,2	6,2
Canada	45	93,4	8,4
Danmark	199	100,5	11,3
New Zealand	499	98,0	7,6
USA	52	97,9	7,5

International comparison for milking speed and temperament among most important countries show that:

- Red breeds: Denmark has higher genetic level than Sweden, Finland and Norway.
- Holstein: Denmark, Finland, Sweden are among the best countries for milking speed. For temperament Denmark, Sweden and Finland are at the same level as many other major countries
- Jersey: Denmark has considerably better milking speed than Canada

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 23-25 genetic level for Interbull NTM for Jersey, Red breeds and Holstein are shown. Bulls included are born in 2009 or later.

Table 23. Genetic level for NTM, Red breeds. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Canada	11	-22	10,4
Germany	14	-7,3	9,4
Denmark	44	9,5	7,9
Finland	214	2,9	8,8
Norway	291	-9,5	8,9
Sweden	171	4,3	7,8
USA	5	-29,8	3,9

Table 24. Genetic level for NTM, Holstein. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	47	-3,6	8,7
Belgium	38	3,0	7,9
Canada	539	-2,6	10,6
Switzerland	58	-10,9	6,5
Czech Republic	51	-4,9	7,9
Germany	811	-1,9	8,9
Denmark	517	6,6	8,4
Spain	177	-7,5	9,1
Estonia	74	-10,0	7,4
Finland	79	5,0	8,5
France	678	-1,5	7,4
UK	205	-2,8	8,6
Hungary	8	-1,1	10,3
Ireland	56	-9,7	11,4
Italy	818	-5,4	9,1
Japan	96	-3,3	7,7
Luxembourg	5	1,4	5,2
Netherlands	899	0,1	8,6
Poland	489	-8,9	8,3
Portugal	7	-23,6	9,8
Slovenia	34	-14,8	8,0
Sweden	115	7,1	7,3
USA	2566	3,0	9,2

Table 25. Genetic level for NTM, Jersey. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	23	-11,8	6,5
Canada	17	-21,4	10,6
Denmark	149	4,2	8,8
USA	394	-5,1	9,1

International comparison of NTM among most important countries shows that:

- Red breeds: Denmark is better than Finland and Sweden. All Nordic countries are better than Canada and Norway
- Holstein: Denmark, Sweden and Finland have the highest level
- Jersey: Denmark's average NTM is 10 index points better than USA

Dates of publication of Interbull breeding values in 2017:

Table 26. Dates of publication in 2017

Month	Date
April	4
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.

Changes since last routine run
In the routine evaluation in December 2016 the following changes are done compared to August 2016 routine evaluation:

Yield
- All breeds from New Zealand has changes in EDC due to DNA parentage testing

Fertility
- All breeds from DFS has updated evaluation for fertility
- All breeds from Canada start using pregnancy test in editing. Further genetic parameters are reestimated. Heritability is now lower for some traits
- Holstein from Italy has corrected pedigree
- Holstein and RDC from Germany has introduced new definition of genetic groups

Calving
- Jersey from New Zealand have base change and small decrease in information due to parentage testing

Conformation
- Holstein and RDC from DFS has few bulls loosing reliability
- Jersey from New Zealand have base change and small decrease in information due to parentage testing

Udder health
- RDC from Norway define effect of herd*year*season in a way that can course reliability to change
- Jersey from New Zealand have base change and small decrease in information due to parentage testing
- Holstein and RDC from Canada has changed calculation of EDC resulting in fewer records and lower reliability for some bulls. Records in calculation of EBV are unchanged

Longevity
- Holstein from Germany has some change in number of daughters due to different editing of data
- Jersey from New Zealand have base change and small decrease in information due to parentage testing
- Holstein from Spain has changed editing. This results in a decrease in reliability for some bulls

Milking speed and temperament
- None
- All breeds from New Zealand has change in number og daughters and herds due to parentage verification

Regards

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