INTERBULL breeding values calculated December 2015

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 01.12.2015.

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 from the following web sites:
Denmark: www.landbrugsinfo.dk/INTERBULL (→ "Søgning på Interbull indekser")
Sweden: http://www.sweebv.info (→ Interbullresultat)
Finland: www.faba.fi (Sonnihaut → Interbull-arvostelut)

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 2008 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 2008 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	23	93,3	94,1	91,0	91,7	8,0
Canada	33	88,8	88,9	83,2	84,5	6,4
Germany	13	98,1	102,4	98,1	99,8	8,5
Denmark	65	99,9	106,5	103,5	105,4	8,1
Estonia	16	95,1	94,6	91,1	91,7	11,2
Finland	246	104,1	101,7	103,0	102,3	7,7
UK	6	78,2	82,0	74,2	76,5	8,8
Norway	209	96,0	94,7	96,2	95,7	9,1
New Zealand	32	87,6	91,8	86,4	88,3	10,6
Sweden	180	98,8	101,8	101,5	102,2	7,4
USA	13	83,6	74,8	73,5	72,2	14,7

Table 3.Genetic level for yield traits, Holstein. Bulls born in 2008 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	120	97,2	98,7	97,7	98,2	7,0
Austria	6	96,0	97,5	92,2	93,5	5,0
Belgium	27	103,7	105,7	104,7	105,3	8,0
Canada	619	105,0	103,5	101,0	101,2	9,0
Switzerland	75	97,9	98,3	94,4	95,3	7,5
Czech Republic	70	103,3	99,8	99,4	98,7	9,2
Germany	1064	103,9	101,8	101,4	101,1	8,7
Denmark	585	102,7	103,1	104,2	104,1	8,4
Spain	223	102,9	98,8	97,6	97,0	8,6
Estonia	75	96,0	100,5	94,4	96,5	9,4
Finland	108	101,3	101,6	101,2	101,4	6,5
France	975	107,3	102,3	105,5	103,8	7,4
UK	235	101,8	102,2	98,3	99,1	10,7
Hungary	12	104,5	103,1	102,8	102,7	7,1
Ireland	119	78,2	91,9	83,0	87,5	12,0
Israel	130	96,3	100,3	95,5	97,2	8,6
Italy	902	102,4	99,7	97,8	97,6	8,1
Japan	95	108,5	103,9	104,9	103,8	7,3
Lithuania	10	87,3	93,0	87,9	90,1	10,4
Luxembourg	9	98,2	105,0	98,8	101,3	8,8
Netherlands	1033	102,8	102,5	102,5	102,4	9,4
New Zealand	637	79,2	94,4	87,7	92,1	8,2
Poland	542	97,8	97,2	95,5	95,7	7,6
Portugal	5	92,8	96,6	90,4	92,2	6,0
Slovenia	26	93,0	91,5	88,4	88,7	4,9
Sweden	130	102,7	102,5	104,6	104,1	7,8
USA	3401	106,5	103,7	102,1	101,9	8,2

Table 4.Genetic level for yield traits, Jersey. Bulls born in 2008 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	41	102,8	91,3	101,7	96,3	8,9
Canada	20	98,7	84,1	91,6	85,8	8,8
Denmark	142	100,1	101,9	101,8	102,4	8,2
New Zealand	443	94,5	88,8	95,3	92,3	7,6
USA	401	114,1	100,5	109,7	103,8	9,0

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 2008 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Holstein on Red Holstein base						
Canada	888	116,4	108,5	110,8	111,0	8,8
Germany	1751	114,5	106,4	110,5	110,3	9,1
Denmark	852	114,1	108,2	114,0	113,8	8,6
Netherlands	1516	114,2	107,2	112,6	112,3	9,4
USA	4825	117,8	108,8	112,1	111,8	8,4
Red Holstein on Red Holstein base						
Belgium	18	109,6	104,2	114,0	111,3	8,4
Switzerland	165	98,2	93,2	95,7	94,6	8,5
Czech Republic	10	102,8	93,5	101,5	98,6	6,4
Germany	307	106,9	97,1	103,8	100,9	8,4
Denmark	20	106,8	100,9	106,2	104,3	10,4
Spain	5	109,2	98,4	102,0	99,6	5,6
Italy	46	107,6	96,5	102,9	99,8	9,9
Netherlands	324	104,8	100,8	107,7	105,9	9,5

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, Netherlands, France, Canada, Germany, USA and Holland have similar genetic level
- Jersey: Denmark has similar genetic level as USA and higher genetic level than New Zealand
- Red Holstein: Denmark and Holland has higher genetic level for yield than the red and white in Germany. 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, body condition score and locomotion is included in this trait group.

Breeding values for body

EBV for body is calculated from the 6 linear traits that are part of the international genetic evaluation. The composite NAV breeding value for body also includes topline. There is no international genetic evaluation of topline.

We calculate international breeding value for body based on a regression of NAV breeding values for the 6 linear international traits on NAV EBV for body for Danish, Swedish and Finnish bulls born in 2004-05. The estimated regression coefficients are used to calculate international breeding value for body 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 includes 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 2008 or later.

Country	No. of bulls	Body		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	65	105,8	5,5	102,1	3,3	111,6	6,9
Germany	24	106,5	6,5	105,0	3,1	105,0	7,7
Denmark	125	102,9	8,5	102,4	4,6	102,2	8,8
Finland	239	98,1	7,3	96,3	4,7	100,5	8,5
UK	5	98,6	10,2			101,0	10,7
Norway	142			99,3	4,0	89,5	8,5
Sweden	177	97,2	7,8	97,9	4,6	99,9	7,9
USA	9	111,4	6,4	105,0	5,6	114,6	9,5

Table 7. Genetic level of conformation traits, Holstein. Bulls born in 2008 or later.

		Body		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	59	106,1	7,5	97,4	3,2	96,9	9,2
Austria	6	110,2	12,7	101,2	3,7	107,8	7,2
Belgium	26	114,6	11,9	99,2	5,0	101,9	11,5
Canada	597	116,8	9,7	100,3	5,7	106,7	10,6
Switzerland	78	115,5	9,1	100,0	6,2	103,6	9,0
Czech Republic	96	110,3	9,3	100,7	5,2	100,4	8,4
Germany	1121	109,4	10,1	99,8	6,1	102,4	10,3
Denmark	577	103,2	11,2	99,7	6,3	103,2	9,5
Spain	238	114,7	10,5	99,8	5,6	104,5	8,2
Estonia	68	103,4	8,4	97,4	4,8	90,0	9,2
Finland	100	100,9	8,8	98,8	5,2	104,2	8,2
France	942	113,5	10,3	98,3	5,4	101,1	9,5
UK	224	109,7	11,7	100,2	4,8	102,8	10,6
Hungary	17	113,4	9,4	100,1	5,5	103,5	7,9
Ireland	45	99,2	14,8	96,0	5,3	92,0	16,7
Italy	933	113,0	10,0	100,3	5,3	105,2	9,4
Japan	435	112,8	9,4	99,4	4,7	101,0	10,4
Luxembourg	9	103,6	5,1	100,1	7,3	98,6	10,3
Netherlands	983	109,4	10,7	101,1	6,1	103,0	10,5
New Zealand	415	88,1	10,9	100,8	8,9	98,2	10,9
Poland	562	105,7	10,2	98,9	5,6	96,4	9,5
Portugal	7	109,4	5,7	98,1	6,0	95,1	9,1
Slovenia	23	102,1	8,0	97,2	6,0	94,5	10,1
Sweden	123	97,6	9,5	99,2	5,5	101,4	7,2
USA	2500	112,1	10,2	101,3	5,2	108,0	9,2

Table 8. Genetic level of conformation traits, Jersey. Bulls born in 2008 or later.

		Body		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	20	103,6	6,3	101,2	7,0	85,6	7,7
Canada	44	110,0	6,4	110,5	7,6	100,8	7,4
Denmark	154	99,2	9,5	100,9	7,2	100,1	10,6
USA	438	109,7	7,9	101,6	6,0	93,6	8,9

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

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

- Holstein: Denmark, Sweden and Finland have lower genetic level for body than most other countries. North America, Spain, France and Italy have the highest genetic level for body. Countries with grass based dairy farming like Ireland and New Zealand has lower genetic level for body. 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 body 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 2008 or later.

Country	No. of bulls	Average	STD
Australia	11	98,4	8,5
Canada	5	101,8	4,1
Germany	16	96,6	10,1
Denmark	101	98,0	10,2
Estonia	14	92,3	8,2
Finland	280	100,0	8,8
UK	6	95,9	10,3
Lithuania	6	97,7	4,7
Norway	209	96,7	7,5
New Zealand	48	91,5	8,2
Sweden	158	101,2	7,9
USA	15	92,5	9,2

Table 10. Genetic level for udder health, Holstein. Bulls born in 2008 or later.

Country	No. of bulls	Average	STD
Australia	187	95,7	6,8
Austria	6	96,6	6,1
Belgium	27	96,0	9,5
Canada	361	95,8	6,3
Switzerland	78	96,8	6,5
Czech Republic	87	94,6	9,4
Germany	1151	95,4	8,3
Denmark	539	101,2	8,3
Spain	245	93,7	7,9
Estonia	75	94,4	7,9
Finland	106	101,0	8,3
France	941	94,7	6,9
UK	242	96,4	8,6
Hungary	18	96,3	4,9
Ireland	140	97,1	7,9
Israel	137	100,1	7,5
Italy	931	96,0	8,2
Japan	411	91,0	7,8
Korea	8	92,0	6,0
Lithuania	10	99,6	11,2
Luxembourg	10	98,6	7,2
Netherlands	1065	96,6	8,0
New Zealand	710	94,8	6,9
Poland	607	94,5	8,9
Portugal	7	95,4	5,1
Slovenia	27	94,3	9,6
Sweden	121	102,8	7,7
USA	3391	99,6	8,2

Table 11. Genetic level for udder health, Jersey. Bulls born in 2008 or later.

Country	No. of bulls	Average	STD
Australia	22	87,9	5,0
Canada	14	86,4	7,0
Denmark	126	101,2	7,7
UK	5	91,1	4,9
USA	456	87,2	8,4

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

- Red breeds: Sweden and Finland have higher genetic level than Norway and Denmark
- Holstein: Denmark, Sweden and Finland 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 2006 or later.

Country	No. of bulls	Average	STD
Australia	45	87,9	8,2
Canada	80	89,1	9,1
Germany	27	92,5	8,2
Denmark	81	94,5	7,9
Finland	299	89,0	13,0
UK	16	83,2	5,2
New Zealand	100	85,7	5,8
Sweden	159	95,9	9,7
USA	38	83,9	9,4

Table 13. Genetic level for longevity, Holstein. Bulls born in 2006 or later.

Country	No. of bulls	Average	STD
Australia	284	87,8	7,4
Belgium	41	92,8	7,3
Canada	1129	91,0	9,3
Switzerland	153	88,0	8,0
Czech Republic	237	92,5	8,5
Germany	2116	91,5	8,9
Denmark	737	95,8	9,3
Spain	414	93,5	7,0
Finland	118	94,1	9,2
France	2158	90,7	7,9
UK	341	94,0	7,4
Hungary	48	91,7	8,3
Ireland	191	91,3	7,8
Israel	224	93,8	6,3
Italy	1414	94,7	7,6
Luxembourg	13	91,9	6,6
Netherlands	1691	92,8	9,2
New Zealand	1136	90,4	5,9
Poland	940	91,1	7,3
Slovenia	48	88,5	9,2
Sweden	148	95,9	9,4
USA	5322	97,6	9,8
South Africa	10	88,6	9,8

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

Country	No	Average	STD
Australia	78	86,5	5,9
Canada	61	85,2	7,4
Denmark	125	97,0	8,6
UK	11	85,3	7,5
Ireland	14	87,2	6,0
New Zealand	840	86,8	5,5
USA	619	89,0	7,2
South Africa	11	87,8	3,6

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: The genetic level is quite similar across countries. Canada, Germany and France have the lowest level, while USA has 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 2008 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 2008 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	65	96,9	5,9	23	96,6	5,8
Denmark	102	98,1	8,3	117	100,1	8,9
Finland	249	100,5	8,4	248	98,2	8,6
Norway	209	100,6	7,3	209	92,0	6,1
Sweden	185	101,5	6,6	184	102,7	6,7
USA	8	92,6	6,4	2	94,5	12,0

Table 16. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2008 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	195	93,9	6,4	5	106,8	2,9
Austria	6	92,8	4,4	6	97,2	7,2
Belgium	27	98,7	8,9	27	99,4	8,7
Canada	652	94,9	7,7	607	97,0	8,7
Switzerland	80	93,6	5,7	64	96,5	8,4
Germany	1132	94,5	7,6	1082	98,0	7,6
Denmark	572	100,2	7,8	558	101,8	8,7
Finland	109	100,7	8,8	109	101,0	8,8
France	1008	96,0	8,2	916	98,3	8,8
UK	178	96,4	8,0	62	97,1	8,4
Hungary	19	93,4	7,0	13	99,1	6,1
Ireland	167	101,1	6,4	9	105,9	6,8
Israel	11	96,5	5,4	140	97,8	5,9
Italy	938	94,1	7,9	480	98,1	6,8
Luxembourg	10	97,8	4,3	10	101,4	6,4
Netherlands	974	97,0	7,0	867	97,9	8,2
New Zealand	735	101,1	5,4	12	93,5	9,8
Sweden	122	101,8	8,4	130	101,4	7,6
USA	3665	97,0	6,7	3294	101,9	6,9

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 2008 or later.

Country	No. of bulls	Average	STD
Australia	23	96,7	9,9
Canada	33	94,5	8,1
Germany	13	91,3	8,4
Denmark	67	98,7	9,9
Finland	231	95,2	8,8
UK	5	95,8	3,4
Norway	209	106,3	8,2
New Zealand	30	98,1	4,5
Sweden	175	100,4	9,0
USA	13	94,3	5,5

Table 18. Genetic level for female fertility, Holstein. Bulls born in 2008 or later.

Country	No. of bulls	Average	STD
Australia	118	91,2	7,9
Austria	5	94,6	3,8
Belgium	27	96,6	8,1
Canada	602	92,3	9,4
Switzerland	72	94,9	4,0
Czech Republic	67	96,3	2,4
Germany	1005	92,8	8,6
Denmark	429	98,2	9,6
Spain	135	91,7	8,0
Finland	87	101,7	9,9
France	884	92,3	7,5
UK	225	94,8	8,4
Hungary	6	93,7	10,2
Ireland	69	108,4	6,8
Israel	121	100,5	2,6
Italy	873	94,0	6,9
Luxembourg	9	92,9	3,9
Netherlands	940	95,7	8,5
New Zealand	628	105,6	6,4
Poland	367	92,5	7,4
Sweden	95	103,2	9,5
USA	3268	97,4	9,5

Table 19. Genetic level for female fertility, Jersey. Bulls born in 2008 or later.

Country	No. of bulls	Average	STD
Australia	41	99,6	8,0
Canada	19	97,4	8,6
Denmark	107	100,6	11,2
Ireland	5	99,4	9,2
New Zealand	442	100,0	6,7
USA	384	93,6	9,7

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 2008 or later are shown for Holstein, Red breeds and Jersey.

Table 20. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2008 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	26	98,3	4,5	26	97,6	4,9
Canada	65	93,1	6,4	64	90,4	4,0
Germany	24	104,1	3,3	24	102,4	3,3
Denmark	102	104,5	8,6	69	105,9	11,8
Finland	240	98,4	5,5	238	99,1	6,6
Norway	198	99,1	2,0	194	98,7	2,8
New Zealand	30	101,1	6,6	30	96,1	5,4
Sweden	170	100,7	4,4	172	101,0	7,2

Table 21. Genetic level for milking speed and temperament, Holstein. Bulls born in 2008 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	173	103,6	4,1	173	102,6	4,1
Austria	6	105,3	1,8			
Belgium	24	94,9	6,8	24	99,7	6,9
Canada	516	96,7	5,7	510	103,0	4,8
Switzerland	74	97,5	3,8	74	102,7	3,2
Germany	907	96,7	6,5	648	100,7	7,3
Denmark	540	99,5	10,7	319	100,7	10,9
Finland	104	99,1	5,4	99	100,9	6,7
France	808	96,4	7,3	781	105,7	7,8
UK	232	97,2	10,7	228	100,9	7,0
Ireland	8	90,7	6,1			
Italy	37	95,4	9,5	29	100,9	8,1
Luxembourg	9	93,9	6,4			
Netherlands	790	98,1	9,3	713	101,3	8,3
New Zealand	557	103,4	6,8	557	94,9	5,3
Slovenia	29	96,5	7,1			
Sweden	125	98,2	4,9	114	99,6	8,6
USA	497	97,2	8,1	485	103,7	7,2

Table 22. Genetic level for milking speed, Jersey. Bulls born in 2008 or later.

Country	No. of bulls	Average	STD
Australia	53	102,1	7,0
Canada	37	93,7	8,5
Danmark	144	102,3	10,2
New Zealand	383	98,3	7,3
USA	30	96,6	8,3

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 and Finland are in top for milking speed. Sweden is above average for milking speed together with Nederlands. For temperament Denmark, Sweden and Finland are at the same level as many other major countries
- Jersey: Denmark has considerably better milking speed than USA and 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 2008 or later.

Table 23. Genetic level for NTM, Red breeds. Bulls born in 2008 or later.

Country	No. of bulls	Average	STD
Canada	8	-15,0	4,0
Germany	13	-2,2	8,9
Denmark	65	6,4	8,9
Finland	246	1,0	8,7
Norway	142	-7,7	8,8
Sweden	180	4,7	7,8
USA	5	-23,6	7,3

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

Country	No. of bulls	Average	STD
Australia	51	-4,2	7,9
Austria	6	-9,5	6,6
Belgium	27	0,4	8,7
Canada	475	-5,3	10,1
Switzerland	75	-10,6	6,4
Czech Republic	70	-5,0	8,4
Germany	1048	-5,3	9,7
Denmark	573	5,3	9,3
Spain	223	-8,8	8,1
Estonia	68	-9,1	7,5
Finland	108	3,9	8,3
France	878	-3,7	8,3
UK	222	-5,1	8,9
Hungary	12	-3,8	7,7
Ireland	71	-9,1	10,3
Italy	896	-6,5	8,8
Japan	95	-2,4	7,6
Luxembourg	9	-3,9	8,3
Netherlands	971	-1,1	8,8
Poland	537	-10,4	7,9
Portugal	5	-13,6	7,6
Slovenia	25	-14,7	8,2
Sweden	130	7,1	7,4
USA	2710	1,9	8,9

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

Country	No. of bulls	Average	STD
Australia	15	-7,5	4,7
Canada	11	-19,5	9,2
Denmark	142	3,5	8,7
USA	359	-7,1	8,9

International comparison of NTM among most important countries shows that:

- Red breeds: Denmark and Sweden is better than Finland. All Nordic countries are better than Canada and Norway
- Holstein: Denmark, Sweden and Finland have the highest level –followed by USA and Holland. Holstein from Canada, Italy and Germany are somewhat lower
- Jersey: Denmark's average NTM is almost 10 index points better than USA

Dates of publication of Interbull breeding values in 2016:

Table 26. Dates of publication in 2016

Month	Date
April	5
August	9
December	6

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 2015 the following changes are done compared to August 2015 routine evaluation:

Yield

- Change of base
    - Holstein from Spain
- For RDC in Norway it is explained that bull might change in reliability due to definition of herd x year correction in model
- Jersey from South Africa include more data
- All breeds from Germany change threshold for including data from individual cow
- All breeds from USA change definition of unknown parent groups

Calving

- RDC from Norway: it was explained that EBV's of youngest bulls might jump more than expected because sires are only being sire of calf's and not sire of cows
- Holstein from Italy have bulls loosing information due to correction in database

Conformation

- RDC from Norway has new model for one trait and has fixed error
- Jersey from South Africa include more data
- Holstein from Italy have bulls loosing information due to correction in database
- Holstein from Spain has transformed data and use new genetic parameters
- Jersey from USA has adjusted correction for heterosis
- RDC from Australia has corrected error in standard deviation
- Jersey from Denmark, Sweden and Finland has changed weights in overall udder

Udder health

- For RDC in Norway: it is explained that bull might change in reliability due to definition of herd x year correction in model
- Jersey from South Africa include more data
- All breeds from Germany change threshold for including data from individual cow
- All breeds from USA change definition of unknown parent groups

Longevity

- Jersey from South Africa include more data
- All breeds from USA change definition of unknown parent groups
- Holstein in Germany has bulls loosing data due to change in editing procedure

Milking speed and temperament

- No changes

Fertility

- Jersey from South Africa has changes method to calculate reliability
- All breeds from USA change definition of unknown parent groups
- Holstein in Spain has made base change
- Holstein and RDC from Germany has excluded non-informative herd x year classes for NR56
- All breeds from Great Britain has last data due to change in data supplied
- Holstein from Italy have bulls loosing information due to correction in database
- For RDC in Norway it is explained that bull might change in reliability due to definition of herd x year correction in model
- Jersey and Holstein from Denmark, Sweden and Finland has changed status for many bulls

Regards

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