August 2013

To VikingGenetics staff and breeding advisors in Denmark, Sweden and Finland

INTERBULL breeding values calculated August 2013

International breeding values for the traits and breeds shown in Table 1 have been published 13.8.2013.

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

Remaining dates of publication of Interbull breeding values in 2013:

Table 2. Dates of publication

Month	Date
December	2

The indices can be found at the national databases in Denmark, Sweden and Finland 2-3 days after they have been published by Interbull.

You can find Interbull breeding values for all bulls with international breeding values from the following web sites:
Denmark: www.landbrugsinfo.dk / INTERBULL
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.

Changes since last routine run
In the routine evaluation in August 2013 the following changes are done compared to April 2013 routine evaluation:

Yield

- Red Holstein from Switzerland: number of daughters, herds or EDC for some bulls has decreased.
- Holstein from Switzerland: number of herds, daughters and EDC has decreased. This caused decrease in reliability for some bulls. Further some bulls changed from official to unofficial.
- Holstein from Japan: number of daughters, herds, and EDC has decreased.
- Holstein from Argentina: quality of data has improved.

Conformation

- Holstein from Spain: a new software for genetic evaluations, reliabilities and EDC computations has been implemented.

Udder health

- Red Holstein from Switzerland: number of daughters, herds or EDC for some bulls has decreased.
- Holstein from Japan: number of daughters, herds, and EDC has decreased.
- Holstein and Red breed from Latvia: the number of daughters, number of herds, and EDC has decreased.
- Holstein from Belgium: identification of herds has been improved. This led to slight decrease in number of herds.
- Holstein from Switzerland: number of herds, daughters and EDC has decreased. This caused decrease in reliability for some bulls. Further some bulls changed from official to unofficial.
- Holstein from Ireland: number of daughters, herds and EDC has decreased.

Longevity

- Holstein from Hungary: more data has been used.
- Red Holstein from Switzerland: number of daughters, herds or EDC has decreased for some bulls.
- Holstein from Ireland: decrease in number of bulls.
- Holstein from Czech Republic: number of herds, daughters and EDC has decreased for some bulls.
- Holstein from Italy: some bulls changed status from official to non-official and number of herds, daughters and EDC decreased for some bulls.
- Holstein from Switzerland: some bulls changed from official to unofficial. Further number of herds, daughters and EDC decreased for some bulls.

Milking speed and temperament

- Holstein from Switzerland: reduction in number of herds, daughters and EDC. This caused a decrease in reliability for some bulls. Some bulls changed from official to unofficial due to changes in publication rules.

Yield

In tables 3-6 is a comparison of the genetic level of yield for bulls from different countries. The analysis includes bulls born in 2007 or later, that have more than 60 daughters (Tables 3, 4 and 5) or 40 daughters (Table 6) in the genetic evaluation.

Table 3. Genetic level for yield traits, Red breeds. Bulls born in 2007 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	16	97,3	99,2	95,6	96,2	6,4
Canada	11	94,5	93,7	91,3	91,3	5,2
Germany	9	96,2	102,8	97,0	98,8	7,7
Denmark	60	99,7	103,7	101,8	103,0	7,3
Estonia	13	109,1	102,2	105,6	104,0	7,0
Finland	187	105,3	103,2	105,0	104,6	8,5
Norway	162	96,6	95,6	97,0	96,9	9,3
New Zealand	16	94,0	98,2	94,1	95,2	6,6
Sweden	122	100,2	101,8	102,3	102,9	8,4
USA	5	87,6	81,6	78,6	77,4	11,3

Table 4. Genetic level for yield traits, Holstein. Bulls born in 2007 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	91	97,3	98,5	97,4	97,8	7,6
Belgium	12	103,8	107,3	107,6	108,6	6,8
Canada	403	106,7	104,2	101,9	101,3	8,5
Switzerland	31	97,0	97,2	95,7	95,9	7,2
Czech Rep.	62	101,4	98,7	98,7	98,2	9,4
Germany	1007	103,2	101,5	100,7	100,3	9,3
Denmark	476	103,9	104,0	105,2	105,4	9,6
Spain	123	104,7	100,1	98,9	97,8	7,2
Estonia	30	100,1	103,4	99,7	100,7	7,6
Finland	94	103,8	103,7	103,7	103,8	7,0
France	703	108,7	103,0	106,3	105,0	8,3
England	119	105,6	103,9	101,8	101,4	12,1
Hungary	9	107,7	99,7	102,7	101,0	4,8
Ireland	95	82,9	95,8	89,2	92,6	11,7
Israel	75	98,8	103,0	99,3	100,5	7,7
Italy	560	103,6	99,6	98,9	98,0	9,0
Japan	73	113,7	104,2	106,6	104,4	5,5
Lithuania	11	89,1	89,9	87,5	87,8	8,3
Luxemburg	6	102,8	105,3	103,0	103,8	6,6
Holland	648	103,9	102,8	104,4	104,3	9,9
New Zealand	329	81,2	96,4	90,2	94,1	8,9
Poland	321	97,2	97,0	96,5	96,6	9,1
Slovenia	20	99,0	93,3	92,6	91,3	6,0
Sweden	103	104,6	104,5	106,0	106,0	8,2
USA	2301	106,7	103,8	102,3	101,8	9,0

Table 5. Genetic level for yield traits, Jersey. Bulls born in 2007 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	17	107,1	94,2	102,9	97,4	6,2
Canada	12	99,3	84,9	94,3	88,1	10,5
Denmark	104	101,3	106,3	105,0	106,8	8,0
New Zealand	234	96,0	93,4	97,7	96,1	7,4
USA	207	114,3	99,9	109,1	102,9	9,5

In table 6 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 6. Genetic level of yield traits in NAV index units on Red Holstein base. Bulls born in 2006 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Holstein on Red Holstein base						
Canada	769	116,9	107,6	110,6	110,0	9,0
Germany	1772	114,5	106,7	110,7	110,3	9,3
Denmark	803	115,6	109,6	115,5	115,6	9,3
Holland	1171	115,3	107,5	114,4	114,0	9,4
USA	3807	118,4	108,6	112,8	112,0	8,9
Red Holstein on Red Holstein base						
Belgium	12	106,8	105,9	113,7	112,8	9,8
Switzerland	119	100,5	94,4	98,0	95,8	7,8
Czech Rep.	9	105,8	99,4	104,4	102,3	4,3
Germany	246	108,0	98,2	105,0	102,0	9,1
Denmark	14	108,4	98,8	107,5	104,5	12,0
Italy	35	109,5	97,8	102,2	98,7	10,6
Holland	247	106,6	101,7	109,7	107,8	9,8

International comparison for yield shows that:

- Red breeds: Denmark, Finland and Sweden have the same genetic level, while the genetic levels of Norway and Canada is much lower
- Holstein: Denmark, Sweden, Finland, France and Holland have the highest genetic level
- Jersey: Denmark has a higher genetic level than USA and New Zealand
- Red Holstein: Denmark has slightly higher genetic level for yield than the red and white in Germany, whereas the Dutch red and white have a higher genetic level of yield. 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 7-9 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 7.Genetic level for conformation traits, Red breeds. Bulls born in 2007 or later.

Country	No. of bulls	Body		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	27	108,8	6,0	102,5	3,7	109,6	7,7
Germany	14	109,2	9,3	105,6	4,3	106,4	6,8
Denmark	86	106,7	8,3	104,4	4,7	104,4	8,1
Finland	189	100,5	8,1	98,4	4,1	103,0	7,1
Norway	130			99,4	4,9	91,2	7,7
Sweden	123	97,1	9,5	99,1	4,9	99,7	8,0
USA	5	113,8	6,2	104,0		113,4	8,7

Table 8. Genetic level of conformation traits, Holstein. Bulls born in 2007 or later.

		Body		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	54	100,4	7,2	97,8	5,0	98,3	10,0
Belgium	11	106,3	6,0	100,9	6,1	103,8	9,9
Canada	395	109,3	6,7	102,2	5,9	107,8	10,3
Switzerland	38	104,3	9,6	99,3	7,2	105,4	9,7
Czech Rep.	88	104,5	6,7	101,3	5,0	103,4	9,4
Germany	966	104,6	9,0	100,7	6,4	103,6	9,4
Denmark	464	100,2	9,6	100,7	6,6	104,1	9,6
Spain	144	106,8	8,1	100,7	6,0	107,5	7,6
Estonia	20	102,5	7,0	99,8	5,0	94,6	8,1
Finland	84	100,6	8,3	99,0	5,6	105,2	7,2
France	709	105,9	7,2	99,9	5,7	104,1	9,3
England	145	104,0	10,9	100,3	4,4	106,2	9,9
Hungary	14	104,8	9,4	102,8	5,5	102,9	8,4
Ireland	36	82,9	17,6	94,7	3,5	89,8	12,5
Italy	576	107,4	7,7	101,3	5,8	108,1	10,1
Japan	263	106,6	7,2	100,7	5,6	105,1	10,7
Holland	627	103,8	8,6	101,2	6,4	104,5	9,4
New Zealand	246	71,7	16,8	108,0		111,0	
Poland	318	98,8	9,2	99,5	6,0	98,3	9,8
Sweden	87	98,0	10,2	99,5	6,6	101,7	8,5
USA	1584	106,1	8,4	101,7	5,8	110,1	8,8

Table 9. Genetic level of conformation traits, Jersey. Bulls born in 2007 or later.

		Body		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Canada	25	109,3	7,3	113,1	6,1	106,1	7,2
Denmark	104	98,0	9,8	101,3	7,9	99,4	8,9
USA	230	109,8	8,7	101,1	6,1	96,7	9,2

International comparison for conformation traits show that:

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

- Jersey: Denmark has lower genetic level for the body than USA, but better for 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 10-13 is a comparison of genetic level of udder health for bulls from different countries.

Table 10. Genetic level for udder health, Red breeds. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	6	98,5	8,7
Canada	7	104,6	8,3
Germany	7	94,8	10,5
Denmark	77	99,6	9,9
Estonia	11	95,6	10,4
Finland	210	99,3	8,3
Norway	130	94,7	6,7
New Zealand	24	92,4	5,9
Sweden	120	101,3	8,5
USA	7	98,4	11,4

Table 11. Genetic level for udder health, Holstein. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	163	95,9	6,6
Belgium	12	94,1	6,8
Canada	416	94,4	7,1
Switzerland	42	96,3	7,5
Czech Rep.	78	95,8	8,5
Germany	1085	95,6	8,1
Denmark	451	100,3	8,9
Spain	143	93,7	8,8
Estonia	24	97,4	9,1
Finland	95	99,9	8,6
France	537	95,3	6,6
England	125	97,1	7,3
Hungary	17	97,6	4,9
Ireland	109	98,3	8,0
Israel	80	102,6	6,3
Italy	588	95,5	7,2
Japan	261	91,3	7,3
Korea	7	93,6	6,5
Lithuania	12	101,1	7,8
Luxemburg	7	100,3	5,1
Holland	689	96,4	7,8
New Zealand	343	95,4	5,8
Poland	353	95,0	8,3
Slovenia	23	97,2	8,1
Sweden	89	101,2	8,2
USA	2416	98,1	8,1

Table 12. Genetic level for udder health, Jersey. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Canada	8	95.1	8,0
Denmark	104	100.5	8,0
USA	232	89.7	6.5

International comparison for udder health show that:

- Red breeds: Denmark, Sweden and Finland have higher genetic level than Norway
- 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 13-15 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 13. Genetic level for longevity, Red breeds. Bulls born in 2005 or later.

Country	No. of bulls	Average	STD
Australia	40	92,0	7,3
Canada	73	90,6	9,1
Germany	24	87,8	7,6
Denmark	74	94,5	8,8
Finland	246	95,2	12,7
England	13	87,7	5,0
New Zealand	107	89,9	5,9
Sweden	150	98,7	9,6
USA	32	86,8	8,0

Table 14. Genetic level for longevity, Holstein. Bulls born in 2005 or later.

Country	No. of bulls	Average	STD
Australia	458	88,6	7,3
Austria	5	82,4	17,0
Belgium	25	95,0	8,4
Canada	1186	90,6	8,5
Switzerland	128	88,8	7,5
Czech Rep.	310	93,1	8,8
Germany	2353	92,0	9,1
Denmark	644	96,8	9,5
Spain	354	94,2	6,9
Finland	89	94,6	9,4
France	2251	89,3	7,6
England	286	93,9	7,7
Hungary	71	91,3	8,6
Ireland	240	93,6	7,1
Israel	219	96,6	7,4
Italy	1317	94,0	7,1
Luxemburg	11	89,5	6,5
Holland	1801	92,8	8,7
New Zealand	1109	93,0	5,6
Sweden	152	98,8	11,0
USA	5707	95,8	9,8

Table 15. Genetic level for longevity, Jersey. Bulls born in 2005 or later.

Country	No	Average	STD
Australia	83	88,1	6,6
Canada	53	84,9	6,9
Denmark	100	98,5	7,7
England	9	81,4	6,6
New Zealand	851	90,4	5,5
USA	571	87,2	6,4
South Africa	18	87,2	5,0

International comparison for longevity shows that:

- Red breeds: Denmark, Finland and Sweden have much higher level than the other countries
- Holstein: The genetic level is very similar across countries. Canada and France have the lowest level
- Jersey: Denmark has better 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 16 and 17 the average genetic level for Red breed and Holstein bulls is shown for different countries. Only bulls born in 2007 or later are included. Bulls need to have breeding values for yield to be included.

Table 16. Genetic level for calving, maternal and calving, direct, Red breeds. Bulls born in 2007 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	28	97,5	6,1	12	100,3	7,1
Denmark	82	96,1	8,1	87	99,8	8,0
Finland	190	99,9	8,2	190	99,4	7,9
Norway	130	103,8	7,2	130	93,1	7,3
Sweden	124	101,6	7,4	123	101,4	7,4

Table 17. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2007 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	141	94,0	7,0	2	104,0	8,5
Belgium	12	98,2	8,4	10	98,2	10,9
Canada	424	93,8	7,3	408	94,4	9,4
Switzerland	44	93,2	8,1	15	92,0	8,1
Czech Rep.	9	96,4	4,8	6	96,8	5,0
Germany	1113	95,0	7,3	1065	97,4	8,8
Denmark	472	99,7	8,0	461	100,9	8,4
Spain	5	98,2	7,7	0		
Finland	95	101,2	7,9	95	100,5	8,3
France	832	96,7	8,8	668	96,5	7,9
England	119	97,2	8,3	16	96,1	7,4
Hungary	17	94,2	5,7	13	100,1	5,2
Ireland	116	102,5	7,6	2	94,5	2,1
Israel	13	101,0	6,5	81	99,8	5,0
Italy	589	95,2	8,1	255	97,9	6,6
Luxemburg	8	97,4	5,2	7	96,0	10,7
Holland	686	97,4	7,2	595	97,7	9,3
New Zealand	16	104,1	4,7	1	95,0	
Sweden	94	102,1	8,5	94	102,7	8,5
USA	2543	96,4	6,6	2265	100,0	8,0

International comparison for calving traits shows that:

- Red breeds: Denmark has lower genetic level for calving, direct than Sweden and Finland. Norway has higher genetic level for this trait than the other Nordic countries. For calving, maternal Denmark, Sweden and Finland are at the same 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 18. Genetic level for female fertility, Red breeds. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	15	98,0	8,2
Canada	11	95,4	4,5
Germany	8	98,6	7,7
Denmark	63	101,6	7,8
Finland	177	97,0	10,2
Norway	130	103,8	6,9
New Zealand	16	100,9	3,7
Sweden	109	103,2	9,5

Table 19. Genetic level for female fertility, Holstein. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	81	95,3	6,1
Belgium	12	98,6	4,5
Canada	382	94,2	6,2
Switzerland	23	95,5	2,2
Czech Rep.	53	95,8	2,5
Germany	852	94,7	5,5
Denmark	436	99,2	8,8
Spain	18	96,8	7,7
Finland	90	101,0	8,0
France	477	95,2	3,4
England	108	96,5	6,1
Hungary	6	94,3	4,8
Ireland	81	112,1	7,1
Israel	67	99,4	2,6
Italy	483	95,7	3,9
Holland	580	94,8	6,9
New Zealand	329	108,7	6,3
Poland	120	96,8	5,9
Sweden	85	100,8	9,1
USA	2176	98,8	8,6

Table 20. Genetic level for female fertility, Jersey. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	14	93,8	9,2
Canada	10	100,5	7,3
Denmark	114	102,5	11,8
New Zealand	234	102,0	6,3
USA	200	99,3	9,4

International comparison for female fertility shows that:

- Red breeds: Denmark and especially Finland has lower level than Sweden. Norway is at the same level as 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 quite similar across major countries

Milking speed and temperament

In Tables 21-23, the genetic level for bulls from different countries, born in 2007 or later are shown for Holstein, Red breeds and Jersey.

Table 21. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2007 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	20	96,8	5,4	20	101,2	5,6
Canada	27	97,4	5,6	27	95,9	4,0
Germany	14	102,3	7,1	14	103,4	2,1
Denmark	87	104,1	4,4	62	105,5	5,3
Finland	190	99,0	4,6	189	98,6	5,0
Norway	124	99,4	1,7	128	98,4	2,6
Sweden	120	102,8	5,9	120	100,9	6,2

Table 22. Genetic level for milking speed and temperament, Holstein. Bulls born in 2007 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	161	106,0	4,3	160	102,2	3,7
Belgium	11	90,3	5,8	11	101,7	4,0
Canada	372	96,7	5,5	370	105,1	5,6
Switzerland	30	98,0	6,3	30	101,2	4,7
Germany	778	97,1	5,3	527	102,2	4,7
Denmark	431	100,2	8,6	372	101,3	7,0
Finland	95	100,9	5,0	95	102,1	5,6
France	601	96,8	5,1	586	106,7	5,3
England	135	97,2	9,6	133	104,0	7,1
Hungary	5	97,0	1,5	5	103,9	1,1
Italy	27	95,6	6,4	18	100,9	5,1
Holland	494	98,9	8,6	455	102,3	6,3
Slovenia	23	99,9	7,9	0		
Sweden	89	95,8	6,2	88	100,1	7,2
USA	292	97,7	6,2	283	104,0	6,5

Table 23. Genetic level for milking speed and temperament, Jersey. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Australia	29	98,7	6,9
Canada	22	91,4	9,1
Denmark	104	101,1	9,6
USA	10	96,3	6,1

International comparison for milking speed and temperament show that:

- Red breeds: Denmark has higher genetic level than Sweden and Finland.
- Holstein: Denmark and Finland are on the top for milking speed. Sweden is among the countries with the lowest level. For temperament Denmark, Sweden and Finland are on the same level compared to 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 24-26 genetic level for Interbull NTM for Jersey, Red breeds and Holstein are shown. Bulls included are born in 2007 or later.

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

Country	No. of bulls	Average	STD
Canada	11	-6,4	7,5
Germany	9	0,1	6,1
Denmark	60	4,0	12,0
Finland	187	3,4	9,3
Norway	130	-8,2	8,8
Sweden	122	5,2	8,7

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

Country	No. of bulls	Average	STD
Australia	38	-4,7	7,3
Belgium	12	3,1	5,1
Canada	389	-5,6	7,4
Switzerland	31	-9,7	8,0
Czech Rep.	62	-4,5	9,1
Germany	995	-5,1	8,3
Denmark	465	5,5	9,7
Spain	123	-6,5	7,2
Estonia	21	-3,0	8,2
Finland	94	4,6	8,8
France	483	-1,3	7,6
England	118	-1,3	9,6
Hungary	8	-6,1	3,9
Ireland	53	-4,7	11,1
Italy	559	-5,2	8,0
Japan	73	-2,7	5,6
Luxemburg	6	-2,0	4,5
Holland	620	-0,1	9,4
Poland	314	-7,2	7,5
Slovenia	19	-13,7	6,3
Sweden	103	1,6	14,6
USA	1780	1,2	8,7

Table 26. Genetic level for NTM, Jersey. Bulls born in 2007 or later.

Country	No. of bulls	Average	STD
Canada	9	-14,2	8,4
Denmark	104	6,5	8,1
USA	189	-4,6	8,4

International comparison of NTM shows that:

- Red breeds: Denmark, Sweden and Finland have the same genetic level, which is much higher than Canada. Norway has a lower level
- Holstein: Denmark, Sweden and Finland have the highest level. Holstein from Canada, Italy and Germany are somewhat lower
- Jersey: Denmark's average NTM is 10 index points better than in the USA

Regards

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