December 2013

INTERBULL breeding values calculated December 2013

Primarily to VikingGenetics staff and breeding advisors in Denmark, Sweden and Finland

International breeding values for the traits and breeds shown in Table 1 have been published 03.12.2013.

Table of content:

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 2014:

Table 2. Dates of publication in 2014

Month	Date
April	1
August	12
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 December 2013 the following changes are done compared to August 2013 routine evaluation:

Yield
- Holstein from France has a little less data included
- Holstein, Jersey and RDC from Germany has less than 10% decrease in number of daughters due to update of sire identities and breed correction of cows
- Holstein and Jersey from Nordic countries have less information across breeds and traits because of update of pedigree and renewed check of data
- Holstein and RDC from South Africa has animals that have changed from official to unofficial proof
- Holstein from Uruguay has small changes in number of daughters because of update of breed code for some cows
- Holstein from Switzerland do no longer include bulls with daughters in less than 10 herds
- Holstein, Jersey and RDC from Netherlands do no longer include bulls with daughters in less than 10 herds

Calving
- All breeds from Canada has changed assignment of codes for type of proof for domestic bulls

Conformation
- Holstein from South Africa has a new organization doing evaluation and variance components have been re-estimated
- RDC and Jersey in the Nordic countries has changed weighting or optimum in overall udder for RDC and overall conformation for JER
- All breeds in Slovenia has changed from use of absolute BVs to RBVs (100, 12)
- Holstein from Italy has submitted BCS

Udder health
- Holstein in South Africa has introduced a test-day model
- RDC in Norway has adopted a new definition of a rolling calving year. The herd recording system is also changing
- Holstein from Czech Republic has excluded records of old bulls without proofs
- Holstein from Slovenia use standardized breeding values instead of absolute breeding values
- Holstein and RDC from Latvia has adjusted breed group
- Holstein from Portugal has changed information for all traits

Longevity
- Jersey from Ireland are included for the first time
- Holstein from South Africa is included for the first time.
- Holstein from Slovenia have changed the scale of the trait
- Holstein from Belgium has changed data edits

Milking speed and temperament
- Holstein from Slovenia use standardized breeding values instead of absolute breeding values

Fertility

- Holstein from South Africa has a new organization doing evaluation and variance components have been re-estimated
- All breeds from USA have replaced single-trait, single-breed evaluations for heifer and cow conception rates with a multi-trait, multi-breed evaluation including crossbreds. Further use of data is improved
- All breeds from Australia has changed scale of breeding values
- Holstein from Spain has updated phantomparent groups
- Jersey from Ireland is included in the fertility evaluation for the first time

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	96,8	99,4	95,2	95,9	7,0
Canada	14	94,1	94,1	91,6	91,7	7,7
Germany	13	97,2	103,9	98,2	100,2	6,7
Denmark	70	100,6	105,4	103,4	104,7	8,1
Estonia	15	109,4	100,3	104,7	102,5	7,5
Finland	204	104,8	102,1	103,8	103,3	8,5
Norway	173	95,2	94,4	96,3	96,1	9,1
New Zealand	24	92,3	96,7	92,1	93,2	7,0
Sweden	130	100,1	102,3	102,8	103,5	7,8
USA	7	84,9	77,4	75,7	74,0	12,9

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	97,1	97,9	97,1	97,5	7,7
Belgium	15	105,9	108,8	107,9	108,9	7,6
Canada	463	105,9	103,7	100,9	100,5	8,0
Switzerland	43	96,2	97,6	94,6	95,0	7,6
Czech Rep.	67	101,5	98,5	98,7	98,1	9,3
Germany	1.117	103,0	101,2	100,3	100,0	9,2
Denmark	526	103,7	103,7	104,9	105,1	9,4
Spain	168	104,2	99,6	98,9	97,9	7,9
Estonia	36	99,3	102,2	98,2	99,1	7,4
Finland	102	103,9	103,8	103,7	103,8	6,8
France	818	108,4	102,6	105,9	104,6	8,0
England	147	104,7	103,7	101,2	101,1	11,3
Hungary	13	107,3	101,7	102,8	101,5	7,0
Ireland	99	81,8	94,5	87,9	91,3	11,6
Israel	94	98,0	102,0	98,4	99,5	7,6
Italy	632	103,4	99,4	98,5	97,7	8,8
Japan	73	113,1	103,7	105,9	103,7	5,4
Lithuania	11	88,6	89,5	86,9	87,3	8,5
Luxemburg	6	101,5	104,3	101,5	102,3	6,5
Holland	757	103,7	102,2	103,9	103,7	9,7
New Zealand	454	81,6	96,3	90,6	94,4	9,0
Poland	356	98,5	97,6	97,0	96,9	8,9
Slovenia	24	95,8	89,8	88,5	87,2	6,5
Sweden	113	104,4	103,9	105,6	105,6	7,7
USA	2.639	106,5	103,6	102,1	101,5	8,8

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	106,4	93,1	102,2	96,5	5,8
Canada	12	99,4	85,2	94,5	88,5	10,4
Denmark	112	101,0	105,6	104,7	106,3	7,8
New Zealand	342	96,4	93,9	97,8	96,3	7,5
USA	244	114,0	99,8	108,9	102,8	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	829	116,5	107,3	110,1	109,5	8,6
Germany	1.869	114,3	106,4	110,4	110,0	9,2
Denmark	852	115,3	109,2	115,2	115,3	9,2
Holland	1.278	115,0	107,0	113,8	113,5	9,3
USA	4.148	118,2	108,4	112,4	111,6	8,8
Red Holstein on Red Holstein base						
Belgium	13	106,5	104,2	112,8	111,6	10,2
Switzerland	133	99,4	93,6	97,3	95,2	8,0
Czech Rep.	9	105,6	99,3	104,2	101,9	4,5
Germany	276	107,9	98,2	104,9	101,8	9,0
Denmark	15	108,9	99,3	108,3	105,2	12,1
Italy	38	109,3	98,0	102,4	99,0	9,7
Holland	271	105,9	101,1	108,8	106,9	9,6

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 for 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	33	108,6	6,1	102,6	3,5	109,5	6,7
Germany	15	110,3	10,1	105,6	4,5	106,3	7,5
Denmark	92	106,7	8,2	104,3	4,7	104,4	8,2
Finland	199	100,3	8,3	98,3	4,2	102,5	7,3
Norway	160			99,3	4,8	91,5	8,3
Sweden	126	96,9	9,4	99,0	4,9	99,2	7,9
USA	8	113,0	8,1			112,0	8,0

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	55	100,5	6,9	97,9	5,2	97,8	10,1
Belgium	15	107,3	5,8	101,0	5,3	102,8	11,8
Canada	453	109,6	6,6	101,9	6,0	107,0	10,6
Switzerland	47	105,5	9,3	98,5	6,7	105,2	9,0
Czech Rep.	100	104,5	6,9	101,2	5,0	102,9	8,9
Germany	1.084	104,8	8,9	100,7	6,5	103,3	9,4
Denmark	509	100,4	9,5	100,7	6,6	104,0	9,6
Spain	175	107,2	8,3	101,1	5,9	107,2	7,9
Estonia	23	101,5	6,9	99,1	5,7	93,5	8,3
Finland	88	101,1	8,7	99,0	5,6	104,7	7,0
France	781	106,1	7,3	99,8	5,9	103,5	9,4
England	168	104,2	11,1	100,4	4,3	105,9	9,6
Hungary	18	104,8	8,9	101,7	5,4	103,4	7,2
Ireland	36	83,1	17,3	94,6	3,5	89,4	12,3
Italy	665	107,6	7,7	101,1	5,8	107,6	10,0
Japan	263	106,8	7,2	100,7	5,5	104,8	10,6
Holland	722	103,6	8,8	101,3	6,4	104,2	9,7
New Zealand	255	72,7	17,5	98,4	6,3	102,0	7,8
Poland	374	99,8	9,1	99,0	6,2	98,4	10,0
Sweden	90	97,7	10,6	99,7	6,8	101,4	8,4
USA	1.874	106,5	8,2	101,8	5,7	109,3	8,9

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	28	108,5	6,5	113,9	6,2	105,9	7,1
Denmark	113	97,8	10,0	101,9	8,0	99,6	9,1
USA	266	109,8	8,8	101,1	6,3	96,8	9,0

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 higher 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	98,7	8,7
Canada	10	103,0	8,6
Germany	9	97,7	8,7
Denmark	90	99,5	9,9
Estonia	15	94,8	10,9
Finland	234	99,2	8,5
Norway	160	96,5	6,6
New Zealand	27	92,9	6,0
Sweden	129	101,6	8,3
USA	9	100,7	13,9

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

Country	No. of bulls	Average	STD
Australia	163	95,5	6,9
Belgium	15	94,3	7,7
Canada	477	94,6	7,3
Switzerland	49	97,0	7,7
Czech Rep.	89	96,0	9,0
Germany	1.185	95,6	8,4
Denmark	502	100,4	8,9
Spain	187	93,7	8,5
Estonia	30	96,5	8,9
Finland	102	100,8	8,3
France	692	95,2	6,7
England	163	97,7	7,1
Hungary	19	96,6	5,4
Ireland	110	98,5	8,0
Israel	97	102,4	6,6
Italy	668	95,6	7,4
Japan	261	91,4	7,3
Korea	12	94,7	5,5
Lithuania	12	101,1	7,8
Luxemburg	7	100,6	5,6
Holland	800	96,4	7,8
New Zealand	507	96,2	5,8
Poland	417	94,0	8,5
Slovenia	24	95,9	8,5
Sweden	95	100,9	8,6
USA	2.751	98,2	8,2

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

Country	No. of bulls	Average	STD
Canada	11	94,8	6,8
Denmark	110	100,2	8,1
USA	275	89,9	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	92,4	6,9
Canada	83	91,9	9,1
Germany	25	90,4	7,5
Denmark	83	95,0	8,7
Finland	282	94,6	12,9
England	14	88,8	6,4
New Zealand	121	89,9	5,7
Sweden	164	98,4	9,8
USA	38	86,7	7,7

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

Country	No. of bulls	Average	STD
Australia	458	88,1	7,4
Austria	6	84,6	10,1
Belgium	26	93,7	8,1
Canada	1.257	90,3	8,6
Switzerland	136	88,5	7,7
Czech Rep.	324	92,3	8,6
Germany	2.537	91,7	9,1
Denmark	741	96,4	9,5
Spain	403	93,9	6,9
Finland	99	94,1	9,5
France	2.535	89,0	7,6
England	299	93,5	7,7
Hungary	73	91,6	8,2
Ireland	242	93,4	7,0
Israel	236	96,7	7,4
Italy	1.476	93,7	7,4
Luxemburg	12	88,9	6,5
Holland	1.919	92,4	9,0
New Zealand	1.257	93,5	5,7
Slovenia	46	89,5	6,6
Sweden	169	98,4	10,7
USA	6.095	95,6	9,9

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

Country	No	Average	STD
Australia	84	87,9	6,4
Canada	63	85,4	6,8
Denmark	114	98,3	7,5
England	10	80,1	7,1
Ireland	5	92,4	6,4
New Zealand	976	90,0	5,2
USA	627	87,6	6,4
South Africa	18	87,3	4,9

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 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 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	34	97,7	6,1	13	99,7	7,2
Denmark	91	96,2	8,1	95	99,6	8,2
Finland	207	100,0	8,3	207	99,4	8,2
Norway	160	102,5	7,4	160	93,9	7,2
Sweden	133	101,5	7,5	133	101,5	7,5

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	93,6	7,0	2	106,0	7,1
Belgium	15	99,0	8,2	14	96,7	11,6
Canada	485	93,7	7,2	460	95,4	9,2
Switzerland	52	94,0	8,2	21	95,2	7,8
Czech Rep.	11	96,5	4,2	7	98,3	4,9
Germany	1.196	95,1	7,3	1161	98,0	8,7
Denmark	517	99,8	8,0	503	101,4	8,5
Spain	5	97,0	7,1	2	99,0	14,1
Finland	106	100,7	8,0	106	101,1	8,5
France	931	96,7	8,7	799	97,0	8,0
England	134	96,9	8,1	26	96,1	8,4
Hungary	19	94,4	5,7	14	99,9	5,3
Ireland	117	102,1	7,8	3	99,0	6,2
Israel	15	100,0	6,5	100	99,4	5,4
Italy	672	95,1	8,1	343	98,8	6,8
Luxemburg	8	97,3	5,4	7	96,6	10,9
Holland	785	97,4	7,3	694	98,3	9,1
New Zealand	36	104,3	4,3	5	102,6	7,8
Sweden	101	101,5	8,8	104	102,9	8,5
USA	2.858	96,4	6,6	2595	101,0	7,9

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	98,4	7,4
Canada	12	97,5	5,6
Germany	11	98,2	9,3
Denmark	73	101,4	8,2
Finland	194	97,1	10,0
Norway	160	104,1	7,4
New Zealand	24	101,5	3,4
Sweden	123	103,7	9,8
USA	5	100,8	7,8

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

Country	No. of bulls	Average	STD
Australia	81	95,0	6,3
Belgium	15	97,1	8,6
Canada	438	93,6	7,0
Switzerland	31	95,7	2,5
Czech Rep.	65	95,5	3,0
Germany	1.020	94,2	6,3
Denmark	481	99,3	9,0
Spain	41	94,1	7,2
Finland	97	101,2	7,9
France	697	95,0	3,6
England	132	96,3	7,5
Hungary	7	94,1	7,0
Ireland	81	112,7	7,5
Israel	90	99,5	2,5
Italy	585	95,3	4,5
Luxemburg	6	91,5	7,8
Holland	678	94,4	7,4
New Zealand	448	110,1	6,5
Poland	178	95,4	6,7
Sweden	92	101,2	10,3
USA	2.487	97,8	8,6

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

Country	No. of bulls	Average	STD
Australia	14	93,1	8,0
Canada	12	101,4	8,0
Denmark	121	102,4	12,1
New Zealand	332	101,7	5,6
USA	235	98,1	9,2

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	96,3	5,3	20	101	5,4
Canada	33	96,8	5,2	32	95,0	3,7
Germany	14	101,5	4,1	14	105,8	1,7
Denmark	93	103,9	3,7	66	105,3	5,5
Finland	208	98,7	5,0	207	98,5	5,4
Norway	141	98,6	1,7	153	98,4	2,8
Sweden	110	101,9	5,7	123	100,7	5,9

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	105,7	4,2	160	101,9	3,7
Belgium	15	91,8	5,0	15	101,1	3,8
Canada	426	96,6	5,3	423	104,2	5,2
Switzerland	36	95,3	5,5	36	102,0	3,8
Germany	878	97,4	5,0	648	102,0	4,6
Denmark	476	100,3	8,6	415	101,0	7,2
Finland	101	100,4	5,0	100	101,8	5,2
France	657	96,5	5,4	638	106,4	5,6
England	153	97,0	9,3	150	104,1	6,9
Hungary	6	95,6	2,0	6	103,6	1,6
Italy	30	96,0	5,3	20	99,5	4,0
Holland	570	98,7	8,5	534	102,0	6,4
New Zealand	7	99,9	7,8	7	100,9	6,9
Slovenia	24	98,1	5,2	0		
Sweden	92	95,5	5,7	89	99,7	6,2
USA	354	97,4	6,5	342	104,3	6,3

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

Country	No. of bulls	Average	STD
Australia	30	98,6	7,0
Canada	25	91,7	9,9
Denmark	114	101,4	10,6
USA	12	93,1	8,1

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 as 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	13	-4,9	7,7
Germany	13	3,8	7,5
Denmark	70	4,6	13,2
Finland	204	2,2	8,9
Norway	160	-7,1	8,8
Sweden	130	5,9	8,3

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

Country	No. of bulls	Average	STD
Australia	39	-5,2	7,5
Belgium	15	2,9	5,9
Canada	446	-6,6	7,6
Switzerland	43	-10,0	7,8
Czech Rep.	67	-5,1	9,5
Germany	1.106	-5,6	8,4
Denmark	511	5,4	10,0
Spain	168	-6,7	7,6
Estonia	27	-3,6	7,7
Finland	102	4,6	8,5
France	620	-1,8	7,4
England	142	-1,8	9,3
Hungary	13	-4,5	8,1
Ireland	53	-5,6	10,7
Italy	632	-5,8	7,8
Japan	73	-3,4	5,5
Luxemburg	6	-4,5	5,3
Holland	724	-0,7	9,2
Poland	353	-7,6	7,5
Slovenia	23	-16,4	7,1
Sweden	113	1,8	14,6
USA	2.093	0,7	8,5

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

Country	No. of bulls	Average	STD
Canada	10	-12,1	10,4
Denmark	112	5,9	7,9
USA	216	-5,1	8,3

International comparison of NTM shows that:

- Red breeds: Denmark, Sweden and Finland have the same genetic level, which is much higher than Canada and Norway
- 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 USA

Regards

Ulrik Sander Nielsen, Anders Fogh, Emma Carlén, Elina Paakala and Martha Bo Almskou