INTERBULL breeding values calculated April 2017

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 04.04.2017.

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 2010 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 2010 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	12	96,7	99,3	96,3	97,4	7,6
Canada	22	86,0	86,3	80,1	81,4	10,2
Germany	11	98,7	98,5	96,9	97,2	5,9
Denmark	30	101,5	105,9	104,6	105,8	6,9
Estonia	15	96,3	94,6	92,7	92,6	9,0
Finland	162	104,6	103,4	104,9	104,4	7,0
Norway	190	95,4	94,7	96,0	95,6	8,4
New Zealand	21	86,6	91,0	85,4	87,4	10,2
Sweden	129	100,3	102,4	102,9	103,3	7,1
USA	7	76,9	66,0	63,6	61,9	10,9

Table 3.Genetic level for yield traits, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	86	95,9	99,1	96,8	97,9	7,4
Belgium	31	103,3	104,6	102,8	103,4	7,5
Canada	547	107,2	107,4	104,9	105,5	9,1
Switzerland	41	100,8	100,5	97,7	98,3	7,7
Czech Republic	30	103,4	102,4	100,5	100,6	8,9
Germany	661	105,9	105,4	104,2	104,4	8,1
Denmark	383	102,3	103,8	104,1	104,4	7,8
Spain	105	102,7	101,7	98,0	98,5	8,4
Estonia	54	93,8	97,8	93,0	94,8	8,8
Finland	55	99,4	98,9	100,1	99,8	8,5
France	547	106,4	103,7	105,9	104,9	7,2
UK	152	104,8	105,1	102,1	102,7	7,7
Ireland	106	78,8	93,9	85,6	90,3	11,9
Israel	89	96,3	102,0	97,2	99,3	7,2
Italy	592	102,9	101,9	100,0	100,2	8,3
Japan	75	109,1	103,5	104,2	102,8	7,7
Luxembourg	6	105,5	107,8	104,7	105,8	8,3
Netherlands	735	104,3	104,4	103,9	104,0	9,4
New Zealand	547	78,6	94,6	88,1	92,6	7,1
Poland	328	99,3	99,7	97,2	97,8	7,5
Slovenia	28	93,0	90,9	89,7	89,5	7,3
Sweden	74	100,1	103,2	103,9	104,4	8,2
USA	2651	107,5	105,9	103,8	103,9	8,8

Table 4.Genetic level for yield traits, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	46	103,5	93,7	101,7	97,1	5,5
Canada	19	99,3	83,3	90,9	84,7	11,5
Denmark	160	100,7	102,0	101,8	102,3	8,3
UK	6	98,3	88,5	93,3	89,3	8,3
New Zealand	495	96,9	88,5	96,5	92,4	7,5
USA	484	115,9	102,0	111,3	105,4	8,9

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 2010 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Holstein on Red Holstein base						
Canada	976	117,2	110,6	112,5	113,0	9,6
Germany	1542	115,9	107,9	112,1	111,9	8,8
Denmark	791	114,0	108,4	113,9	113,9	8,3
Netherlands	1535	114,9	108,5	113,0	113,0	9,2
USA	4860	118,1	110,2	112,7	112,8	8,6
Red Holstein on Red Holstein base						
Belgium	15	110,7	101,0	111,9	108,1	9,8
Switzerland	129	99,0	95,4	97,1	96,4	7,1
Germany	150	108,5	98,9	106,4	103,4	8,3
Denmark	12	106,3	100,9	105,5	103,8	8,1
Spain	6	105,3	95,2	104,5	100,8	8,0
Italy	26	107,8	97,3	105,8	102,3	8,1
Netherlands	281	105,7	101,7	108,7	106,9	8,6

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, 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 2010 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	42	106,6	5,4	102,1	3,9	109,2	7,6
Germany	19	110,2	6,4	103,7	3,6	104,4	8,6
Denmark	81	103,1	8,9	102,5	4,3	103,1	8,9
Finland	153	97,0	7,8	96,6	4,8	101,0	8,2
Norway	190			97,8	4,5	91,3	9,1
Sweden	123	97,2	7,6	98,3	5,2	101,0	7,2
USA	7	110,0	5,9	100,7	2,9	117,6	8,9

Table 7. Genetic level of conformation traits, Holstein. Bulls born in 2010 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	47	110,4	7,5	98,7	4,3	97,2	12,0
Belgium	30	110,7	11,2	101,0	6,9	104,6	11,1
Canada	517	117,2	10,2	101,2	5,6	108,7	10,0
Switzerland	42	115,8	10,4	99,4	6,4	103,6	9,3
Czech Republic	39	109,8	8,6	102,3	5,8	100,4	8,8
Germany	687	110,8	10,6	101,4	6,4	105,1	10,0
Denmark	379	102,5	11,9	101,1	6,2	104,0	9,4
Spain	119	113,2	10,3	100,5	6,1	105,1	8,4
Estonia	50	103,7	8,6	97,6	5,1	88,8	11,4
Finland	51	99,2	9,7	101,4	5,4	105,4	11,0
France	525	114,5	10,7	99,7	6,0	104,7	10,2
UK	136	112,2	10,5	100,9	5,1	103,6	8,6
Ireland	51	95,6	13,1	96,6	4,9	86,3	19,1
Italy	607	113,3	9,9	101,3	5,0	105,3	9,5
Japan	348	114,1	10,3	99,8	5,1	102,1	9,8
Luxembourg	7	108,4	7,0	102,4	4,9	108,1	5,0
Netherlands	705	111,6	11,0	102,6	6,4	105,7	10,5
New Zealand	500	86,9	10,0	107,4	9,1	105,1	12,9
Poland	384	106,8	9,8	99,6	4,8	95,8	9,1
Slovenia	27	102,4	9,1	99,3	6,8	90,6	8,7
Sweden	72	97,8	9,4	99,0	6,9	101,4	8,0
USA	1691	113,3	10,4	101,7	5,2	109,5	8,9

Table 8. Genetic level of conformation traits, Jersey. Bulls born in 2010 or later.

		Frame		Feet&legs		Udder	
Country	No	Average	STD	Average	STD	Average	STD
Australia	13	104,9	6,9	100,9	5,3	88,3	7,2
Canada	22	114,6	5,5	110,9	7,6	98,4	8,4
Denmark	114	101,0	9,3	101,2	7,6	99,9	9,1
USA	405	112,0	7,9	103,1	7,2	95,3	8,3

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 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 2010 or later.

Country	No. of bulls	Average	STD
Germany	11	86,9	9,8
Denmark	65	98,3	9,9
Estonia	14	90,8	8,7
Finland	192	99,8	8,3
Norway	190	95,9	9,8
New Zealand	30	88,4	10,3
Sweden	124	100,8	8,6
USA	10	89,1	6,1

Table 10. Genetic level for udder health, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	65	94,9	8,0
Belgium	15	98,1	5,3
Canada	183	96,2	8,4
Switzerland	22	93,9	6,2
Czech Republic	19	98,0	7,0
Germany	346	96,2	8,2
Denmark	194	102,6	7,7
Spain	62	95,3	7,2
Estonia	25	95,5	9,7
Finland	26	103,6	6,1
France	258	96,0	7,0
UK	40	96,5	8,1
Ireland	70	96,9	7,8
Israel	47	101,7	6,9
Italy	301	96,8	7,5
Japan	162	91,8	8,7
Netherlands	379	97,5	7,3
New Zealand	294	93,1	8,4
Poland	227	95,3	8,8
Slovenia	15	91,1	10,5
Sweden	36	104,5	6,4
USA	1381	100,4	7,9

Table 11. Genetic level for udder health, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	10	90,9	8,8
Canada	8	82,7	6,1
Denmark	117	101,8	8,0
UK	5	87,7	7,3
USA	426	88,4	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 2009 or later.

Country	No. of bulls	Average	STD
Australia	12	85,1	11,8
Canada	54	90,9	8,3
Germany	12	86,5	10,5
Denmark	32	99,5	9,2
Finland	150	98,8	7,9
UK	8	88,5	7,9
Norge	51	90,4	6,7
New Zealand	54	87,0	6,1
Sweden	108	99,4	7,5
USA	12	81,4	6,3

Table 13. Genetic level for longevity, Holstein. Bulls born in 2009 or later.

Country	No. of bulls	Average	STD
Australia	103	89,7	9,9
Belgium	34	97,9	9,0
Canada	626	95,2	9,5
Switzerland	61	88,4	6,9
Czech Republic	56	97,4	8,0
Germany	724	95,7	8,5
Denmark	420	101,0	8,4
Spain	170	96,1	7,1
Finland	65	99,4	9,6
France	767	94,3	7,8
UK	173	95,8	7,5
Hungary	11	96,8	5,5
Ireland	169	93,6	6,8
Israel	132	93,5	5,5
Italy	742	97,8	7,3
Netherlands	876	96,9	8,4
New Zealand	756	92,0	6,1
Poland	642	93,3	7,3
Slovenia	40	91,4	8,5
Sweden	90	103,3	6,9
USA	2974	102,1	9,5

Table 14. Genetic level for longevity, Jersey. Bulls born in 2009 or later.

Country	No	Average	STD
Australia	38	88,1	4,9
Canada	31	89,2	6,3
Denmark	91	101,3	7,3
UK	8	88,2	3,5
Ireland	5	81,8	2,3
New Zealand	546	88,4	5,1
USA	416	93,0	6,7

International comparison for longevity among most important countries shows that:

- Red breeds: Denmark, Finland and Sweden have higher level than the other countries
- 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 2010 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 2010 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	42	94,5	9,4	11	96,0	6,7
Denmark	53	99,7	10,9	47	102,5	7,6
Finland	169	101,2	10,0	104	99,7	9,4
Norway	190	101,0	9,8	190	91,9	7,9
Sweden	135	101,8	8,4	116	102,1	6,5

Table 16. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2010 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	157	95,0	7,5	7	101,0	5,5
Belgium	30	100,0	5,0	28	98,9	7,9
Canada	596	97,5	6,4	548	98,5	7,5
Switzerland	49	95,2	5,9	35	97,1	5,2
Germany	687	97,1	6,5	634	97,2	7,5
Denmark	387	101,2	7,1	381	102,3	7,3
Finland	55	101,2	8,8	37	102,4	7,6
France	584	97,7	7,4	503	99,9	9,4
UK	148	99,4	6,0	40	98,4	7,9
Ireland	139	100,0	5,0	9	104,1	7,6
Israel	19	97,9	7,8	95	96,0	5,3
Italy	610	95,8	7,3	229	98,0	6,0
Luxembourg	8	93,6	6,1	6	100,7	8,1
Netherlands	690	98,0	6,2	611	98,1	7,0
New Zealand	595	99,8	5,1	8	94,4	9,1
Sweden	75	103,4	7,4	75	100,5	7,7
USA	2887	98,4	6,1	2590	102,9	6,5

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

- Red breeds: Denmark, Finland, Sweden and Norway have similar genetic level for calving, direct. 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 2010 or later.

Country	No. of bulls	Average	STD
Australia	11	94,9	7,2
Canada	19	98,1	5,9
Germany	11	94,9	6,4
Denmark	29	98,4	7,8
Finland	139	96,0	8,8
Norway	190	102,8	7,3
New Zealand	21	98,4	4,5
Sweden	93	102,1	7,0
USA	7	94,1	9,7

Table 18. Genetic level for female fertility, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	80	93,1	8,7
Belgium	30	98,4	9,3
Canada	522	93,6	9,6
Switzerland	34	94,6	3,1
Czech Republic	24	95,6	3,0
Germany	596	95,8	7,8
Denmark	354	102,8	9,6
Spain	28	92,9	5,1
Finland	47	102,0	12,4
France	439	94,8	4,1
UK	145	96,1	7,3
Ireland	106	108,0	6,0
Israel	86	99,1	2,4
Italy	560	95,1	6,7
Luxembourg	6	94,2	8,4
Netherlands	631	95,5	8,8
New Zealand	547	104,8	5,0
Poland	196	92,9	7,2
Sweden	56	102,7	9,0
USA	2542	99,0	9,2

Table 19. Genetic level for female fertility, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	21	94,0	10,5
Canada	9	94,7	8,6
Denmark	113	101,8	9,9
New Zealand	357	100,3	6,9
USA	353	91,5	10,5

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

- Red breeds: Denmark and especially Finland has lower level than Sweden and Norway
- 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 2010 or later are shown for Holstein, Red breeds and Jersey.

Table 20. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2010 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	15	94,1	4,0	15	102,3	4,9
Canada	42	93,4	7,9	42	89,5	6,5
Germany	19	103,9	6,1	19	102,0	5,6
Denmark	69	105,8	8,5	25	107,0	15,4
Finland	162	99,2	7,0	147	101,2	7,4
Norway	148	98,9	1,3	149	100,4	1,8
New Zealand	23	99,3	5,0	23	96,9	4,0
Sweden	128	103,7	6,3	120	100,0	6,5

Table 21. Genetic level for milking speed and temperament, Holstein. Bulls born in 2010 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	132	104,6	5,4	132	101,7	5,8
Belgium	25	94,1	5,9	21	101,9	6,1
Canada	415	97,0	7,3	406	103,1	6,4
Switzerland	44	98,4	5,4	42	100,8	4,3
Germany	573	97,4	8,5	417	101,0	9,9
Denmark	373	98,2	11,0	168	101,2	13,9
Finland	53	96,8	7,4	49	100,6	8,9
France	426	97,7	8,4	416	105,2	8,9
UK	141	98,1	12,6	131	99,6	7,4
Ireland	9	91,3	7,4			
Italy	38	94,8	9,3	37	99,7	8,4
Luxembourg	6	101,4	7,3			
Netherlands	569	98,3	9,5	495	101,2	8,3
New Zealand	522	103,2	6,0	522	95,0	3,3
Slovenia	29	97,6	5,4			
Sweden	73	100,2	6,3	72	100,1	7,6
USA	387	98,1	9,7	374	105,1	8,3

Table 22. Genetic level for milking speed, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australien	30	101,1	4,6
Canada	20	95,6	8,6
Danmark	117	98,2	10,9
New Zealand	329	98,1	7,9
USA	38	99,9	6,8

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

- Red breeds: Denmark and Sweden have higher genetic level than Finland and Norway.
- Holstein: Sweden has the highest genetic level. Denmark and Finland have similar level as other countries for milking speed. For temperament Denmark, Sweden and Finland are at the same level as many other major countries
- Jersey: Denmark, New Zealand have 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 2010 or later.

Table 23. Genetic level for NTM, Red breeds. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Canada	8	-23,4	12,2
Germany	11	-7,9	7,8
Denmark	30	10,1	7,4
Finland	162	5,0	7,9
Norway	190	-8,8	8,6
Sweden	129	5,3	7,6

Table 24. Genetic level for NTM, Holstein. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	19	-1,1	10,3
Belgium	16	3,7	7,1
Canada	194	2,1	9,0
Switzerland	19	-7,3	7,9
Czech Republic	15	2,5	5,7
Germany	350	1,6	7,5
Denmark	375	8,1	7,5
Spain	52	-5,8	7,9
Estonia	24	-10,3	7,1
Finland	52	7,0	6,8
France	244	1,0	6,7
UK	71	0,3	7,1
Ireland	36	-10,3	11,9
Italy	289	-1,8	7,9
Japan	48	-2,0	7,2
Netherlands	396	2,7	8,5
Poland	159	-6,8	8,5
Slovenia	14	-15,2	9,3
Sweden	74	8,2	6,5
USA	1018	6,0	8,2

Table 25. Genetic level for NTM, Jersey. Bulls born in 2010 or later.

Country	No. of bulls	Average	STD
Australia	12	-9,8	4,2
Canada	7	-22,1	11,6
Denmark	109	4,6	9,1
USA	333	-4,3	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, Finland and USA 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 April 2017 the following changes are done compared to December 2016 routine evaluation:

Yield

- Holstein from France have base change
- Holstein from Holland include data from 4th and 5th lactation
- Holstein from Italy change base and cut off one year of data
- Holstein from Germany have base change
- All breeds from New Zealand has change in daughters per bull due to DNA parentage testing
- All breeds from Canada has base change
- Holstein and Jersey from Australia change to RR test-day model. Further base change
- Holstein from Great Britain has changed model and editing of data

Fertility

- Holstein from Germany has corrected an error detected in genetic group and corrected birth year for some bulls. Further base is changed
- RDC from Norway may have bulls with changing reliability across evaluations due to rolling herd x year x season definition
- Holstein from France change base
- Holstein from Italy change base and cut off one year of data
- Jersey from New Zealand have change in daughters per bull due to DNA parentage testing

Calving

- Jersey from New Zealand has change in daughters per bull due to DNA parentage testing. Further genetic parameters are re-estimated
- Holstein from Germany have base change
- Holstein from France have base change
- RDC from Norway may have bulls with changing reliability across evaluations due to rolling herd x year x season definition
- Holstein from Italy change base and cut off one year of data
- All breeds from Canada has base change
- All breeds from Australia has base change
- Holstein from Belgium has base change

Conformation

- Holstein and RDC from DFS has corrected error for udder depth
- Holstein from France have base change
- Holstein from Italy change base and cut off one year of data
- Holstein from Germany have base change
- All breeds from Canada has base change
- All breeds from Australia has base change
- All breeds from New Zealand has change in daughters per bull due to DNA parentage testing

Udder health

- RDC from Norway may have bulls with changing reliability across evaluations due to rolling herd x year x season definition
- Holstein from France have base change
- Holstein from Holland introduce data from 4th and 5th lactation
- Holstein from Italy change base and cut off one year of data
- Holstein from Germany have base change
- All breeds from New Zealand has change in daughters per bull due to DNA parentage testing
- All breeds from Canada has base change
- All breeds from Australia has base change

Longevity

- RDC from Norway participate for the first time
- Holstein from France have base change
- Holstein from Italy change base and cut off one year of data
- Holstein from Germany have base change
- All breeds from New Zealand has change in daughters per bull due to DNA parentage testing
- All breeds from Canada has base change
- All breeds from Australia has base change

Milking speed and temperament

- RDC from Norway may have bulls with changing reliability across evaluations due to rolling herd x year x season definition
- Holstein from France have base change
- Holstein from Germany have base change
- All breeds from New Zealand has change in daughters per bull due to DNA parentage testing
- All breeds from Canada has base change
- All breeds from Australia has base change

Regards

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