INTERBULL breeding values calculated December 2024

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.

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International breeding values for the traits and breeds shown in table 1 have been published 3th December 2024

Current evaluation	
Daughter proven bulls: Yield Conformation Somatic cell count and udder health Longevity Calving – maternal and direct Female fertility Milking speed and temperament NTM for Nordic and foreign bulls	Young genomic tested bulls - HOL: Yield Conformation Somatic cell count and udder health Longevity Calving – maternal and direct Female fertility Milking speed and temperament

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.

Bulls from Denmark, Finland and Sweden are in the following grouped under DNK/FIN/SWE

Daughter proven bulls

In the tables below, only sires that have breeding values based on daughter information is shown.

Yield

In tables 2-4 is a comparison of the genetic level of yield for bulls from different countries. The analysis includes bulls born in 2017 or later, that have more than 60 daughters in the genetic evaluation.

Table 2. Genetic level for yield traits, Red breeds. Bulls born in 2017 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	13	90,9	83,5	81,7	80,4	16,3
Canada	19	92,0	88,1	84,7	84,8	9,3
Germany	11	100,4	99,4	100,1	99,7	6,8
DNK/FIN/SWE	170	100,5	104,6	104,4	105,5	8,3
UK	13	82,0	75,8	69,6	70,0	13,6
Norway	128	99,1	93,5	95,7	93,8	9,4
New Zealand	16	89,9	86,0	82,7	82,8	9,9
USA	6	82,5	70,8	68,0	66,0	21,2

Table 3. Genetic level for yield traits, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	63	97,6	102,0	99,1	101,2	9,7
Belgium	18	102,6	105,4	103,7	105,1	7,0
Canada	394	108,1	109,5	107,2	108,3	11,7
Switzerland	86	97,1	97,2	96,1	96,5	9,5
Czech Republic	50	109,7	107,7	106,6	106,4	9,1
Germany	754	112,0	105,5	109,9	107,0	9,3
DNK/FIN/SWE	251	100,0	102,7	103,2	103,8	8,8
Spain	71	112,7	101,5	105,2	101,3	8,3
Estonia	7	97,4	90,6	91,6	89,6	9,7
France	316	105,7	102,0	104,9	103,1	8,1
UK	51	99,9	108,4	101,8	105,9	9,1
Hungary	6	106,5	111,5	109,0	111,0	7,8
Israel	123	101,1	100,2	99,5	99,5	7,1
Italy	179	106,3	103,9	106,1	104,9	8,5
Japan	27	110,3	107,6	105,7	105,7	8,7
Luxembourg	11	112,1	107,8	107,6	106,7	7,9
Netherlands	508	105,4	106	106,2	106,3	9,1
New Zealand	744	74,7	93,0	84,8	91,9	7,2
Poland	96	106,8	103,0	105,7	103,9	8,0
Slovenia	22	98,1	89,2	90,0	87,5	7,2
USA	2331	108,4	113,1	107,7	110,5	10,0

Table 4. Genetic level for yield traits, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	24	103,5	88,5	95,7	88,7	5,3
Canada	22	107,6	92,4	98,7	92,0	13,6
DNK/FIN/SWE	83	102,3	105	105,4	106,1	8,1
New Zealand	406	98,0	94,0	97,6	95,2	8,1
USA	390	115,1	101,3	108,6	101,9	10,8

International comparison for yield among most important populations shows that:

- Red breeds: DNK/FIN/SWE have higher genetic level than Norway and considerably higher level that Canada

- Holstein: USA has the highest genetic level while DNK/FIN/SWE has average genetic level

- Jersey: Denmark has higher genetic level than USA. New Zealand has considerably lower genetic level

Conformation

The international genetic evaluation is done for 16 linear traits for Holstein, Red breeds and Jersey. In addition, frame, body condition score and locomotion are 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 5-7 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 5. Genetic level for conformation traits, Red breeds. Bulls born in 2017 or later.

Country	No. of bulls	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Canada	29	103,5	6,0	106,0	5,8	100,1	7,7
Germany	13	108,1	6,8	106,3	5,5	103,5	7,8
DNK/FIN/SWE	161	98,3	8,6	102,3	5,6	100,5	7,5
UK	12	99,5	6,6			97,6	10,2
Norway	103	97,3	8,7	101,0	5,9	85,4	9,5

Table 6. Genetic level of conformation traits, Holstein. Bulls born in 2017 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	22	116,2	12,5	98,8	5,1	101,5	14,1
Austria	6	100,3	9,0	99,5	3,0	99,0	12,5
Belgium	18	110,7	12,5	103,7	5,8	100,7	7,9
Canada	354	113,0	10,4	96,9	5,4	105,5	10,4
Switzerland	98	108,8	9,1	98,7	5,3	105	10,5
Czech Republic	53	108,8	9,0	98,9	4,2	99,0	9,3
Germany	736	107,3	9,1	100,9	5,4	104,5	9,0
DNK/FIN/SWE	228	99,4	10,2	100,9	5,7	102,4	8,6
Spain	82	112,9	8,1	100,2	6,0	102	9,7
Estonia	8	104,3	7,9	99,0	2,0	92,4	10,3
France	271	117,0	9,7	101,8	5,6	108,9	9,8
UK	31	102,5	11,4	97,5	4,2	101,4	9,5
Hungary	6	111,8	9,9	98,2	5,9	101,2	8,4
Italy	178	112,4	10,4	98,5	5,0	101,9	9,2
Japan	330	110,4	9,9	97,5	5,1	98,1	9,9
Korea	6	108,5	6,1	97,7	1,8	93,3	10,3
Luxembourg	10	109,0	9,2	100,8	4,8	99,4	8,1
Netherlands	423	107,0	9,8	104,5	7,0	99,4	10,3
New Zealand	733	84,4	8,9				
Poland	75	109,8	11,2	101,7	5,8	98,0	9,8
Slovenia	28	105,6	11,1	97,8	4,8	89,8	7,7
USA	1452	106,4	10,5	97,8	5,2	100,4	9,5

Table 7. Genetic level of conformation traits, Jersey. Bulls born in 2017 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	9	107,4	7,8	103,3	6,2	95,7	5,9
Canada	28	101,0	10,1	104,6	5,7	99,9	8,3
DNK/FIN/SWE	80	96,5	7,3	97,3	7,9	101,4	10,1
USA	268	102,6	7,9	100,8	6,3	101,6	8,8

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

- <u>Red breeds:</u> Germany has the highest genetic level for both Frame, feet&legs and udder. Canada has similar genetic level for udder as DNK/FIN/SWE. Compared to Norway, DNK/FIN/SWE have similar genetic level for frame and feet&legs and higher level for udder.

- <u>Holstein:</u> DNK/FIN/SWE has lower genetic level for frame than the main Holstein populations. Canada, Spain, France and Italy have the highest genetic level for frame. Populations with grass based dairy farming like New Zealand has lower genetic level for frame. For feet&legs Netherlands has the highest level and there are small differences between populations. DNK/FIN/SWE has around average genetic level for udder, while France, Canada and Germany have the highest genetic level for udder.

- <u>Jersey:</u> Denmark has lower genetic level for frame than USA, and the same level 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 8-10 is a comparison of genetic level of udder health for bulls from different countries.

Table 8. Genetic level for udder health, Red breeds. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	16	98,1	7,1
Canada	11	95,6	10,2
DNK/FIN/SWE	192	100,7	8,7
UK	8	98,9	6,4
Norway	134	100,5	9,0
New Zealand	28	91,2	7,4
USA	5	99,5	7,0

Table 9. Genetic level for udder health, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	72	97,3	6,7
Belgium	15	99,3	6,9
Canada	251	98,6	8,9
Switzerland	30	99,7	8,9
Czech Republic	55	96,2	8,6
Germany	563	100,3	7,6
DNK/FIN/SWE	245	101,9	7,0
Spain	81	102,3	8,5
Estonia	10	97,1	9,4
France	275	102,1	7,3
UK	29	98,2	7,2
Hungary	6	99,2	6,7
Israel	128	100,2	8,3
Italy	168	99,7	8,5
Japan	239	93,9	7,0
Korea	21	94,0	5,9
Luxembourg	6	99,6	6,0
Netherlands	321	100,1	7,5
New Zealand	774	92,4	6,8
Poland	101	99,3	8,8
Slovenia	28	95,3	8,7
USA	1361	98,8	8,3

Table 10. Genetic level for udder health, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	25	91,3	6,0
Canada	12	87,7	9,7
DNK/FIN/SWE	82	100,3	7,2
New Zealand	377	94,2	6,4
USA	178	84,1	9,5

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

- <u>Red breeds:</u> DNK/FIN/SWE has same genetic level as Norway

- <u>Holstein:</u> DNK/FIN/SWE has similar or higher genetic level than other major European populations, USA and Canada

- <u>Jersey:</u> Denmark is substantially better than the other populations.

Longevity
In tables 11-13 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 11. Genetic level for longevity, Red breeds. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	10	89,2	10,4
Canada	37	86,2	10,2
Germany	13	97,0	8,9
DNK/FIN/SWE	176	100,9	9,2
UK	14	80,3	6,2
Norge	148	90,6	7,2
USA	10	79,3	8,7

Table 12. Genetic level for longevity, Holstein. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	54	93,2	10,4
Austria	8	100,9	8,3
Belgium	19	102,3	7,1
Canada	512	100,5	9,1
Switzerland	114	94,3	8,5
Czech Republic	56	104,5	6,1
Germany	978	103,9	8,4
DNK/FIN/SWE	270	103,0	7,6
Spain	50	95,5	8,0
France	380	98,3	8,2
UK	41	97,5	14,0
Hungary	5	105,6	3,7
Israel	152	92,8	6,0
Italy	198	98,5	7,4
Luxembourg	17	101,6	9,8
Netherlands	661	102,4	8,9
New Zealand	707	85,8	5,9
Poland	148	101,8	9,2
Slovenia	55	91,8	5,8
USA	2701	103,5	9,1

Table 13. Genetic level for longevity, Jersey. Bulls born in 2016 or later.

Country	No. of bulls	Average	STD
Australia	19	97,5	7,2
Canada	23	95,1	7,9
DNK/FIN/SWE	83	100,8	7,1
New Zealand	191	90,9	5,5
USA	466	100,2	7,5

International comparison for longevity among most important populations shows that:

- Red breeds: DNK/FIN/SWE has higher level than the other populations

- Holstein: DNK/FIN/SWE are among the countries with the highest genetic level

- Jersey: Denmark and USA has the highest genetic level

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 enough 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 14 and 15 the average genetic level for Red breed and Holstein bulls is shown for different countries. Only bulls born in 2017 or later are included. Bulls need to have breeding values for yield to be included.

Table 14. Genetic level for calving, maternal and calving, direct, Red breeds. Bulls born in 2017 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	27	93,3	5,7	10	97,0	8,2
DNK/FIN/SWE	168	100,8	7,0	148	100,1	6,2
Norway	130	99,6	8,3	132	91,6	7,1

Table 15. Genetic level for calving, maternal and calving, direct, Holstein. Bulls born in 2017 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	78	97,4	5,0	4	96,0	2,9
Austria	7	95,1	7,4	6	98,5	8,3
Belgium	19	99,1	4,6	18	101,1	5,5
Canada	411	98,6	5,6	317	102,5	4,6
Switzerland	107	96,7	5,2	79	100,2	7,6
Germany	829	99,0	5,7	747	101,0	6,0
DNK/FIN/SWE	256	100,3	5,8	251	102,1	5,7
Spain	48	98,0	4,1	12	102,4	4,3
France	363	96,9	5,9	330	105,1	7,3
UK	47	100,4	4,2	24	102,0	3,4
Israel	66	96,5	4,4	131	92,0	5,8
Italy	179	97,4	4,8	130	101,0	4,9
Luxembourg	14	97,0	4,4	12	100,8	6,7
Netherlands	502	99,0	5,8	436	98,9	7,3
New Zealand	5	103,2	3,1	0		
Poland	108	96,5	4,0	100	97,7	5,8
USA	2410	100,3	5,0	1750	103,6	4,7

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

- <u>Red breeds:</u> DNK/FIN/SWE and Norway have similar genetic level for calving, direct. For calving, maternal DNK/FIN/SWE has a higher level than Norway

- <u>Holstein:</u> DNK/FIN/SWE are around the average 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 +
$\qquad$ 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 16. Genetic level for female fertility, Red breeds. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	12	92,8	11
Canada	17	93,1	8,2
Germany	11	95,8	8,8
DNK/FIN/SWE	160	99,9	10,1
UK	11	93,4	6,9
Norway	113	111,5	7,0
New Zealand	13	98,4	6,1
USA	6	93,8	4,9

Table 17. Genetic level for female fertility, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	53	97,1	6,9
Belgium	19	92,6	8,0
Canada	362	95,9	9,0
Switzerland	84	95,5	4,7
Czech Republic	45	96,7	3,5
Germany	682	97,5	9,5
DNK/FIN/SWE	251	103,7	10,4
Spain	38	91,8	7,6
France	269	96,6	8,2
UK	36	100,9	6,3
Israel	117	96,5	2,7
Italy	148	95,8	8,5
Japan	27	91,3	6,3
Luxembourg	11	93,5	9,4
Netherlands	474	95,2	9,0
New Zealand	560	98,9	4,9
Poland	70	89,6	6,9
USA	2213	95,7	8,0

Table 18. Genetic level for female fertility, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	22	91,0	8,4
Canada	20	89,3	9,1
DNK/FIN/SWE	97	100,8	13,2
New Zealand	300	97,3	7,0
USA	361	89,7	8,8

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

- <u>Red breeds:</u> DNK/FIN/SWE has a lower level than Norway

- <u>Holstein:</u> DNK/FIN/SWE has a higher genetic level than all other populations

- <u>Jersey:</u> Genetic level is higher in Denmark than the other populations

Milking speed and temperament

In Tables 19-21, the genetic level for bulls from different countries, born in 2017 or later are shown for Holstein, Red breeds and Jersey.

Table 19. Genetic level for milking speed and temperament, Red breeds. Bulls born in 2017 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Canada	27	89,8	14,3	27	94,5	13,3
Germany	8	102,9	2,7	12	103,9	4,5
DNK/FIN/SWE	174	99,3	7,9	142	100,8	12,6
Norway	116	93,3	4,7	107	98,2	5,7

Table 20. Genetic level for milking speed and temperament, Holstein. Bulls born in 2017 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	31	101,4	9,2	31	105,2	9,4
Austria	7	97,2	6,0			
Belgium	14	89,5	7,0	14	102,9	11,4
Canada	278	97,6	11,6	270	103,8	13,9
Switzerland	102	97,2	10	102	102,8	10,4
Germany	566	96,0	9,2	450	101,1	15,4
DNK/FIN/SWE	215	100,3	7,9	176	100,7	16,4
France	259	94,8	8,5	257	103,7	10,2
UK	37	99,4	10,6	37	103,8	8,4
Italy	156	94,2	3,6	154	102,6	8,4
Luxembourg	8	92,5	6,8			
Netherlands	386	92,8	10,2	340	102,5	13,3
New Zealand	739	102,6	3,7	739	97,3	2,7
Slovenia	35	95,9	6,8			
USA	696	98,9	12,5	670	103,8	14,4

Table 21. Genetic level for milking speed, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australien	19	102	9,5
Canada	25	98,1	9,6
DNK/FIN/SWE	77	101,3	10,1
New Zealand	356	99,0	6,8
USA	20	103,5	9,2

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

- Red breeds: DNK/FIN/SWE has a higher genetic level for milking speed and temperament than Norway and Canada

- Holstein: DNK/FIN/SWE has similar level as other populations for milking speed and temperament.

- Jersey: Denmark has similar genetic level as New Zealand and USA

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 $\frac{1}{2}$ (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 22-24 genetic level for Interbull NTM for Jersey, Red breeds and Holstein are shown. Bulls included are born in 2017 or later.

Table 22. Genetic level for NTM, Red breeds. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Canada	14	-22,9	10,3
Germany	8	2,9	8,0
DNK/FIN/SWE	167	9,0	9,4
UK	8	-39,1	6,6
Norway	103	-9,0	8,5

Table 23. Genetic level for NTM, Holstein. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Australia	20	-2,5	12,1
Belgium	16	3,6	7,7
Canada	280	6,0	13,3
Switzerland	64	-6,3	12,6
Czech Republic	49	3,2	8,1
Germany	582	6,6	9,1
DNK/FIN/SWE	245	8,7	9,1
Spain	70	-0,8	8,8
Estonia	6	-18,5	12
France	270	2,9	8,2
UK	27	8,0	7,9
Hungary	6	10,5	9,0
Italy	169	2,0	8,7
Japan	27	-0,8	8,1
Luxembourg	8	-0,5	11,7
Netherlands	375	5,2	10,1
Poland	86	-1,8	9,4
Slovenia	22	-19,1	8,0
USA	1207	8,2	9,9

Table 24. Genetic level for NTM, Jersey. Bulls born in 2017 or later.

Country	No. of bulls	Average	STD
Canada	10	-15,1	12,5
DNK/FIN/SWE	81	7,1	8,1
USA	17	-8,3	8,9

International comparison of NTM among most important populations shows that:

- Red breeds: DNK/FIN/SWE is better in NTM than Canada and Norway

- Holstein: DNK/FIN/SWE, UK and USA have the highest level and are closed followed by the major European populations.

- Jersey: Denmark's average NTM is more than 15 index points better than USA

Changes since last run

In the evaluation in December 2024 the following changes are done compared to August 2024 evaluation. Only changes in major countries:

Yield
- USA (ALL) has drops in information due to pedigree verification and data edits.
- New Zealand (ALL) has change in information for many animals based on pedigree verification due to genomic information. New heritabilities have been introduced
- Netherland (HOL,JER) has reduction in information due to pedigree verification from genomic information.

Fertility
- USA (ALL) Has drops in information due to pedigree verification and data edits. No longer participating in the CRC evaluation.
- New Zealand (ALL) has reduction in information due to pedigree verification from genomic information.
- Netherland (HOL, JER) has reduction in information due to pedigree verification.
- Italy (HOL) has decrease in information due to strict editing criteria.
- Germany (HOL) has reduction in information due to routine data editing/selection procedures.

Calving
- USA (ALL) has drops in information due to pedigree verification and data edits.
- New Zealand (ALL) has reduction in information due to pedigree verification from genomic information.
- New Zealand (HOL, RDC) has re-entering the evaluation for calving. Trait definition: the heifer calving difficulty breeding value for a sire is calculated from the difficulty its calves have, being born from a two-year-old dam. Sires with more negative heifer calving difficulty breeding values are expected to produce calves that exhibit less calving difficulties in first calving heifers than those with more positive breeding values for heifer calving difficulty. Calving difficulty is 0 if calving assistance code is 'not reported' or 'reported no assistance'. Calving difficulty is 1 if calving assistance code is 'minor assistance' or 'major assistance'.
- Netherland (HOL) has reduction in information due to pedigree verification.
- Italy (HOL) has decrease in information due to strict editing criteria.

Conformation
- Denmark, Finland, Sweden (ALL) has for OCS, OFL, and OUS made a linear combitation of the linear traits. These weights have been changed.
- New Zealand (ALL) has change in information for many animals based on pedigree verification due to genomic information. New heritability for FTL has been introduced
- Netherland (HOL,JER) has change in information for many animals based on pedigree verification due to genomic information
- USA (HOL) has drops in information due to pedigree verification. Two bulls are missing from the evaluation due to a change in their Type of Proof.
- USA (JER,RDC) has drops in information due to pedigree verification and data edits.

Udder health
- USA (ALL) has drops in information due to pedigree verification and data edits.
- New Zealand (ALL) has change in information for many animals based on pedigree verification due to genomic information. New heritabilities have been introduced
- Netherland (HOL, JER) has reduction in information due to pedigree verification.
- Germany (HOL) has reduction in information due to routine data editing/selection procedures.

Longevity
- USA (ALL) has drops in information due to pedigree verification and data edits.
- New Zealand (ALL) has change in information for many animals based on pedigree verification due to genomic information.
- Netherland (HOL,JER) has reduction in information due to pedigree verification.
- Germany (HOL) has reduction in information due to routine data editing/selection procedures.
- Italy (HOL) has decrease in information due to strict editing criteria.

Milking speed and temperament
- New Zealand (ALL) has change in information for many animals based on pedigree verification due to genomic information.
- Netherland (HOL,JER) has reduction in information due to pedigree verification.

Genomic tested young Holstein bulls

In the tables below, only Holstein sires that have breeding values based on genomic information and no daughters is shown.

Averages are only shown for countries with more than 20 bulls.

Yield

In tables 25 is a comparison of the genetic level of yield for bulls from different countries.

Table 25. Genetic level for yield traits, Holstein. Bulls born in 2021 or later.

Country	No. of bulls	Milkindex	Fatindex	Proteinindex	Y-index	Y-index STD
Australia	114	98,8	106,2	100,9	104,4	8,7
Austria	6	117,8	114,7	110,8	111,3	5,5
Belgium	30	110,9	115,7	113,0	115,0	6,3
Brasilia	13	108,8	116,3	108,2	112,5	5,1
Canada	790	109,3	118,6	110,6	115,3	11,7
Switzerland	29	103,1	105,3	102,8	104,2	9,4
Czech Republic	71	114,0	114,2	113,0	113,5	5,7
Germany	924	115,6	113,8	115,9	114,8	7,6
DNK/FIN/SWE	187	98,8	116,9	111,6	117,8	7,8
Spain	141	112,1	106,7	108,4	106,6	9,5
France	665	108,5	107,6	110,4	109,3	7,9
UK	82	105,9	121,9	111,6	118,7	16,3
Italy	152	112,6	112,9	114,8	114,3	8,6
Netherlands	893	108,5	112,5	111,9	113,0	7,9
New Zealand	14	71,7	88,7	81,4	87,7	7,2
Poland	127	112,7	111,4	113,8	112,8	7,5
USA	3171	111,2	124,0	114,9	120,8	7,6

International comparison for yield shows that DNK/FIN/SWE, has same genetic level as other major countries

Conformation

The international genetic evaluation is done for 16 linear traits for Holstein. In addition, frame condition score and locomotion are included in this trait group.

Calculation of frame, feet&legs and udder follows same principles as for daughter proven bulls.

In tables 26 is a comparison of genetic level of composite conformation traits for bulls from different countries.

Table 26. Genetic level of conformation traits, Holstein. Bulls born in 2021 or later.

Country	No	Frame		Feet&legs		Udder	
		Average	STD	Average	STD	Average	STD
Australia	16	110,4	10,6	98,9	4,6	104,1	8,4
Belgium	16	108,8	8,0	107,4	6,4	102,4	7,3
Canada	532	115,7	11,1	100,3	4,6	105,0	8,8
Switzerland	10	118,5	7,5	102,2	3,0	113,8	9,3
Czech Republic	40	110,2	6,6	101,4	4,4	103,3	10,1
Germany	579	107,6	8,7	103,1	4,6	107,7	8,4
DNK/FIN/SWE	116	103,0	11,9	101,8	4,4	106,2	7,4
Spain	94	115,0	12,2	102,2	4,1	112,0	8,9
France	399	115,9	8,6	104,4	4,3	115,4	8,8
UK	53	105,5	9,4	98,7	3,3	96,6	10,6
Italy	90	113,5	8,7	100,3	3,4	105,4	9,5
Netherlands	553	107,6	8,8	106,8	6,6	102,9	9,1
New Zealand	5	81,0	8,1				
Poland	86	112,4	8,5	101,8	4,1	106,9	9,1
USA	2085	106,4	9,6	98,0	4,1	97,0	8,5

> International comparison for conformation traits among most important populations shows that DNK/FIN/SWE has lower genetic level for frame than other populations. For feet&legs there are only small differences between populations. For Udder France and Spain have the highest level while DNK/FIN/SWE is around average.

Somatic cell count and udder health

In tables 27 is a comparison of genetic level of udder health for bulls from different countries.

Table 27. Genetic level for udder health, Holstein. Bulls born in 2021 or later.

Country	No. of bulls	Average	STD
Australia	15	96,6	5,4
Belgium	16	102,4	5,4
Canada	532	98,9	5,4
Switzerland	10	101,9	7,6
Czech Republic	27	99,7	5,5
Germany	582	103,0	5,8
DNK/FIN/SWE	116	104,3	5,8
Spain	94	103,6	9,1
France	406	107,3	5,8
UK	61	99,5	4,8
Italy	82	101,7	5,7
Netherlands	551	102,1	6,3
New Zealand	5	88,6	2,2
Poland	86	104,4	5,8
USA	2111	99,4	4,7

> International comparison for udder health among most important populations show that DNK/FIN/SWE is around average for the European populations while North American populations have a lower level.

Longevity

In tables 28 is a comparison of genetic level of longevity for bulls from different countries.

Table 28. Genetic level for longevity, Holstein. Bulls born in 2021 or later.

Country	No. of bulls	Average	STD
Australia	16	98,7	6,9
Belgium	16	106,3	5,8
Canada	532	105,7	5,8
Switzerland	10	107,9	8,4
Czech Republic	27	105,3	5,7
Germany	582	113,4	5,7
DNK/FIN/SWE	116	110,2	5,7
Spain	94	107,6	9,1
France	406	109,7	5,9
UK	61	106,7	5,6
Italy	82	107,5	5,5
Netherlands	552	108,9	7,3
Poland	86	107,2	5,0
USA	2114	107,9	4,5

International comparison for longevity among most important populations shows smaller difference between the major populations.

Calving – maternal and direct

In Tables 29 the average genetic level for bulls is shown for different countries.

Table 29. Genetic level for calving, maternal and calving, direct, HOL. Bulls born in 2021 or later.

Country	Calving, direct			Calving, maternal		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	15	98,8	2,9	14	101,3	5,7
Belgium	15	99,3	3,3	16	102,2	4,1
Canada	495	99,0	4,3	532	102,3	5,0
Switzerland	6	99,3	1,6	10	103,0	5,5
Czech Republic	27	99,4	4,1	27	104,6	3,4
Germany	528	100,5	3,9	579	103,5	5,0
DNK/FIN/SWE	93	100,6	3,8	116	102,9	4,6
Spain	94	98,1	4,9	94	99,8	4,9
France	405	97,8	3,9	399	101,7	4,5
UK	61	100,2	3,9	53	103,6	3,8
Italy	90	99,7	3,4	89	104,1	4,0
Netherlands	512	100,1	4,0	554	101,3	5,0
Poland	86	97,2	4,0	86	100,7	4,4
USA	1971	100,7	3,4	2083	104,6	3,7

International comparison for calving (direct and maternal) shows that DNK/FIN/SWE has similar level as the other major countries

Female fertility

In Tables 30 the average genetic level for bulls is shown for different countries.

Table 30. Genetic level for female fertility, Holstein. Bulls born in 2021 or later.

Country	No. of bulls	Average	STD
Australia	14	97,5	5,4
Belgium	15	98,3	5,6
Canada	511	95,7	7,3
Switzerland	10	99,2	8,5
Czech Republic	27	97,8	6,9
Germany	568	103,6	6,8
DNK/FIN/SWE	115	107,3	7,3
Spain	92	100,0	8,3
France	399	103,9	7,0
UK	48	101,5	4,8
Italy	80	100,4	7,2
Netherlands	549	100,4	7,8
Poland	85	99,6	6,0
USA	1761	100,4	5,6

International comparison for female fertility among most important populations shows that DNK/FIN/SWE is in the top.

Milking speed and temperament

In Tables 31, the genetic level for bulls from different countries.

Table 31. Genetic level for milking speed and temperament, Holstein. Bulls born in 2021 or later.

Country	Milking speed			Temperament		
	No. of bulls	Average	STD	No. of bulls	Average	STD
Australia	15	98,8	6,7	7	101,3	2,6
Belgium	15	94,6	3,5	14	104,1	5,4
Canada	515	98,4	4,4	459	104,6	10,9
Switzerland	10	98,0	2,0			
Czech Republic	26	99,2	7,3	5	103,8	11,4
Germany	574	98,3	3,5	574	103,1	6,9
DNK/FIN/SWE	115	102,5	3,8	115	102,4	4,9
Spain	94	96,7	2,6	82	103,7	1,4
France	399	93,9	2,9	398	104,7	3,2
UK	52	100,5	6,5	46	103,2	1,3
Italy	89	94,1	8,4	87	103,3	7,5
Netherlands	553	95,6	4,3	550	102,7	9,8
New Zealand	5	101,7	2,3			
Poland	86	93,1	15,8	74	102,5	1,5
USA	1959	101,7	4,8	1693	103,7	3,7

For milking speed DNK/FIN/SWE has the highest genetic level. For temperament are only small differences between populations.

Changes since last run

In the evaluation in December 2024 the following changes are done compared to August 2024 evaluation:

Yield:
- France has changes in information due to pedigree verification
- Germany has base change
- Netherland has some missing bulls due to data edits and bulls were no longer qualified for publication

Fertility:
- France has changes in information due to pedigree verification. Changes in type of proofs for hco
- Germany has base change
- Denmark, Finland, Sweden has introduced Single Step for fertility. The model is the same as for the traditional EBVs, and the procedures used are similar as for conformation and milking speed

Calving:
- France has changes in information due to pedigree verification
- Germany has base change

Conformation:
- France has changes in information due to pedigree verification
- Germany has base change. For ang, lower correlation for birth year 2021,due to the short history of the data for this new trait

Udder health:
- France has decrease in reliability for mas for a large number of bulls as the parameters to compute reliabilities have been reworked, causing an important downward reliability variation. Changes in information due to pedigree verification
- Germany has base change

Longevity:
- France has changes in information due to pedigree verification
- Germany has base change

Milking speed and temperament:
- France has changes in information due to pedigree verification
- Germany has base change

International comparison of changes since last run shows that:

- <u>All countries:</u> Changes are smaller changes with a minimal effect on the reliability and indexes.

Dates of publication of Interbull breeding values in 2025:

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.

Regards
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