Milkability and Temperament MACE Correlation and Pilot Study in Dairy Cattle Populations

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Introduction

Several countries and breeds are currently evaluating individuals for workability traits and include these functional traits in their selection goals. Nevertheless at present no international genetic evaluations for sires are available for milkability and temperament. This study has been jointly developed by ANARB, by the Department VSA of the University of Milan, and Iterbull Centre. Objective was to estimate MACE correlation values among countries and a preliminary MACE genetic evaluation for workability traits (milkability and temperament) in dairy cattle breeds. This paper provides a summary of the results for all breeds and for the two traits considered.

Material and Methods

Milkability and temperament were analyzed separately. A total of 5 breeds (Holstein, Brown Swiss, Guernsey, Jersey, Red Dairy Cattle, and Simmental) and 10 countries Austrialia (AUS), Canada (CAN), Switzerland (CHE), Germany and Austria (DEA), Denmark, Finland and Sweden (DFS), United Kingdom and Ireland (GBR), Italy (ITA), Japan (JPN), The Netherland and Flanders (NLD), New Zeland (NZL), United States of America (USA) participated to this study for a total of 28 breed by country combinations for milkability and 24 combinations for temperament.

Input parameters have been provided by each country according to the INTERBULL form_GE together with domestic bulls EBV.

For the Simmental breed only ITA and the NLD provided information, but due to the poor links between the two countries the breed was omitted from the study.

The Holstein-USA MACE software (Klei, 1998; Klei & Weigel, 1998) has been used for the estimation of correlation among countries and MACE genetic evaluations.

In the genetic parameter estimation step no restriction on bulls birth year was applied, i.e. all sires were included in the estimation. The EBV were estimated on two different sets of data: in the first one (**EBV-P**) same restrictions for the correlations estimation step were applied; in the second one (**EBV-S**) only qualifying bulls born in most recent 22 years for all the breeds were considered, except in Holstein where only sires bon in the last 10 years were used.

In addition to standard MACE software descriptive statistics, frequency of country of origin within the first 100 bulls in each country-breed combination were estimated. Moreover the ranking of the first 30 bulls in CAN for each breed was compared with their ranking in other countries.

Results and Discussion

MACE Genetic Parameters

Generally, the correlation values across countries for milkability were medium to large, considering the fact that this functional trait is recorded in different systems with various methods (Tables 1 to 5, above diagonal). Values were from 0.70 to 0.99 for all breeds except for Jersey where for 4 countries combinations (AUS-CAN, AUS-DFS, CAN-NZL, and DFS-NLD) correlations resulted between 0.46 and 0.60. Estimation of genetic parameters was facilitated by the fact that the

connection among populations was sufficiently strong (Data not shown).

Temperament is a functional trait with slightly different definitions from country to country: the trait is scored subjectively and it is heavily influenced by management system. Consequently, the correlations for temperament (Tables 1 to 5, below diagonal) were lower compared to those for milkability. However, the correlation values were similar to those routinely estimated at Interbull for other functional traits like longevity and fertility.

MACE EBV

Correlation values between domestic EBV and MACE genetic evaluation are here reported either for milkability and temperament (Table 1 to 5). Correlations were generally large. Generally correlation are increasing when sire used in the MACE genetic evaluation estimation are a selected sample, as described in material and method (EBV-S), respect to use of all sires (EBV-P).

In the ranking descriptive statistics (data not shown) AUS sires were excluded. The reason is because with their inclusion, 70 to 80 in the top 100 sires were AUS sires for all breeds for both traits, which was considered not a realistic situation. Australian domestic EBV resulted to be on a very different scale respect to other countries.

Very few country-breed combinations show a particularly small correlation. Distribution of origin of sire in the top 100 (excluding AUS sires) appeared similar across countries (data not shown). Individual re-ranking within the best 30 bulls was assessed against CAN. Re-ranking for the same individuals was limited in other countries respect CAN, except for JER-Temperament (data not shown).

Conclusion

MACE Correlations for milkability and temperament are comparable to those of other traits currently considered for MACE genetic evaluation at Interbull, thus indicating that a MACE evaluation for workability traits is feasible for all breeds.

Acknowledgments

Interbull Centre is gratefully acknowledged for providing software for the estimation of genetic parameters and for the estimation of MACE EBV. Authors thanks Filippo Miglior, Jorgen Dodenohff, Bill Montgomerie for the useful comments provided during the development of this study.

References

Klei, B. 1998. Solving MACE Equations. *Interbull Bulletin 17,* 3-7.

Klei, B. & Weigel, K. 1998. A Method to Estimate Correlation Among Countries Using data on all Bulls. *Interbull Bulletin 17,* 8-14.

Table 1. Brown Swiss. Correlation matrix: Milkability above diagonal, Temperament below diagonal. Correlation between domestic EBV and MACE estimates for Milkability (M Corr EBV-P / EBV-S) and Temperament (T Corr EBV-P / EBV-S)

	CAN	CHE	DEU	ITA	NLD	USA	M Corr EBV-P	T Corr EBV-P	M Corr EBV-S	T Corr EBV-S
CAN	1.00	0.93	0.84	0.92	0.93	0.87	0.90	0.97	.98	.99
CHE		1.00	0.96	0.91	0.99	0.73	0.99		.99	
DEU			1.00	0.90	0.97	0.69	0.99		.99	
ITA				1.00	0.91	0.93	0.95		.96	
NLD	.99				1.00	0.73	0.93	0.97	.97	.99
USA						1.00	0.93		.94	

Table 2. Guernsey. Correlation matrix: Milkability above diagonal, Temperament below diagonal. Correlation between domestic EBV and MACE estimates for Milkability (M Corr EBV-P / EBV-S) and Temperament (T Corr EBV-P / EBV-S)

	AUS	CAN	NZL	M Corr EBV-P	T Corr EBV-P	M Corr EBV-S	T Corr EBV-S
AUS	1.00	0.86	0.99	0.98	0.99	.99	.99
CAN	-0.05	1.00	0.90	0.98	0.98	.98	.98
NZL	0.33	0.92	1.00	0.89	0.95	.86	.94

Table 3. Jersey. Correlation matrix: Milkability above diagonal, Temperament below diagonal. Correlation between domestic EBV and MACE estimates for Milkability (M Corr EBV-P / EBV-S) and Temperament (T Corr EBV-P / EBV-S)

	AUS	CAN	DFS	NLD	NZL	M Corr EBV-P	T Corr EBV-P	M Corr EBV-S	T Corr EBV-S
AUS	1.00	0.57	0.46	0.98	0.79	0.99	0.99	.99	.99
CAN	-0.09	1.00	0.85	0.72	0.56	0.99	0.99	.99	.99
DFS	0.73	0.62	1.00	0.60	0.72	0.99	0.98	.99	.99
NLD	0.97	-0.34	0.53	1.00	0.80	0.92	0.86	.86	.77
NZL	0.83	-0.24	0.47	0.87	1.00	0.99	0.99	.99	.99

Table 4. Holstein. Correlation matrix: Milkability above diagonal, Temperament below diagonal. Correlation between domestic EBV and MACE estimates for Milkability (M Corr EBV-P / EBV-S) and Temperament (T Corr EBV-P / EBV-S)

	AUS	CAN	CHE	DEU	DFS	GBR	ITA	JPN	NLD	NZL	M Corr EBV-P	T Corr EBV-P	M Corr EBV-S	T Corr EBV-S
AUS	1.00	0.87	0.91	0.90	0.93	0.81	0.92	0.86	0.94	0.94	0.99	0.99	.99	.99
CAN	0.64	1.00	0.95	0.95	0.96	0.74	0.90	0.91	0.94	0.88	0.95	0.98	.95	.94
CHE	0.15	0.03	1.00	0.99	0.99	0.82	0.96	0.92	0.99	0.92	0.52	0.99	.55	.84
DEU	0.60	0.97	0.20	1.00	0.99	0.83	0.96	0.93	0.98	0.89	0.96	0.94	.98	.96
DFS	0.72	0.87	0.15	0.89	1.00	0.85	0.95	0.95	0.99	0.90	0.98	0.99	.99	.99
GBR	0.65	0.65	0.46	0.73	0.82	1.00	0.79	0.86	0.83	0.76	0.71	0.98	.81	.91
ITA							1.00	0.85	0.96	0.91	0.34		.29	
JPN	0.68	0.79	0.34	0.81	0.85	0.75		1.00	0.93	0.80	0.89	0.98	.97	.95
NLD	0.72	0.88	0.21	0.88	0.89	0.73		0.79	1.00	0.93	0.97	0.99	.98	.99
NZL	0.76	0.57	0.22	0.58	0.65	0.52		0.59	0.74	1.00	0.74	0.99	.81	.96

Table 5. Red Dairy Cattle. Correlation matrix: Milkability above diagonal, Temperament below diagonal. Correlation between domestic EBV and MACE estimates for Milkability (M Corr EBV-P / EBV-S) and Temperament (T Corr EBV-P / EBV-S)

	AUS	CAN	DFS	NZL	M Corr EBV-P	T Corr EBV-P	M Corr EBV-S	T Corr EBV-S
AUS	1.00	0.70	0.91	0.74	0.99	0.99	.99	.99
CAN	0.72	1.00	0.91	0.99	0.99	0.98	.99	.99
DFS	0.67	0.94	1.00	0.91	0.99	0.99	.99	.99
NZL	0.77	0.58	0.51	1.00	0.96	0.99	.99	.99