

Type Traits MACE Correlation Coefficients Estimation in Brown Swiss

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Introduction

MACE for conformation has been already implemented in Holstein and Jersey breeds to rank bulls for productive and type traits with the same methodology, MACE. In the Brown Swiss effort to harmonise type traits classification has been carried out in the recent past and the necessity to explore the feasibility of a type traits MACE evaluation has been raised to the attention of breeders associations at the last World Brown Swiss Conference in Madison 2000. The World Brown Swiss breeder association appointed a research group to verify whether MACE for conformation is feasible, thanks to semen exchange and harmonisation of trait classification. Objective of this work is the estimation of MACE correlation coefficients for type traits in Brown Swiss breed.

Material and Methods

Genetic evaluations for conformation traits were directly obtained from Canada, France, Germany, Italy, Switzerland, and USA, while pedigree information were provided by Interbull. Austria did not provide data because undergoing changes in national EBVs genetic evaluation system, but actively participate to the project and to results discussion. Australia, Brazil and Slovenia were also contacted to obtain conformation data. Data from Canada were not used in this analysis due to the very low number of common bulls with other Countries.

Table 1 Type traits requested EBVs obtained by each Country¹

Trait requested	ITA	USA	DEU	FRA	CHE
Stature	*	*	Cm	Height at sacrum	cm
Chest Width	Strength & vigour	Strength (1§§)	*	X	X
Body Depth	Depth	*	*	*	Depth
Angularity	*	Dairy form(2§§)	Dairy character	Dairy character	Muscling
Rump Angle	*(side view)	*	*	*	*
Rump Width	*	Thurl width	*	*	Width
Rear leg – side view	*	*	*(rear leg hock angle)	*	Hock angle
Foot angle	X	*	X	*	X
Pasterns	*	O	*	O	*
Deep Heel (hoof height)	*	X	*	*	Hooves
Fore Udder	*	*	*	*	*(length and strength)
Attachment					
Rear Udder Height	*	*	*	*	*
Rear Udder Width	*	*	*	*	*
Udder support	*	Udder Cleft	*	*	Suspensor ligament
Udder depth	*	*	*	*	*
Teat placement	Teat direction	*	*	Teat direction	Teat direction
Teat length	*	*	*	*	*

1) In each cell symbol * indicates that the evaluation was obtained for the requested traits, symbol X that the evaluation for the trait is missing and description indicate differences in trait definition.

Traits considered in this study are listed in Table 1. Traits obtained are indicated for each of the five Countries. Some trait definition differs across country and lead to similar but not the same trait (e.g. stature, measured at girth in four countries but not in France, measured at sacrum, or angularity, measured as muscling in Switzerland). Foot angle is measured in USA and France but not in any other Country in this study, while pasterns and hoof height are not measured in USA.

Proofs were deregressed according to Sigurdsson and Banos (1995), and a bi-trait model was used to estimate correlation across countries according to Sigurdsson et al. (1996). Convergence was considered met when the average change in parameters was less than 10^{-6} between two iteration runs.

Correlation coefficients between foot angle and pasterns and foot angle and hoof height were estimated in order to investigate possible alternative trait combination to overcome the lack of homogeneous information on feet traits.

Results and Discussion

Number of common bulls which provide, together to sire and maternal grandsire the most of information (Sigurdsson et al., 1996) is limited. This may bias downward correlation coefficient estimation. In Table 2 number of common bulls is shown for each country combination.

Table 2. Number of common bulls between Countries

	USA	DEU	FRA	CHE
ITA	42	41	22	31
USA		35	18	39
DEU			13	28
FRA				9

As can be noticed correlation coefficients between some country combination, e.g. France with others, are based on very little information.

A complete set of correlation Tables is presented in appendix. Generally all the traits show medium to large correlation coefficients. Stature shows coefficients larger than .80 except for FRA/CHE. The difference in measurement of stature may be the cause of a lower coefficient

value. Correlation with foot angle has been estimated with hoof height and pasterns. Even if the traits were not the same, coefficients value indicates a possible use of this three traits to rank bulls for feet characteristics, overcoming the lack of an harmonised trait. CHE is measuring fore udder with two different traits (strength and length), the first highly correlated with USA, the latter with the other three Countries.

No other studies on Brown Swiss are available. Correlation values found in this research are in line with finding in Jersey breed (Klei, 2000), where the size of links (i.e. the number of common bulls) between countries is comparable with the one in this study, and in the Holstein breed (Klei, 1998).

Table 3. Averaged correlation coefficients among all traits and overall mean for each Country

	USA	DEU	FRA	CHE	Mean
ITA	0.83	0.70	0.69	0.78	.75
USA		0.57	0.78	0.77	.73
DEU			0.46	0.61	.58
FRA				0.58	.63
CHE					.68

In Table 3 the average of all correlation coefficients is shown for each country combination. The largest value is found for ITA/USA (.83) while the smallest one for DEU/FRA (.46). The last column in Table 4 indicates the average correlation coefficient value of each country with all the others showing that ITA and USA are the two countries mostly correlated with all the other countries.

Conclusions

Results of this study show correlation coefficients in line with other breeds, especially with Jersey where the size of links between Countries is comparable to the one in this study and a MACE evaluation is routinely offered. Thanks to international genetic exchange links between country will increase. MACE evaluation seems feasible in the Brown Swiss breed and no Country shows such a low correlation coefficient to justify exclusion from MACE evaluation. All traits could be included, even if further harmonisation work is needed for some of them. No obstacle are envisaged for the possible inclusion in a MACE

evaluation of other traits (i.e. European harmonised traits), and countries (e.g. Austria, Canada) not included in this study.

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Appendix

STATURE				
	USA	DEU	FRA	CHE
ITA	.9	.9	.83	.87
USA		.88	.89	.86
DEU			.83	.85
FRA				.72

CHEST WIDTH				
	USA	DEU	FRA	CHE
ITA	.8	.65	*	*
USA		.62	*	*
DEU			*	*
FRA				*

BODY DEPTH				
	USA	DEU	FRA	CHE
ITA	.85	.57	.86	.82
USA		.39	.79	.8
DEU			.28	.5
FRA				.79

ANGULARITY				
	USA	DEU	FRA	CHE¹
ITA	.8	.47	.82	-.71
USA		.42	.89	-.78
DEU			.5	-.3
FRA				-.73

1) CHE = Muscularity

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RUMP ANGLE				
	USA	DEU	FRA	CHE
ITA	.94	.86	.88	.9
USA		.77	.86	.87
DEU			.65	.75
FRA				.77

RUMP WIDTH				
	USA	DEU	FRA	CHE
ITA	*	*	*	*
USA		.52	.7	.49
DEU	.51		.36	.75
FRA	.8	.64		.16

REAR LEGS - SIDE VIEW				
	USA	DEU	FRA	CHE
ITA	.91	.76	.65	.77
USA		.79	.86	.74
DEU			.53	.53
FRA				.54

PASTERNS				
	USA¹	DEU	FRA¹	CHE
ITA	.71	.52	.44	.86
USA		.17	.73	.56
DEU			.07	.38
FRA				.51

1) Foot angle

HOOF HEIGHT				
	USA¹	DEU	FRA	CHE
ITA	.76	.47	.54	.62
USA		.47	.69	.73
DEU			.36	.56
FRA				.42

1) Foot angle

UDDER CLEFT				
	USA	DEU	FRA	CHE
ITA	.71	.78	.76	.74
USA		.42	.85	.82
DEU	.53		.54	.56
FRA	.8	.61		.82

FORE UDDER ATTACHMENT					
	USA	DEU	FRA	CHE¹	CHE²
ITA	.72	.71	.46	.19	.80
USA		.39	.6	.76	.5
DEU			.29	.17	.69
FRA				.06	.39

1) Strength

2) Length

UDDER DEPTH				
	USA	DEU	FRA	CHE
ITA	.88	.53	.74	.82
USA		.49	.9	.86
DEU			.51	.59
FRA				.7

REAR UDDER HEIGHT				
	USA	DEU	FRA	CHE
ITA	.87	.86	.68	.71
USA		.75	.71	.89
DEU	.78		.64	.58
FRA	.79	.65		.43

TEAT PLACEMENT				
	USA	DEU¹	FRA	CHE¹
ITA¹	.79	.79	.45	.79
USA		.66	.74	.55
DEU	.7		.39	.7
FRA	.48	.63		.28

1) Teat Direction

REAR UDDER WIDTH				
	USA	DEU	FRA	CHE
ITA	.9	.81	.57	.78
USA		.62	.76	.87
DEU	.65		.38	.68
FRA	.74	.25		.71

TEAT LENGHT				
	USA	DEU	FRA	CHE
ITA	.94	.75	.91	-.78
USA		.69	.73	-.9
DEU	.78		.62	-.68
FRA	.76	.86		-.79