

Accuracy of Foreign Dairy Bull Evaluations in Predicting US Evaluations for Yield

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Introduction

The inclusion of additional data from other countries has been shown to improve the accuracy of dairy bull evaluations (Powell and Norman, 1998; Powell *et al.*, 2000). Even in studies investigating the current quality of Interbull procedures, the value of including additional data from foreign daughters in domestic dairy bull genetic evaluations was supported (Powell and Norman, 2000; Weigel and Powell, 2000). These four studies included mainly U.S. bulls and did not evaluate the accuracy of foreign data alone. In the case of foreign bulls, the earliest information available for breeding decisions in the United States comes from foreign daughters, and they often provide the large majority of data available later. Thus, an investigation of the accuracy of predicting future U.S. evaluations using only foreign data is worthwhile.

The objectives of this study were to investigate: 1) the usefulness in prediction of future U.S. evaluations from using Interbull evaluations based only on foreign daughters, including comparison with using U.S. parent average (PA) and 2) the accuracy of the Interbull reliability (REL) as an indicator of predictive ability of Interbull for future U.S. domestic evaluation.

Materials and Methods

Data were for Holstein bulls having a U.S. domestic (based only on U.S. daughters) genetic evaluation for yield in August 2003. Foreign evaluations used in comparisons were the most recent February or August Interbull evaluation for each bull that included no U.S. daughters. Selected evaluations were on the U.S. scale, and bulls were included only when the Interbull reliability (REL) for this evaluation was at least 80 percent. The U.S. PA

from the same evaluation date was obtained also. The August 2003 (current) U.S. domestic genetic evaluation was used to represent the "best" evaluations. This evaluation was used even though the REL was likely lower than that of the current official evaluation, because daughters in the latest foreign-only evaluation would also be included in the current official. Bulls were excluded if the REL of the August 2003 U.S. domestic evaluation was less than 80 percent. All evaluations and PA were converted to the current U.S. base to allow the comparison of evaluations across time.

Interbull (foreign) evaluations and concurrent U.S. PA were compared to the August 2003 U.S. domestic evaluations for milk, fat, and protein for difference, standard deviation of difference, and correlation. Expected correlation was the square root of the product of the mean REL. A majority of bulls included in the study had the greatest number of their foreign daughters in Canada. Analyses were repeated separately for these (Canadian) and all other bulls to determine whether the source of foreign data influenced results.

Results and Discussion

Numbers of bulls and mean REL are in Table 1. About two thirds of the bulls had most of their milking daughters in Canada at the time of their latest Interbull evaluation without U.S. daughters. Of the other 92 bulls, 42 had most daughters in The Netherlands, 14 in France, and 12 in Germany. Mean REL were very similar between the Canadian and other bull groups. The Canadian bulls had slightly higher PA REL, although PTA REL was higher for the other bulls. This may reflect additional efforts in the earlier years to incorporate Canadian ancestral data. This may reflect additional efforts in the earlier years to incorporate Canadian ancestral data.

Table 1. Numbers of bulls and mean reliabilities (REL) of PTA and parent averages (PA).

	Bulls (no.)	Mean REL (%)		
		Latest foreign Interbull PTA ¹	Concurrent U.S. PA	Current U.S. PTA ²
All bulls	281	88	42	91
Canadian bulls ³	189	87	43	91
Other bulls	92	89	40	92

¹ Latest Interbull evaluation including no U.S. daughters.

² U.S. domestic PTA for August, 2003 (including no foreign daughters).

³ Bulls with mostly Canadian daughters in the latest foreign Interbull evaluation including no U.S. daughters.

Mean differences between foreign PTA or concurrent U.S. PA and August 2003 U.S. PTA, and SD of those differences are in Table 2. Mean differences for foreign PTA were near zero but were substantially negative for PA, indicating that PA was an underestimate of the later U.S. PTA. Typically, PA are found to be overestimates of true merit. However, bulls graduated from foreign sampling are expected to have positive Mendelian sampling, thus overwhelming any positive bias in PA (usually attributed to bias in dam PTA). Thus PA is not

only lower in REL, but is biased. The SD for differences for foreign PTA are less than for PA differences but are still large. In interpreting those SD, it must be remembered that the foreign PTA and current U.S. PTA include completely independent sets of daughters, whereas comparisons are more typically between an early PTA and a later one that includes the earlier daughters. Because the PA information in this situation was found not very useful, it will be omitted from subsequent tables.

Table 2. Mean differences and SD of differences of the latest Interbull PTA including no U.S. daughters (foreign PTA) or concurrent U.S. parent average (PA) with August 2003 U.S. domestic (current U.S.) PTA.

Trait	Foreign PTA		Concurrent U.S. PA	
	Mean difference ¹ (kg)	SD of the difference (kg)	Mean difference ² (kg)	SD of the difference (kg)
Milk	10.1	167.4	-135.9	253.6
Fat	-0.2	6.1	-3.4	10.0
Protein	0.0	4.7	-3.8	7.1

¹ Foreign PTA – current U.S. PTA.

² U.S. PA – current U.S. PTA.

Differences in Table 3 are separate for Canadian bulls and other bulls and are close to zero with a slight tendency for the other bulls to be over-predicted by Interbull. The SD of differences were quite similar between the two groups of bulls. Correlations (Table 4) were similar for the three traits and essentially as expected. Corresponding figures are in Table 5 separated for Canadian and other bulls. Expected correlations, based on REL, were

nearly the same for the two groups. Correlations for Canadian bulls were lower than expected, especially for fat, while correlation for other bulls were equal or greater than expected values. The higher correlations for the other bulls might be related to the larger variation in Interbull PTA (12 to 17 percent) and U.S. PTA (21 to 36 percent) for other bulls relative to Canadian bulls.

Table 3. Mean differences and SD of differences of the latest Interbull PTA including no U.S. daughters (foreign PTA) with August 2003 U.S. domestic (current U.S.) PTA for Canadian¹ and other bulls.

Country of most daughters in foreign PTA	Trait	Mean difference ² (kg)	SD of the difference (kg)
Canada	Milk	5.0	167.8
	Fat	−0.5	6.2
	Protein	−0.1	4.7
Other	Milk	20.4	167.0
	Fat	0.4	6.0
	Protein	0.3	4.6

¹ Bulls with mostly Canadian daughters in the latest foreign Interbull evaluation including no U.S. daughters.

² Foreign PTA – current U.S. PTA.

Table 4. Correlations of the latest Interbull PTA including no U.S. daughters (foreign PTA) with August 2003 U.S. domestic PTA.

Trait	Actual	Expected
		.89
Milk	.90	
Fat	.87	
Protein		

Table 5. Correlations of the latest Interbull PTA including no U.S. daughters (foreign PTA) with August 2003 U.S. domestic PTA for Canadian¹ and other bulls.

Country of most daughters in foreign PTA	Trait	Actual	Expected
Canada			.89
	Milk	.88	
	Fat	.84	
	Protein	.86	
Other			.90
	Milk	.93	
	Fat	.90	
	Protein	.93	

¹ Bulls with mostly Canadian daughters in the latest foreign Interbull evaluation including no U.S. daughters.

Conclusions

Evaluations from Interbull and based on foreign daughters only were generally predictive of the later U.S. national evaluation. Differences averaged near zero for milk, fat, and protein. In contrast, PA was a considerable underestimate due to the bulls in question being graduates of foreign progeny testing programs and selected for positive Mendelian sampling. Thus, PA are not a viable alternative to the Interbull evaluations from foreign daughters. The foreign evaluations were also essentially as correct in ranking bulls as expected from the REL.

Differences in predictive ability between the evaluations of Canadian and other foreign bulls were small on average. Standard deviations of those differences were nearly identical between the two groups of bulls. Correlations with the August 2003 U.S. evaluations were higher for other bulls than for Canadian bulls, perhaps related to higher variation. These results clearly show that evaluations based on foreign data, specifically that from Interbull, is useful in selecting bulls for use in the United States.

References

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