

# Impact of Japanese Imported Semen Evaluations on International Bull Evaluations

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## Introduction

Generally, evaluations of bulls based on daughters from imported semen provide more information in estimating genetic correlations across countries than connections of bulls through pedigrees. However, imported semen is usually very expensive or has limited availability resulting in highly selective matings and preferential treatment of daughters causing bias to domestic genetic evaluations.

Schaeffer et al., 1996 and Banos et al., 1993 mentioned that evaluations of bulls from imported semen could lead to biased results for these bulls in international genetic evaluations, but Weigel, 1996 reported that this bias could be reduced by requiring foreign bulls to have a high minimum number of daughters before including them in international comparisons. In the INTERBULL routine evaluations, evaluations of bulls from imported semen are included when

- 1) the evaluation is based on a minimum of 75 daughters in 50 herds,
- 2) first country evaluation is present in the data, and
- 3) the importing country of evaluation agrees to have them included.

Japan has not participated in INTERBULL evaluations, but interest in international evaluations in Japan has grown recently. Before Japan participates in INTERBULL evaluations, several decisions must be made based on scientific studies. The purpose of this study was:

- 1) To estimate genetic correlations between Japan and its main supplier of semen, Canada and USA, and
- 2) To determine the effects of evaluations of bulls from imported semen on international bull evaluations.

## Materials and Methods

Genetic evaluation files from August 1998 were obtained from Canada (CDN), USA (AIPL-USDA), and Japan (NLBC-MAFF) containing evaluations of Holstein bulls for milk, fat, and protein yields. The files were edited as follows:

- 1) non-AI bulls were excluded,
- 2) evaluations based on less than 10 herds were excluded,
- 3) bulls born before 1980 were excluded, and
- 4) bulls without first country evaluation in Canada, USA, or Japan were excluded.

The total number of bulls from all three countries was 21,400 for milk and fat yields, and 21,251 for protein yields. Based on the imported semen designations, five datasets were created.

- 1) (NIS) was created by eliminating evaluations that were based on imported semen from all countries;
- 2) (REG) only evaluations based on imported semen in Japan were eliminated;
- 3) (REG-IS90) evaluations based on imported semen in Japan with accuracy less than 0.90 were eliminated;
- 4) (REG-IS80) evaluations based on imported semen in Japan with accuracy less than 0.80 were eliminated;
- 5) (REG-ISALL) all evaluations based on imported semen in Japan were included;

Evaluations were de-regressed as described by Rozzi and Schaeffer, 1996. Genetic parameters were estimated as described in Klei and Weigel, 1998 for each data set. International breeding values for the three countries were calculated as described by Schaeffer et al., 1996. Heritabilities in each country were assumed to be known (Canada 0.33, USA 0.30, and Japan 0.30).

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To determine the impact of evaluations based on imported semen, data set REG was assumed to be unbiased because from a Japanese perspective, but dataset NIS was considered unbiased for all three countries, and therefore, results from the other three datasets were compared to these. Pedigrees were identified for at least two generations back on each bull. Unknown parents were assigned to genetic groups by national origin, birth year of the bull, and pathway of selection.

Small genetic groups (i.e. less than 10 bulls) were combined to adjacent birth year groups. The same pedigree files were used in the analyses of all five datasets.

## Results and Discussion

The numbers of bulls by country of evaluation and within the five datasets are given in Table 1. When evaluations based on imported semen were excluded, no bull was evaluated in all three countries. Many bulls with first crop daughters in Japan have strong pedigree relationships to bulls in North America which could offset the lack of bulls with evaluations in all three countries.

About 80% of the progeny tested young bulls in Japan were imported from North America. Thus, most Japanese bulls were half brothers to bulls progeny tested in North America. About 30% (417) Japanese bulls were full brothers to bulls tested in North America (Table 2). This was almost double the number of full brothers between France and USA (Powell et al., 1997).

Estimates of sire variances and genetic correlations are shown in Table 3. Genetic correlations were over 0.93 between Japan and Canada/USA. Although Japan adjusts yields to a 26 mo at first calving basis and North American yields are on a mature cow basis, the evaluation systems were generally similar among the 3 countries.

Differences in genetic correlations (NIS vs REG) were greatest for protein yields between Canada and USA rather than between Japan and either Canada or USA. The genetic correlations between Japan and Canada were slightly greater than between Japan and USA for almost all datasets.

Changes in international evaluations (on the Japanese scale) with and without evaluations based on imported semen are shown in Table 4 and Figure 1. Average changes were small when compared to those for European countries and USA as reported by Banos et al., 1993 and Weigel, 1996. When evaluations based on imported semen with high reliability were included (REG-IS90), then average changes were larger. As a reference, changes in evaluations with and without evaluations based on imported semen in Canada or USA (REG vs NIS) are given in Tables 5 and .6, expressed on Canadian and USA scales, respectively.

## Conclusions

The impact of Japanese evaluations based on imported semen seems to have little effect on genetic correlation estimates, but they seem to result in biased international evaluations even if the reliabilities are high. Therefore, they could be used in the estimation of genetic parameters, but should not be included in the calculation of international evaluations.

## Acknowledgements

Thanks go to Dr. Bert Klei (Holstein Association, USA) for providing computer programs to estimate variance components, Mr. Pete Sullivan (CGIL, University of Guelph) for useful comments, and to CDN (Canada), AIPL-USDA (USA), and NLBC-MAFF (Japan) for providing evaluation files.

## References

- Banos, G., Philipsson, J., Bonaiti, B., Carabaño, M., Claus, J., Leroy, P., Rozzi, P., Swanson, G. & Wilmink, J. 1993. Report of a joint research project between INTERBULL and COPA/COGECA on the feasibility of a simultaneous genetic evaluation of Black-and White dairy bulls across the European Community countries. INTERBULL Bull. No. 9. Int. Bull Eval. Serv., Uppsala, Sweden.
- Klei, L. & Weigel, K.A. 1998. A method to estimate correlations among traits in different countries using data on all bulls. INTERBULL Bull. No. 17. Int. Bull Eval. Serv., Uppsala, Sweden.

- Powell, R.L. Wiggans, G.R & Sieber, M. 1997. Consistency of international genetic evaluations of holstein bulls. J. Dairy Sci. 80, 2177.
- Rozzi, P. & Schaeffer, L.R. 1996. New deregression procedures used on type traits. A paper presented at the INTERBULL workshop, 25-26 November 1996, Verden, Germany.
- Schaeffer, L.R., Reents, R. & Jamrozik, J. 1996. Factors influencing international comparisons of dairy sires. J. Dairy Sci. 79, 1108.
- Weigel, K.A. 1996. Impact of second-country data of foreign bulls on international evaluations of dairy bulls. J. Dairy Sci. 79, 900.

Table 1 Number of bulls by country of evaluation

	Data set				
	REG	REG-IS90	REG-IS80	REG-ISALL	NIS
<b>Milk/Fat</b>					
Proof in					
CAN/USA/JPN	1	97	139	175	0
CAN/USA	613	517	475	439	191
CAN/JPN	0	2	3	4	1
USA/JPN	1	42	66	98	1
CAN	4,093	4,091	4,090	4,089	4,266
USA	15,262	15,221	15,197	15,165	15,511
JPN	1,430	1,430	1,430	1,430	1,430
<b>Protein</b>					
Proof in					
CAN/USA/JPN	1	97	139	175	0
CAN/USA	607	511	469	433	189
CAN/JPN	0	2	3	4	1
USA/JPN	1	42	66	98	1
CAN	4,099	4,097	4,096	4,095	4,268
USA	15,115	15,074	15,050	15,018	15,364
JPN	1,428	1,428	1,428	1,428	1,428

Table 2 Number of full-brother groups

(FBG) that have 1<sup>st</sup> crop daughters across countries, and number of bulls in each category (Milk/Fat)

	Number of		
	FBG	bulls	(1st crop in JPN)
1 <sup>st</sup> crop daughters in			
CAN/USA/JPN	33	124	(38)
CAN/USA	245	628	
CAN/JPN	82	197	(93)
USA/JPN	256	668	(286)
Total		1,617	(417)

Table 3 Estimated genetic correlations

Dataset		CAN/USA	CAN/JP	USA/JP
		N	N	N
Milk	REG	0.956	0.972	0.953
	REG-IS90	0.955	0.966	0.948
	REG-IS80	0.955	0.964	0.942
	REG-ISALL	0.955	0.959	0.942
Fat	NIS	0.944	0.972	0.947
	REG	0.960	0.953	0.966
	REG-IS90	0.959	0.959	0.949
	REG-IS80	0.959	0.956	0.948
Prt	REG-ISALL	0.959	0.948	0.947
	NIS	0.969	0.962	0.965
	REG	0.942	0.961	0.966
	REG-IS90	0.940	0.961	0.935
	REG-IS80	0.939	0.957	0.927
	REG-ISALL	0.940	0.944	0.926
	NIS	0.915	0.960	0.965

**Table 4** The effect of imported semen proofs in Japan on Japanese MACE-EBV (kg)

		Number of Bulls	Change		
Traits	Data set		Mean	Max	Min
Imported semen in Japan					
Milk	(REG-ISALL)-(REG)	275	+18.20	+349.74	-382.65
	(REG-IS80)-(REG)	206	+19.72	+347.60	-302.62
	(REG-IS90)-(REG)	139	+28.84	+339.91	-290.72
Fat	(REG-ISALL)-(REG)	275	+0.54	+13.52	-12.50
	(REG-IS80)-(REG)	206	+0.61	+13.46	-11.64
	(REG-IS90)-(REG)	139	+0.74	+9.84	-11.78
Protein	(REG-ISALL)-(REG)	275	+0.57	+12.04	-13.72
	(REG-IS80)-(REG)	206	+0.68	+11.94	-9.90
	(REG-IS90)-(REG)	139	+0.92	+10.37	-10.07

**Table 5** The effect of imported semen proofs in Canada\* on Canadian MACE-EBV(kg)

REG - NIS	Number of bulls	Change		
		Mean	Max	Min
		Imported semen in Canada*		
Milk	249	+43.46	+591.29	-316.50
Fat	249	-0.86	+14.96	-14.25
Protein	249	+0.92	+14.17	-12.92

\*imported from USA only

**Table 6** The effect of imported semen proofs in USA\* on American MACE-PTA(lb)

REG - NIS	Number of bulls	Change		
		Mean	Max	Min
		Imported semen in USA*		
Milk	174	-25.11	+469.57	-695.14
Fat	174	+0.42	+17.68	-23.35
Protein	174	+0.05	+18.20	-22.16

\*imported from Canada only

**Fig 1** Change of Japanese MACE-EBVM for imported semen to Japan

