Revisiting Interbull Rules of Data Inclusion

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Abstract

Relaxation of Interbull data inclusion rules by adding a minimum value for effective daughter contribution to the previously existing rules was examined. Holstein data for production, fertility and calving traits submitted to the Interbull Centre for September 2008 test-evaluation was used. Results indicate that relaxations had negligible effects on the correlation of national and international predicted genetic merit. Further, correlations of international predicted genetic merits under different alternatives was equal or larger than 0.995. It is therefore suggested that these newly tested data inclusion criteria to be implemented as soon as possible.

Introduction

A close look at the Interbull Code of Practice (CoP) reveals that data handling issues can be categorized under three general headings.

Interbull rules of data submission: Paragraphs 7.1.2, 7.1.3, 7.1.4 and 7.1.8 of CoP determine which bulls should be included in the national data files.

Interbull rules of data inclusion: Chapters 5 and 6 of CoP, and especially Paragraph 5.3, 5.4, 6.4.2, and 6.6.1 determine which of the submitted bulls will be included in the analyses.

Interbull use of data in the MACE evaluation: In the actual MACE evaluations number of daughters or herds is not used at all. It is the effective daughter contribution /EDC) that is used as the weighting factor and calculation of reliabilities.

Despite the complexity of the data handling rules (including some contradictory rules), it seems that Interbull community is generally happy with these rules. However, the increasing use of multi-trait evaluations at the national level has created some new situations that force us to revisit the inclusion rules. The new situation involves bulls that do not meet the inclusion criteria, but have otherwise high EDC values. An example is the existence of bulls in national evaluations for calving traits with less than 50 daughters, but EDC values larger or much larger than 50. Another new situation involves bulls that have national evaluations for a trait in an importing country which is not evaluated at all in their country of first evaluation. An example is the existence of French bulls in any other country with evaluation for any fertility interval trait.

Objectives: The main objective of this study is to examine the consequences of amending Interbull data inclusion rules by including the bulls that either fulfill the current rules or have an EDC value that exceed the minimum required number of daughters. Correlations between national and international breeding values and international reliabilities will be used to assess the effects of the “new” rules.

Material & Method

Data used in this study were the data submitted for the Interbull test-evaluation of September 2008. Before the data submission all countries were asked to provide data on all bulls participating in the national evaluations. In other words, participating countries were asked not to edit the data before submission.

Only the data for the Holstein breed submitted for production, calving and fertility traits were used in this study. Correlations used were the same as the ones estimated during the Interbull test-evaluation of September 2008.

Current Interbull rules of data inclusion (designated at NDAU10) were amended for production and fertility (designated as NEDC10) through adding the alternative of a minimum value of to EDC to the current rules (minimum EDC value of 10 for Code 11 and 12 bulls, and 75 for Code 21 bulls). For calving traits the current rules (designated as NDAU50) were amended in the same way (designated as NEDC50, i.e. minimum EDC value of 50 for Code 11 and 12 bulls, and 75 for Code 21 bulls). For calving traits a more relaxed inclusion criteria of changing the minimum required number of daughters (or EDC value) to 10 was also used (designated as NDAU10 and NEDC10).

Estimation of international breeding values was conducted by a modified version of MACE package originally prepare by B. Klei of the Holstein Association, USA.

Results

Impact of relaxing the data inclusion rules for production traits fat, milk and protein yield is negligible. Added number of records and bulls are about 0.5% and correlations of national and international breeding values are virtually unchanged.

For fertility traits the impact on the number of records and bulls is moderate (1.8% to 7.5% increase for number of records, and 0.8% to 5.8% increase for number of bulls). However, changes in the correlations of national and international breeding values are negligible.

Impact of relaxing the data inclusion criteria for direct calving traits (direct calving=DC and direct stillbirth=DS) from 50 daughter to the EDC value of 50 on the number of records (13% to 23%) is large. For maternal traits (maternal calving=MC and maternal stillbirth=MS) the increases amount to 36% to 39%. Number of bulls increase to a lesser extent. Further relaxing of the data inclusion criteria (to 10 daughters or to EDC value of 10) has only small effects. Interestingly, the impact on the correlations of national and international breeding values is quite negligible.

Addition of so many new records and bulls to the data is not affecting the international breeding values of the bulls that fulfill current data inclusion criteria. This can be seen in Table 1, in which international breeding values for the trait directing calving (DC) under the standard scenario (NDAU50) are compared with three relaxation levels. The correlation between the standard scenario and the alternative scenarios are always 0.995 or higher. It can be concluded that the new bulls' records are not negatively affecting the evaluation.

Discussion

The three categories of Interbull data handling rules are logical responses to population structures and genetic evaluation models prevailing in Interbull member countries. Because these have been developed under disparate conditions and in response to different needs there are some mild conflicts among them. For example, Paragraph 7.1.8 of CoP is in contradiction to other paragraphs of Chapter 7 and to the spirit CoP. In order to assess the suitability of the data inclusion rules we need to take a look at the history of these rules.

Historical background

At the start of international genetic evaluations (IGE) for production traits, a minimum of 10 daughters from at least 10 herds (the so-called 10/10 rule) was required to include a bull in IGE. The rationale behind this decision was to exclude "natural mating" bulls and to include only bulls from progeny testing programs. Let's call this **"AI-Bull" condition**.

At the same time it was argued that the first batch of daughters of foreign proven bulls (the so-called code 21 bulls) may be subjected to the preferential treatments by farmers. Consequently, in order to minimize the risk of bias, it was decided to impose a minimum of 150 (/30/80) daughters from at least 50 (/10/20) herds for inclusion of such bulls in IGE (for HOL/GUE/OTH). By using the 150/50 rule, domestic bulls are protected

against foreign bulls. Let's call this **"Non-preferential treatment" condition**.

Preferential treatment is indeed a complicated issue. In the early days of Interbull (mid-1980's), when rules for conversion equations were discussed, the absolute majority of countries had genetic evaluations only for production traits and the model used in many countries was a single (first) lactation model. Further, there were relatively few imported bulls in each country. For daughters of imported bulls the only measurement available was the first lactation record, which is obviously influenced by the preferential treatment. At the same time, preferential treatment was mainly targeted towards milk production. Therefore, we had a situation in which milk production trait was the target of both selection and preferential treatment.

However, we are now in a situation where almost all countries use multiple lactation models and also have evaluations for several trait groups. Foreign bulls are selected for many traits, and not only production. Further, in each country there are relatively large numbers of foreign bulls available. Moreover, preferential treatment is probably practiced less in later lactations (we have seen that using the 10/10, 50/10 or 150/50 rule has no effect on estimated genetic correlations (Jorjani, 2007, unpublished results)). On the other hand, the choice of 150/30/80 daughters in 50/10/20 herds is quite arbitrary and the result of compromise between different subjective opinions.

Use of 150/50 rule has another purpose as well. Imagine an importing country in which the criteria for official publication of foreign bulls (code 21 bulls) are very stringent. This may lead to the exclusion of many foreign bulls from being marketed in the importing country. To prevent protectionism and to facilitate international trade, foreign bulls may be included in IGE even if they are not officially published in the importing country. In this sense, by using the 150/50 rule, foreign bulls are protected against domestic bulls (i.e. in the opposite direction to the "Non-preferential treatment" condition). Let's call this **"Fare treatment" condition**.

The second interpretation of the 150/50 rule is actually supported by Article 5.3d of "Code of Practice", accessible through the following link:

http://www-interbull.slu.se/service_documentation/General/Code_of_practice/framesida-code.htm

Later, when IGE for the first low heritability trait group (udder health traits) was under investigation, the "AI-Bull" condition was modified and set to the more stringent value of 50 daughters from 10 herds. The reason for the choice of 50 daughters was to ensure reasonably high international reliabilities (at the same level as for production or conformation traits) for bulls. As the precedence, the old "Interbull Guidelines" for calculation of conversion equations (Interbull Bulletin 4) was used. Based on those guidelines, only bulls with a reliability of 75% (or approximately 20 daughters per bull) were used in calculation of conversion equations. To determine an appropriate number of daughters, some alternatives were compared with each other and the value of 50 daughters was a compromise that allowed sufficient number of bulls with high international reliability to be included in the IGE for udder health traits. Obviously, inclusion of bulls with minimum of 50 daughters results in higher international reliabilities. Let's call this **"Minimum reliability" condition**.

The use of 50 daughters as the minimum for calving traits was just a carry-over of the discussions for udder health traits.

For female fertility traits (Fall 2004), three different values for minimum number of daughter (10, 25 and 50) were tested. Results indicated that the three different values had no discernible effect on the genetic correlations. Again, in Spring 2007, the minimum values of 10 or 50 for number of daughters or EDC were compared with each other and the old results were confirmed (i.e. the choice of 10 or 50 daughters/EDC had no discernible effect on the genetic correlations). Given the high genetic correlations and relatively large size of daughter groups for female fertility traits, the "AI-Bull" condition was used in its original

form (as is used for production and conformation traits).

The "Minimum reliability" condition had another purpose as well, namely to protect Interbull results against "rumors" of "producing low reliable values".

Conclusion & Suggestions

Conclusions from the present study are that relaxing the data inclusion criteria has negligible impact on the international genetic evaluations and facilitate a speedy evaluation of young bulls. Therefore, it is recommended that these new tested data inclusion criteria to be implemented in the routine evaluations conducted at the Interbull Centre.

Further, based on the results and discussions present above the following mutually independent suggestions are presented to the Interbull Technical Committee (and later Interbull Steering Committee).

1- All numerical constraints and limits for Interbull rules of data submission to be removed. The national genetic evaluation results for all bulls, irrespective of their number of herds and daughters, should be submitted to the Interbull Centre.
2- Determination of AI-bulls should be done through the information on "Status of bull". Bulls with status of bull = 10 or 20 are included in the data for the MACE evaluation.
3- Rules of data inclusion is suggested to follow a two step procedure:
   a) All bulls with an official publication code = "Y", irrespective of their number of herds or daughters, should be included in the data for the MACE analysis. Bulls with type of proof = 21 are a part of this category. Bulls with an official publication code = "N" and type of proof = 11 or 12 are excluded.
   b) For bulls with type of proof = 21 and an official publication code= "N" the requirement of the first country should be removed. Such bulls should be included in the data for the MACE analysis if they have a minimum EDC value. The minimum EDC value is suggested to be equal for all breeds and traits. The suggested EDC minimum value for all breeds and traits is 50.

Table 1. Correlation of international predicted genetic merit between the default and three other alternatives for maternal calving ease.

	NDAU50 NEDC50	NDAU50 NDAU10	NDAU50 NEDC10
AUS	0.995	0.996	0.995
CAN	0.999	0.999	0.998
CHE	0.999	0.999	0.999
DFS	0.998	0.998	0.998
FRA	0.999	0.999	0.999
ISR	0.999	0.999	0.999
ITA	0.998	0.998	0.998
NLD	0.998	0.999	0.998
USA	0.999	0.999	0.999