Introduction

The latest genomic routine international evaluation for females fertility traits took place as scheduled at the Interbull Centre. Data from seventeen (18) countries were included in this evaluation.

International genetic evaluations for female fertility traits of bulls from Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Netherlands, New Zealand, Norway, Poland, Spain, Sweden, Switzerland, South Africa, the United Kingdom and the United States of America were computed. Holstein data were included in this evaluation.

Based on a decision made by Interbull Steering committee in August 2007, female fertility traits are classified as follows:

T1 (HC): Maiden (H)eifer's ability to (C)onceive. A measure of confirmed conception, such as conception rate (CR), will be considered for this trait group. In the absence of confirmed conception an alternative measure, such as interval first-last insemination (FL), interval first insemination-conception (FC), number of inseminations (NI), or non-return rate (NR,preferably NR56) can be submitted;

T2 (CR): Lactating (C)ow's ability to (R)ecycle after calving. The interval calving-first insemination (CF) is an example for this ability. In the abscence of such a trait, a measure of the interval calving-conception, such as says oprn (DO) or calving interval (CI) can be submitted;

T3 (C1): Lactating (C)ow's ability to conceive (1), expressed as a rate trait. Traits like conception rate (CR) and non-return rate (NR, preferably NR56) will be considered for this trait group;

T4 (C2): Lactating (C)ow's ability to conceive (2), expressed as an interval trait. The interval first insemination-conception (FC) or interval first-last insemination (FL) will be considered for this trait group. As an alternative, number of inseminations (NI) can be submitted. In the abscence of any of these traits, a measure of interval calving-conception such as days open (DO), or calving interval (CI) can be submitted. All countries are expected to submit data for this trait group, and as a last resort the trait submitted under T3 can be submitted for T4 as well.

T5 (IT): Lactating cow's measurements of (I)nterval (T)raits calving-conception, such as days open (DO) and calving interval (CI).

Based on the above trait definitions the following traits have been submitted for international genetic evaluation of female fertility traits.

Country	Traits	Submitted traits and their definitions
AUS	T2=CY	Calving interval converted to 42 days pregnancy rate
	T4=C2	Calving interval converted to 42 days pregnancy rate
	T5=IT	Calving interval converted to 42 days pregnancy rate
BEL	T2=CY	PR=Pregnancy Rate (=[21/(DO-45+11)]*100, with DO=days open)
	T4=C2	PR=Pregnancy Rate (=[21/(DO-45+11)]*100, with DO=days open)
	T5=IT	PR=Pregnancy Rate (=[21/(DO-45+11)]*100, with DO=days open)
CAN	T1=HC	NR=Non Return Rate after 56 Days in heifers (NRR), %
	T2=CY	CF=Interval from Calving to First Service in cows(CF)
	T3=C1	NR=Non Return Rate after 56 Days in cows(NRR), %
	T4=C2	FC=Interval first insemination-conception in cows
	T5=IT	DO=Days open
CHE	T2=CR	CF=Interval from Calving to First Service (ICF), days
	T3=C1	NR=Non Return Rate after 56 Days (NRR), %
	T4=C2	NR=Non Return Rate after 56 Days (NRR), %
CHR	T2=CR	CF=Interval from Calving to First Service (ICF), days
	T3=C1	NR=Non Return Rate after 56 Days (NRR), %
	T4=C2	NR=Cows' Non Return Rate after 56 Days (NRR), binary

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CZE       T1=HC   CR=Heifers' Conception rate (pregnant or not after 3 months)
          T3=C1   CR=Cows' Conception rate (pregnant or not after 3 months)
          T4=C2   CR=Cows' Conception rate (pregnant or not after 3 months)

AUT/DEU   T1=HC   NR=Heifers' Non Return Rate after 56 days
          T2=CY   CF=Interval from calving to first insemination cows (days)
          T3=C1   NR=Cows' Non Return Rate after 56 days
          T4=C2   FL=Interval from first to last insemination cows (days)
          T5=IT   DO=Days open (days)

DFS       T1=HC   NR=Heifers' Non Return Rate after 56 days
          T2=CY   CF=Interval from calving to first insemination cows (days)
          T3=C1   NR=Cows' Non Return Rate after 56 days
          T4=C2   FL=Interval from first to last insemination cows (days)
          T5=IT   DO=Days open (days)

ESP       T2=CY   DO=Days open
          T4=C2   DO=Days open
          T5=IT   DO=Days open

FRA       T1=HC   CR=Heifers' Conception rate (binary trait) for maiden heifers
         T2=CY  Interval between calving and first AI
          T3=C1   CR=Cows' Conception rate (binary trait) for cows
          T4=C2   CR=Cows' Conception rate (binary trait) for cows

GBR       T2=CY   CI=days between 1st and 2nd calvings
          T3=C1   NR=1st lactation non return at 56 days
          T4=C2   CI=days between 1st and 2nd calvings
          T5=IT   CI=days between 1st and 2nd calvings

IRL       T2=CY   CI=Calving interval
          T4=C2   CI=Calving interval
          T5=IT   CI=Calving interval

ISR       T3=C1   CR=Inverse of the number of insemination to conception (%)
          T4=C2   CR=Inverse of the number of insemination to conception (%)

ITA       T2=CY   CF=Days to first service
          T3=C1   NR=Non-return rate at 56 days (%)
          T4=C2   CI=Calving Interval (days)
          T5=IT   CI=Calving interval (days)

ITA(BSW) T2=CY   CF=Interval calving to first insemination
          T4=C2   Days Open
          T5=IT   CI=Calving interval

NLD       T2=CY   CF=Interval calving to first insemination (days)
          T3=C1   NR=Non-return rate 56 days (binary trait)
          T4=C2   FL=Interval from first to last insemination cows (days)
          T5=IT   CI=Calving Interval (days)

NOR       T1=HC   NR=NR=Non-return rate 56 days (heifers)
          T2=CY   CF=Interval calving to first insemination (days)
          T3=C1   NR=NR=Non-return rate 56 days (cows)
          T4=C2   CI=Calving Interval (days)
          T5=IT   CI=Calving Interval (days)

NZL       T2=CY   PM=Lactating cow's ability to start cycling
          T4=C2   PC=Lactating cow's ability to conceive (CR42)
          T5=IT   PC=Lactating cow's ability to conceive (CR42)

POL       T1=HC       Non return rate at 56 days for heifer
         T2=CR  Interval from calving to first insemination
          T3=C1       Non return rate at 56 days for cows
          T4=IT       Days open
          T5=IT       Days open

USA       T1=HC   CR=Conception rate (heifer)
          T2=CY   CF=Interval from calving to first insemination
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T3=C1 CR=Conception rate (cow)
T4=C2 DP=Daughter Pregnancy Rate
T5=IT DP=Daughter Pregnancy Rate

ZAF T4=IT CI=Calving Interval
T5=IT CI=Calving Interval

CHANGES IN NATIONAL PROCEDURES

Changes in the national genetic evaluation of female fertility traits are as follows:

DEU (HOL) Some bulls are no longer published as they are no longer AI bulls and some appear now with a new ID.

FRA (HOL) The list of QTLs has been updated and enlarged, the residual polygenic effects are now estimated using a genomic matrix instead of a kinship matrix.
Did not participate in cc2 evaluation.

NLD (HOL) Base change, introduction of HCO and change for CC1 (CR instead of NR56).

INTERBULL CHANGES COMPARED TO THE DECEMBER ROUTINE RUN

No changes in Interbull procedures

DATA AND METHOD OF ANALYSIS

Eleven Holstein populations sent GEBV data for up to 38 traits, while classical EBVs for the same traits were used in the analyses. Young bull GEBVs from the GEBV providers have been converted to the scales of all countries participating in classical MACE. A bull will get a MACE EBV or a GMACE EBV but not both.
From those eleven countries, National GEBVs of bulls less than seven years of age and with no classical MACE proofs were included for the breeding value prediction with a further requirement of either a MACE-PA or a GMACE-PA (for young genomic bulls with young genomic sires) being available.

SCIENTIFIC LITERATURE

The international genetic evaluation procedure is based on international work described in the following scientific publications:

VanRaden, P.M. and Sullivan, P.G. 2010. International genomic evaluation methods for dairy cattle. Gen. Sel. Evol. 42:7

Sullivan, P.G. and Jakobsen, J.H. 2012. Robust GMACE for young bulls methodology. Interbull Bulletin 45, Article 1.

Sullivan, P.G. 2012a. GMACE reliability approximation. Report to the GMACE working group of Interbull. GMACE_rels 2013

Sullivan, P.G. 2012b. GMACE variance estimation. Report to the GMACE working group of Interbull. GMACE_vce 2013

Sullivan, P.G. 2012c. GMACE Weighting Factors. Report to the GMACE working group of Interbull. GMACE_gedcs 2013

Jakobsen, J.H. and Sullivan, P.G. 2013. Trait specific computation of shared reference population. Reference sharing Nov 2013

NEXT ROUTINE INTERNATIONAL EVALUATION

Dates for next routine run can be found on http://www.interbull.org/ib/servicecalendar

NEXT TEST INTERNATIONAL EVALUATION

Dates for next routine run can be found on http://www.interbull.org/ib/servicecalendar

PUBLICATION OF INTERBULL ROUTINE RUN

Results were distributed by the Interbull Centre to designated representatives in each country. The international evaluation file comprised international proofs expressed on the base and unit of each country included in the analysis. Such records readily provide more information on bull performance in various countries, thereby minimising the need to resort to conversions.

At the same time, all recipients of Interbull results are expected to honour the agreed code of practice, decided by the Interbull Steering Committee, and only publish international evaluations on their own country scale. Evaluations expressed on another country scale are confidential and may only be used internally for research and review purposes.

Table 1. National evaluation dates in GMACE run April 2015

Country	Date
CAN	20150401
DEU	20150408
DFS	20150202
ESP	20150320
FRA	20150410
GBR	20150314
ITA	20150312
NLD	20150401
POL	20150301

Table 2.

Number of bulls in reference population for hco

CAN	16142.0						
DEU	1427.0	29298.0					
DFS	1326.0	25028.0	25447.0				

Number of bulls in reference population for crc

CAN	21967.0							
DEU	1416.0	30515.0						
DFS	1326.0	26454.0	26914.0					
ESP	1216.0	27339.0	24827.0	27810.0				
FRA	1471.0	25292.0	22708.0	24819.0	26602.0			
GBR	20816.0	1268.0	1177.0	1072.0	1311.0	20875.0		
ITA	20309.0	1051.0	939.0	880.0	1064.0	20226.0	20611.0	
NLD	1344.0	21153.0	20942.0	19963.0	19088.0	1212.0	1002.0	22209.0
POL	136.0	2403.0	206.0	2512.0	2458.0	132.0	137.0	215.0	2629.0

Number of bulls in reference population for cc1

CAN	21926.0					
DEU	1384.0	28946.0				
DFS	1294.0	24897.0	25281.0			
FRA	1447.0	23977.0	21392.0	25267.0		
GBR	20716.0	1235.0	1143.0	1273.0	20777.0	
NLD	1321.0	19658.0	19390.0	17826.0	1188.0	20408.0

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Number of bulls in reference population for        cc2
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CAN 23640.0
DEU  1370.0 30064.0
DFS  1286.0 26021.0 26488.0
ESP  1211.0 27135.0 24632.0 27610.0
GBR 22412.0  1222.0  1138.0  1066.0 22461.0
ITA 21722.0  1043.0   933.0   879.0 21648.0 21949.0
NLD  1341.0 20956.0 20753.0 19896.0  1206.0  1019.0 22186.0
POL   136.0  2398.0   206.0  2507.0   132.0   137.0   215.0  2624.0

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Number of bulls in reference population for        int
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CAN 23491.0
DEU  1368.0 30033.0
DFS  1282.0 26008.0 26471.0
ESP  1206.0 27124.0 24618.0 27595.0
GBR 22338.0  1221.0  1137.0  1065.0 22387.0
ITA 21700.0  1042.0   932.0   878.0 21629.0 21927.0
NLD  1336.0 20947.0 20741.0 19885.0  1204.0  1017.0 22145.0
POL   136.0  2398.0   206.0  2507.0   132.0   137.0   215.0  2624.0
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