```
Introduction
--------------------------------------------------------------------------------
The latest routine international evaluation for longevity trait  took place
as scheduled at the Interbull Centre. Data from twenty one  (21) populations were
included in this evaluation.

International genetic evaluations for direct longevity  trait of bulls from
Australia, Belgium, Canada, Switzerland, Germany, Denmark-Finland-Sweden
Spain, France, The United Kingdom, Ireland, Israel,
Italy, New Zealand, The Netherlands, The United States of America
Hungary, Norway, Slovenia and Czech Republic were computed. Brown Swiss, Guernsey,
Holstein, Jersey, Red Dairy Cattle and Simmental breed data were included in this evaluation.


Changes in national procedures
--------------------------------------------------------------------------------
Changes in the national genetic evaluation of longevity traits are as
follows:

NOR (RDC)  The rolling definition of hys (random) and herdX5yr (fixed) is causing the daughters to distribute somewhat differently over classes at each evaluation. Therefore some bulls occasionally may lose edc
                 and reliability although number of daughters remain the same. Some cows disappear if they have been sold to a new herd since last evaluation. Usually there are less than five such cows per bull,
   but the number will be up to 20 for elite bulls with many recent daughters.
DEU (ALL)  Performance data: phenotypic data from 2000 onwards. Pedigree: sire and maternal grandsire of animals having own performance must be known, Breed: breed of animal having own performance must be consistent
                 with the breeds of parents
CHE (BSW)  Ongoing correction of the data by the breeding organization together with the plausibility criterion applied with respect to herd size changes is causing some drops in information
CZE (HOL)  New data since 2016 for HOL including a base change. No longer participating with SIM.
GBR (ALL)  Noticeable updates in input data from our data providers, resulting in some bulls losing daughters and herd. In additional we have updated the way we build our pedgiree as well resulting in some changes in the                               ped
                 Data providers have now correctly eliminated the eartag numbers of these cows, so that only the herd-book numbers are now included. Base change
NZL (ALL)  Results based on brand new models which are based on the most recent version of LICâ s genetic evaluation software based on a multiple trait models.
                 The new multiple traits have caused a general drop in reliability. It contains a number of enhancements which result in more accurate genetic evaluations and reduces the time taken to compute genetic
                 evaluations. Implementation of Parent Average Adjustment (PAA), changes to the daugher count for all traits. When the single trait models are combined  into a multi trait BV the single trait daughter count
                 that was the greatest (which is always the 2 year old daughter count)was taken into account. The old routine for Fertility and longevity were based on having a record for that trait or a production record,
                 this is now change so that it is a count of that particular trait.
NLD (ALL)  Base change, now the cows born in 2015 are the base (it was 2010)
AUS (ALL)  Pedigree corrections based on genotype information has caused drops in information. Changed the method for calculation of reliabilities
USA (ALL)  Base change
SVN (ALL)  Until now the EBV were limited to the interval(52, 148). We used to reduce all EBV greater than 147 to not exceed 148. We reduced all EBv smaller than 53 to be no less than 52.
                 From now on, we no longer apply such restriction to EBVs.
POL (HOL)  Base change
JPN (HOL)              Small decrease in information due to additional records and modification of pedigree
BEL (HOL)              Some change in type of proof due to changes in pedigree information and the fact that the program that determines the type of proof for bulls is based on pedigree information
ISR (HOL)              Small decrease in information due to pedigree corrections.
ITA (HOL)              Base change plus cut off of 1 year of data causing decreases in information.
DEA (BSW)             Base change
POL (HOL)              Decrease in information due to data edits
CHE (ALL)              Base change, small drops in information due to manual editings. BSW: few bulls missing in this evaluation due to change in status of bulls.
CAN (ALL)              Base change
FRA (ALL)              Base change


INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN
------------------------------------------------------------
Subsetting:
----------
As decided by the ITC in Orlando, new subsetting was introduced
in the september test run. Sub-setting is necessary for operational
purposes and restrictions of time scales. To minimize the effect of
subsetting, larger subsets with 10-12 countries and with 4 link
providing countries have been applied.


Window:
-------
```

According to the decision taken by ITC in Orlando, the following
changes have been introduced in regards to the windows used for
post processing:

The upper bounds have been set to 0.99 as these were judged to have
very little effect on evaluations. The lower values have been
set to about the 25% percentile value. The largest changes are for
the lower values for conformation traits, with the lowest window being
40% for OFL otherwise it is about 50% for all other confirmation traits.
It is anticipated that these low values may not have large impact on
evaluations since there were very few countries combinations whose
estimated correlations fell between the old limit of 0.30 and these new limits.

The window so far applied for MAS evaluation have been found too high compared to the
within-country genetic correlation between mastitis and SCS available from the literature.
It has been an ITC recommendation to adjust the windows for MAS in this test run to make them more in line with the
values available from the literature. The recommendation has been approved by the Steering committee.
Also, according to the decision taken by ITC in Orlando (2015) to review all windows every five (5) years, an overall
review of the windows for all traits will take place during the first half of 2020 with the aim of implementation set for the September 2020 test run.

DATA AND METHOD OF ANALYSIS

Data were national genetic evaluations of AI sampled bulls with at least
10 daughters or 10 EDC (for clinical mastitis and maternal calving traits at least
50 daughters or 50 EDC, and for direct calving traits at least 50 calvings or 50 EDC) in at
least 10 herds. Table 1 presents the amount of data included
in this Interbull evaluation for all breeds.

National proofs were first de-regressed within country and then analysed
jointly with a linear model including the effects of evaluation country,
genetic group of bull and bull merit. Heritability estimates used in both
the de-regression and international evaluation were as in each country's
national evaluation.

Table 2 presents the date of evaluation as supplied by each country

Estimated genetic parameters and sire standard deviations are shown in APPENDIX I
and the corresponding number of common bulls are listed in APPENDIX II.

SCIENTIFIC LITERATURE

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

International genetic evaluation computation:
     Schaeffer. 1994. J. Dairy Sci. 77:2671-2678
     Klei, 1998. Interbull Bulletin 17:3-7

Verification and Genetic trend validation:
     Klei et al., 2002. Interbull Bulletin 29:178-182.
     Boichard et al., 1995. J. Dairy Sci. 78:431-437

Weighting factors:
     Fikse and Banos, 2001. J. Dairy Sci. 84:1759-1767

De-regression:
     Sigurdsson and G. Banos. 1995. Acta Agric. Scand. 45:207-219
     Jairath et al. 1998. J. Dairy Sci. Vol. 81:550-562

Genetic parameter estimation:
     Klei and Weigel, 1998, Interbull Bulletin 17:8-14
     Sullivan, 1999. Interbull Bulletin 22:146-148

Post-processing of estimated genetic correlations:

      Mark et al., 2003, Interbull Bulletin 30:126-135
      Jorjani et al., 2003. J. Dairy Sci. 86:677-679
      https://wiki.interbull.org/public/rG%20procedure?action=print

Time edits
      Weigel and Banos. 1997. J. Dairy Sci. 80:3425-3430

International reliability estimation
      Harris and Johnson. 1998. Interbull Bulletin 17:31-36

NEXT ROUTINE INTERNATIONAL EVALUATION

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

NEXT TEST INTERNATIONAL EVALUATION

Dates for the next test 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 minimizing the need to resort to
conversions.

At the same time, all recipients of Interbull results are expected to honor
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.

PUBLICATION OF INTERBULL TEST RUN

Test evaluation results are meant for review purposes only and should not be
published.

^LTable 1. National evaluation data considered in the Interbull
evaluation for Longevity (April Routine Evaluation 2020).
Number of records for direct longevity by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS		137	7906	1729	714	
BEL			1653			
CAN	226	103	12320	737	853	
CHE	2990		3448			
CZE			4314			
DEA	6500					
DEU			22024		269	
DFS			13588	2511	9232	
ESP			3753			
EST						
FRA	401		16947			
FRM						4600
GBR	119	308	7736	803	550	80

HUN			3421			
IRL			2906	189	65	
ISR			1494			
ITA	2148		9354			
JPN						
KOR						
LTU						
LVA						
NLD	181		15187	156	70	340
NOR					3819	
NZL	54	57	7564	4699	1252	
POL			10458			
PRT						
SVK						
SVN	392		572			595
URY						
USA	1114	788	38452	4682	716	61
ZAF			1246	692	135	
HRV						
MEX						
CAM					36	
============	========	========	========	========	========	========
No.Records	14125	1393	184343	16198	17711	5676
Pub. Proofs	11629	1111	143682	13247	15968	4997

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal
----

BSW   dlo

	CAN	CHE	DEA	NLD	NZL	USA	ITA	FRA	GBR	SVN
CAN	9.12									
CHE	0.73	11.01								
DEA	0.80	0.85	14.16							
NLD	0.65	0.80	0.80	315.66						
NZL	0.59	0.59	0.45	0.51	317.97					
USA	0.91	0.66	0.78	0.72	0.60	2.72				
ITA	0.78	0.67	0.79	0.62	0.45	0.68	16.10			
FRA	0.65	0.77	0.79	0.68	0.53	0.68	0.53	0.94		
GBR	0.85	0.60	0.50	0.60	0.63	0.84	0.64	0.53	0.32	
SVN	0.73	0.65	0.81	0.72	0.53	0.72	0.78	0.65	0.56	24.11

GUE   dlo

	AUS	CAN	NZL	USA	GBR
AUS	0.06				
CAN	0.63	7.90			
NZL	0.72	0.68	282.16		
USA	0.66	0.90	0.66	2.86	
GBR	0.64	0.91	0.70	0.87	0.37

HOL   dlo

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	IRL	ISR	ITA	NLD	NZL	USA	HUN	CZE	SVN	ZAF	POL
AUS	0.04																			
BEL	0.66	0.38																		
CAN	0.65	0.86	6.21																	
CHE	0.75	0.78	0.84	12.34																
DEU	0.70	0.85	0.89	0.86	12.61															
DFS	0.72	0.86	0.86	0.82	0.93	12.34														
ESP	0.56	0.78	0.87	0.77	0.84	0.75	11.96													
FRA	0.61	0.61	0.59	0.76	0.64	0.71	0.57	0.99												

```
GBR      0.70     0.89     0.91     0.80     0.87     0.83     0.88     0.56     0.31
IRL      0.58     0.83     0.79     0.65     0.74     0.69     0.76     0.45     0.80     2.05
ISR      0.61     0.58     0.56     0.64     0.64     0.70     0.53     0.67     0.55     0.53   103.91
ITA      0.52     0.64     0.75     0.72     0.74     0.67     0.87     0.61     0.75     0.62     0.51     5.83
NLD      0.57     0.64     0.64     0.74     0.72     0.75     0.61     0.67     0.63     0.47     0.65     0.52   266.48
NZL      0.70     0.75     0.65     0.75     0.76     0.73     0.54     0.58     0.67     0.68     0.53     0.46     0.53   248.62
USA      0.66     0.86     0.90     0.80     0.88     0.89     0.88     0.65     0.85     0.74     0.68     0.75     0.73     0.66     2.26
HUN      0.45     0.56     0.65     0.53     0.57     0.52     0.75     0.46     0.65     0.51     0.43     0.68     0.46     0.45     0.71     1.27
CZE      0.45     0.51     0.60     0.57     0.59     0.49     0.70     0.44     0.59     0.57     0.43     0.68     0.45     0.45     0.60     0.53    12.47
SVN      0.46     0.80     0.72     0.62     0.74     0.70     0.70     0.51     0.71     0.67     0.58     0.54     0.65     0.66     0.80     0.52     0.45    25.56
ZAF      0.75     0.86     0.88     0.77     0.89     0.86     0.85     0.63     0.89     0.86     0.58     0.70     0.60     0.78     0.90     0.62     0.57     0.71    23.86
POL      0.45     0.45     0.48     0.58     0.60     0.52     0.61     0.45     0.51     0.45     0.44     0.62     0.45     0.45     0.52     0.45     0.52     0.47     0.49    12.56
```

```
-------------------------------------------------------------------------------
JER     dlo
-------------------------------------------------------------------------------
        AUS      CAN      DFS      NLD      NZL      USA      GBR      ZAF      IRL
AUS     0.05
CAN     0.51     7.12
DFS     0.67     0.67    12.12
NLD     0.59     0.61     0.79   334.31
NZL     0.67     0.51     0.70     0.52   226.58
USA     0.62     0.82     0.79     0.75     0.60     2.39
GBR     0.58     0.85     0.75     0.65     0.51     0.81     0.29
ZAF     0.50     0.60     0.67     0.55     0.48     0.71     0.74    27.69
IRL     0.57     0.70     0.58     0.46     0.54     0.66     0.70     0.59     1.54
```

```
-------------------------------------------------------------------------------
RDC     dlo
-------------------------------------------------------------------------------
        AUS      CAN      DEU      DFS      NZL      USA      GBR      NLD      ZAF      IRL      NOR      CAM
AUS     0.05
CAN     0.57     6.82
DEU     0.64     0.86    12.50
DFS     0.66     0.74     0.90    12.95
NZL     0.70     0.51     0.64     0.52   279.24
USA     0.60     0.86     0.88     0.85     0.51     2.54
GBR     0.65     0.90     0.83     0.74     0.52     0.81     0.31
NLD     0.54     0.65     0.74     0.75     0.51     0.76     0.61   327.66
ZAF     0.56     0.85     0.84     0.62     0.55     0.85     0.80     0.61    29.79
IRL     0.55     0.75     0.72     0.63     0.60     0.66     0.72     0.48     0.79     1.48
NOR     0.56     0.77     0.72     0.83     0.45     0.82     0.65     0.77     0.62     0.65    41.42
CAM     0.45     0.53     0.66     0.62     0.44     0.62     0.50     0.64     0.45     0.44     0.47     9.02
```

```
-------------------------------------------------------------------------------
SIM     dlo
-------------------------------------------------------------------------------
        FRM      NLD      SVN      GBR      USA
FRM     0.98
NLD     0.59   276.56
SVN     0.63     0.71    22.57
GBR     0.60     0.61     0.71     0.26
USA     0.74     0.76     0.80     0.82     2.29
```

```
-----------------------------------------------------------------------------------------
^LAPPENDIX II. Number of common bulls
-----------------------------------------------------------------------------------------
BSW
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  CHE  DEA  NLD  NZL  USA  ITA  FRA  GBR  SVN
     -------------------------------------------------------------------
  CAN    0  120  135   40   24  162  119   83   57   33
  CHE   99    0  579   91   24  314  454  166   68   79
  DEA  112  473    0  137   33  329  711  219   69  105
```

```
   NLD    35    86   127     0    22    69   116    73    33    45
   NZL    22    19    26    14     0    29    27    22    17    13
   USA   150   292   291    58    24     0   239   121    81    41
   ITA   104   392   598    95    23   170     0   196    71   100
   FRA    73   125   166    58    19    83   155     0    52    56
   GBR    53    51    46    25    14    73    49    44     0    23
   SVN    29    75    97    45    11    33    99    56    18     0
------------------------------------------------------------------------------
GUE
--------
common bulls below diagonal
common three quarter sib group above diagonal
        AUS  CAN  NZL  USA  GBR
------------------------------------------------------------------------------
   AUS     0   46   26   61   36
   CAN    46    0   13   68   29
   NZL    26   11    0   28   15
   USA    56   58   26    0   88
   GBR    32   24   13   90    0
------------------------------------------------------------------------------
HOL
--------
common bulls below diagonal
common three quarter sib group above diagonal
        AUS  BEL  CAN  CHE  DEU  DFS  ESP  FRA  GBR  IRL  ISR  ITA  NLD  NZL  USA  HUN  CZE  SVN  ZAF  POL
------------------------------------------------------------------------------
   AUS     0  649 1243  560 1465 1226  821 1174 1373  693  104 1109 1338 1093 1721  691  798  174  461  956
   BEL   559    0  667  515 1001  773  586  792  834  470   79  732 1019  450  828  489  535  164  296  684
   CAN  1184  628    0  818 2158 1323 1200 1335 1618  518  118 1562 1375  661 3127  979  999  193  469 1263
   CHE   478  511  647    0 1075  688  522  609  735  384   62  688  847  369  962  427  436  138  258  627
   DEU  1054 1011 1498  941    0 2493 1420 2199 2140  839  161 2432 3023  877 3278 1226 1591  304  535 2270
   DFS   865  715 1075  595 1797    0  981 1572 1718  749  152 1586 2083  795 2033  908 1211  258  504 1574
   ESP   577  561  697  417  894  718    0 1067 1088  489  108 1212 1030  505 1469  746  829  187  435  996
   FRA   735  735  780  510 1043  752  720    0 1565  714  125 1629 1831  739 2384  924 1198  199  459 1540
   GBR  1220  852 1826  696 1784 1409  920  973    0 1012  147 1655 1914  965 2320  934 1138  233  530 1461
   IRL   595  463  461  383  733  617  470  544 1082    0   99  654  875  704  768  446  537  125  327  603
   ISR    64   47   74   37  128  116   60   59  115   76    0  146  159  106  187  118  124   48   67  145
   ITA   809  689 1176  609 1595 1218  875  824 1390  571  108    0 1652  707 2494 1027 1195  236  482 1545
   NLD  1114 1119 1212  802 2694 1821  883 1031 1810  816  122 1325    0  966 2364  967 1289  256  493 1730
   NZL  1067  365  645  309  652  554  375  402  879  606   85  531  863    0 1004  485  598  128  349  613
   USA  1650  712 3254  845 2245 1530  936 1163 2200  684  172 1705 1908  942    0 1325 1575  236  622 1967
   HUN   517  408  846  340  952  723  587  588  878  398   83  892  794  375 1271    0  913  163  390  945
   CZE   521  422  690  324 1206  790  610  726  913  423   93  870 1127  430 1241  847    0  191  405 1156
   SVN   123  134  138  102  296  216  144  133  189   97   37  204  219   90  179  126  138    0  102  250
   ZAF   396  253  394  210  417  380  374  303  482  288   44  379  401  281  596  310  282   72    0  408
   POL   693  618  994  507 1979 1267  676  917 1341  504  112 1180 1566  462 1826  837  937  224  304    0
------------------------------------------------------------------------------
JER
--------
common bulls below diagonal
common three quarter sib group above diagonal
        AUS  CAN  DFS  NLD  NZL  USA  GBR  ZAF  IRL
------------------------------------------------------------------------------
   AUS     0  235  136   63  411  453  215  224   52
   CAN   238    0   94   31  165  405  164  152    9
   DFS   104   85    0   92  138  188  168  140   43
   NLD    53   25   90    0   65   76   76   65   30
   NZL   445  174  114   57    0  335  221  196  111
   USA   485  412  164   81  401    0  246  298   44
   GBR   224  167  165   72  231  287    0  175   76
   ZAF   216  147  120   60  203  311  183    0   38
   IRL    50    8   37   29  124   45   80   38    0
------------------------------------------------------------------------------
RDC
--------
common bulls below diagonal
```

```
common three quarter sib group above diagonal
        AUS  CAN  DEU  DFS  NZL  USA  GBR  NLD  ZAF  IRL  NOR  CAM
       -----------------------------------------------------------------
AUS       0   93   35  190  121  116   86   24   38   16   61   10
CAN      95    0   12  152   77  205   93    6   72    5    6    0
DEU      35   11    0   48   13   20   14   14    3    6   13    0
DFS     169  154   39    0  153  176  117   44   51   19  133    0
NZL     122   76   13  147    0  104   78   18   37   11   35    9
USA     117  189   20  172  104    0  117   37   63   27   68   18
GBR      84   92   14  113   73  110    0   29   51   23   52    0
NLD      23    6   14   43   17   35   28    0    3   13   39    0
ZAF      39   74    3   50   33   57   44    3    0    3    0    0
IRL      15    5    6   15   11   27   22   13    3    0   54    0
NOR      51    6   12  105   33   69   54   39    0   52    0    0
CAM      10    0    0    0    9   18    0    0    0    0    0    0
       -----------------------------------------------------------------
SIM
--------
common bulls below diagonal
common three quarter sib group above diagonal
        FRM  NLD  SVN  GBR  USA
       -----------------------------------------------------------------
FRM       0  107    0   63   43
NLD     128    0   46   42   19
SVN       0   45    0    0    0
GBR      80   40    0    0   19
USA      58   21    0   26    0
       -----------------------------------------------------------------
```