Interbull's international exchange of information on genetic traits in collaboration with World Holstein Friesian Federation (WHFF).

Expertise and infrastructure for international data exchange

For more than 20 years, the Interbull Centre has been evaluating and exchanging genetic data from around the world, aiding individual countries, organisations and farmers to identify those animals from around the world that will perform best under their own unique farming conditions. A key part in the exchange has been the quality control of this data. Three times per year data is distributed to its customers.

WHFF

The **World Holstein Friesian Federation (WHFF)** harmonised the codes and nomenclature for genetic traits to support its recommendation that genetic traits be reported to breed Herdbook official documents and be made available for data exchange. The transfer of such data currently happens through bilateral (in most cases manual) exchange of data.

International Data Exchange on Genetic Traits

Following a request from WHFF to assist with the **international exchange of information on these genetic traits**, the Interbull Centre's database (IDEA) for the collection of animal trait information ('AnimInfo') has been expanded to facilitate the collection of the WHFF genetic trait information. Subsequently, tests have been carried out with Interbull Centre's customers in Germany, The Netherlands and Great Britain to upload this information in a case study.

The National Genetic Evaluation Centres (NGECs), on behalf of the national Herdbooks in these three countries, uploaded the information on more than 160 000 genetic tests for some 100 000 Holstein cows and bulls to the Interbull Centre's Database, and the exchange of genetic traits seemed very efficient, giving substantial extra information for each country and Herdbook that participated in the test

Currently the NGECs in 32 countries are involved in International Bull Evaluation Services for Holstein cattle (see www.interbull.org/ib/users_map). Each of these 32 NGECs will now have the possibility to join the exchange of information on genetic traits: All NGECs can upload information on genetic traits for Holstein bulls and cows from the moment that they sign up to this service and will then be able to download the information of other countries. The service is currently free of charge.

Traits and codes:

WHFF has agreed that the list on the WHFF web site is the list of Genetic Traits it wishes to have available for exchange. The current list of traits and codes is included in Table 1. WHFF has procedures in place to update this Table. New codes/genetic traits that are added to this list, can be included in the international exchange service after agreement between WHFF and Interbull Centre.

Note that only **true genetic tests** will be exchanged through the Interbull Centre: the codes 'VRR' (colour) and 'POR' (polled) are not based on genetic tests and are therefore excluded from this service.

About AnimInfo

AnimInfo is a module in the Interbull Data Exchange Area (IDEA) website. The purpose of AnimInfo is to collect reported information from NGECs with IDEA access and to use AnimInfo as an international exchange area for information on any animal (both bulls and cows are allowed) that is present in the IDEA Pedigree Database. AnimInfo does not verify or authorize such information. The responsibility of such verification rests with the NGECs and their relevant local/national herdbooks uploading the information. Examples of additional information are coat colour, breed% information, herdbook number, ear tag number, genetic traits etc. The type of additional information that can be registered in IDEA AnimInfo is decided by Interbull Service Users in collaboration with Interbull Centre.

Exchange of Information on Genetic Traits

In order for NGECs to exchange national Holstein genetic trait data through Interbull's IDEA, the NGECs need to put procedures and agreements in place with the local/national Holstein Associations, have access to IDEA and sign a letter of agreement with the Interbull Centre.

Quality Control on uploaded data in IDEA

To maintain high quality on the data uploaded in IDEA, only 1) information on animals for which pedigree records are in the IDEA Pedigree Database, and 2) abbreviations and codes agreed between Interbull Centre and WHHF, can be uploaded. To prevent unknown animals, or incorrect codes and abbreviations to be uploaded to AnimInfo, the data is carefully checked by a checking program developed at the Interbull Centre. This results in 1) known animals with valid abbreviations and codes to be uploaded in AnimInfo, and 2) a list of animals that cannot be uploaded, and that can be used by the NGEC to correct this data, before trying to upload this information again.

Correct information depends on the supplier of the information. The Interbull Centre cannot check if the provided information is correct, but does identify information on conflicting information it receives.

Conflict resolution

If conflicting information on a genetic trait for the same animal is uploaded or is otherwise publicly available, the conflict needs to be resolved by the NGECs and, if applicable, national Holstein Associations that provided the conflicting information. If they cannot resolve the conflict, they have to contact the bull owner and ask for assistance. Until the resolution of the conflicts both sets of data on the specific animal is disseminated. Following resolution, the correct information should be uploaded as soon as possible. In order to assist with the identification of such conflicts, the NGECs can download a report that includes a list with conflicting information.

Information for National Holstein Associations

The Interbull Centre distributes official Genetic and Genomic Evaluations to the NGECs three times per year (through the so-called "routine runs"). At the same time – three times per year - a list with conflicting information will be made available. NGECs will be able to upload and download the latest information on genetic traits at any time during the year.

Participation and further details

If you wish to participate in, or if you have any questions about the exchange of genetic traits:
- WHFF members, please contact:
  - The WHFF Secretary General (worldholstein@gmail.com); or
  - Your national Genetic Evaluation Centre (see www.interbull.org/ib/users_map).
- National Genetic Evaluation Centres, please contact:
  - The Interbull Centre (Interbull@slu.se)

Table 1: Genetic Traits as reported on the WHFF website.
Based on: www.whff.info/documentation/genetictraits.php#go1

C = carrier
F = tested free or non-carrier

Gene Name	Description	Gene and Expression Code
BLAD	**Bovine Leukocyte Adhesion Deficiency** (deficiency of a normally occurring protein needed for white blood cells or leukocytes, which are body's infection fighters)	**BLC** = tested carrier of BLAD **BLF** = tested non-carrier of BLAD
Mule foot	**Mule-Foot** (toes of foot are joined, giving animal a single hoof, instead of cloven ones)	**MFC** = tested carrier of Mule foot **MFF** = tested non-carrier of Mule foot
DUMPS	**Deficiency of Uridine Monophosphate Synthase** (one of many enzymes contributing to normal metabolic processes)	**DPC** = tested carrier of DUMPS **DPF** = tested non-carrier of DUMPS
CVM	**Complex Vertebral Malformation** (causes still-born calves, abortions, and early embryonic losses)	**CVC** = tested carrier of CVM **CVF** = tested non-carrier of CVM
Factor X1	**Factor X1** (blood clotting disorder)	**XIC** = tested carrier of Factor X1 **XIF** = tested non-carrier of Factor X1
CIT	**Citrullinemia** (accumulation of ammonia and other toxics in blood in baby calves)	**CNC** = tested carrier of Citrullinemia **CNF** = tested non-carrier of Citrullinemia
Brachyspina	**Brachyspina** (causes abortion and stillborn, shortened spinal cord, long legs and abnormal organs)	**BYC** = tested carrier of Brachyspina **BYF** – tested non-carrier of Brachyspina ====== * **POR** = code
Polled	Animals without horns (reported born hornless- - Not Tested).	
Polled (Current-Indirect Test)	Indirect Test	**POS** = tested true polled (homozygous PP) **POC** = tested carrier of polled (heterozygous Pp) **POF** = tested free of polled
Polled (Future)	When a direct test becomes available. Direct test code will "trump" test code on animal record	
Cholesterol Deficiency	Cholesterol Deficiency	**CDF** = tested non-carrier / free of cholesterol deficiency **CDC =** tested carrier of cholesterol deficiency (heterozygous) **CDS** = tested true carrier of cholesterol
Red	Red gene	**RDC** = carrier of red gene **RDF** = tested non-carrier of red gene
Red	Variant Red gene	~~**VRR** = not tested/determined by lineage~~ * **VRS** = tested true (homozygous) **VRC** = VRC =tested carrier (heterozygous) **VRF** = tested free
Black/Red	Black/red gene	**BRC** = carrier of black / red gene
Black	Black gene	**BKC** = carrier of black gene

* 'VRR' (colour) and 'POR' (polled) are not based on genetic tests and are therefore excluded from this service.

3