

## Interbull Technical Workshop 2023 Overview of the New Traits Session

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### Abstract

New phenotypes have been systematically collected by national genetic centres, often leading to implementation of national genetic evaluation for several economically important dairy traits. However, the MACE portfolio has remained fixed to seven publishable trait groups since workability (including milking speed and temperament traits), was added in 2009. Streamlining the procedure for identifying new suitable traits for the MACE portfolio has been identified as a key goal in the 2020-2023 Interbull strategic plan. The first stage to achieve such objective is surveying the available data across countries on a more routinely basis: countries could be on different stages of data collection, research or development of national evaluation, and that there could be also differences in the above stages per breed.

Information about national genetic evaluations for traits included in MACE evaluations have, for several decades, been collected and published on the Interbull Centre website in the form of word or pdf documents. In 2022, with the introduction of the Performance Recording, Evaluation and Publication database (PREPdb), electronic forms, rather than flat files, were developed for collecting such information. The “Other Traits” form, dedicated to traits not (yet) included in international evaluations, was also introduced. Prior to the Interbull Technical Workshop held in Rome in February 2023, Interbull Centre encouraged all its members to fill in the Other Traits form with as much information on additional traits they record nationally as possible. The aim was to identify possible new trait(s) to include in the Interbull portfolio. Upon review of the information collected, gestation length, retained placenta and milk fever/hypercalcemia were identified as the most frequently reported traits, and were chosen as the traits to be further discussed during the workshop’s session. This report provides an overview of the discussion that took place both during the panel session and the groups’ discussion that characterised the workshop’s session on new traits.

**Key words:** MACE, gestation length, health traits, retained placenta, milk fever, hypercalcemia, Interbull strategic plan, PREPdb

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### Introduction

In the 1980’s, the increasing international trade in frozen semen and embryos notably remarked the need for a standardised documentation of dairy cattle genetic evaluations’ methods as applied in various

countries. In 1985, Interbull Centre performed a very first “survey” among the participating countries focusing on production traits’ evaluations (Interbull Bulletin nr. 2, 1986). Detailed information on which traits included, how they were evaluated and expressed, the definition of the genetic base with which

comparisons were made, was made publicly available. The purpose was helping in the interpretation of international bull catalogues by AI studs, breeders as well as for educational purposes, whenever international information on sire evaluation procedures or breeding programs was needed.

The initial survey was then replaced by the so-called Genetic Evaluation (GE) Forms and used since then to collect information on national genetic evaluations. The information in the forms was updated regularly on the Interbull webpage, one form per organisation per trait group. Over the years, however, with the development of new and more sophisticated methods of data collection and statistical models, the rigid structure of the GE-forms started to become a limiting factor. For example, when differences in the type of procedures applied for traits within a given trait group were present, GE-forms did not allow the same level of detailed information for all of them to be provided. To overcome this problem, Interbull Centre has invested in the development of a new platform, Performance Recording, Evaluation and Publication database (**PREPdb**, <https://prep.interbull.org/>) which was first launched in March 2022. The PREPdb enables users to upload descriptive information regarding performance recording, national genetic evaluation systems and publication policies for each individual trait within a trait group in standardised forms. A dedicated form for traits not yet evaluated at international level, was also included: the “Other Traits” form provides information on traits collected and/or evaluated at national level, and is a central part of the new traits pipeline proposed for identifying next suitable trait(s) to be included in the international evaluation.

This paper describes the PREPdb, the Other Traits form and the new trait pipeline as presented at the Interbull Technical Workshop, which was held in Rome in February 2023, as well as the discussion that took place about the expansion of Interbull portfolio with the inclusion of new economically important traits.

## **Materials and Methods**

### ***PREP database***

In March 2022, Interbull Centre launched a beta version of the PREPdb, in part as its role as European Reference Center [(EU) 2017/1422]. The PREPdb is equipped with electronic forms allowing users to provide information per trait rather than per trait-group, thus improving the content, details and quality of information provided. The electronic forms are also equipped with lists of standard pre-defined answers enhancing the capability to compare information and facilitating harmonisation and standardisation of the procedures. Currently, PREPdb has been equipped with specific electronic forms for both dairy and beef traits. Electronic forms are available for all internationally evaluated beef traits. For the internationally evaluated dairy traits they are, at the moment, limited to production and calving traits. Electronic forms for the remaining traits such as conformation, fertility, udder health and workability will be added over time so to completely replace the use of the current GE forms.

### ***The Other Traits form***

Over the years, countries have developed evaluations for many more traits than are currently evaluated internationally. Some examples are claw health, feed intake, and metabolic disorders. A good overview of the needs from its members is essential for a service provider such as Interbull, given that different countries are on different stages of data collection, research phase, and development of genomic evaluations. The scenario may also differ across breed-trait combinations. The need to collect specific feedback from countries on a more routinely basis led to the creation of the Other Traits form. In order to ensure future relevance in a fast-changing environment, the form allows the identification of traits from a pre-defined list of options and the addition of

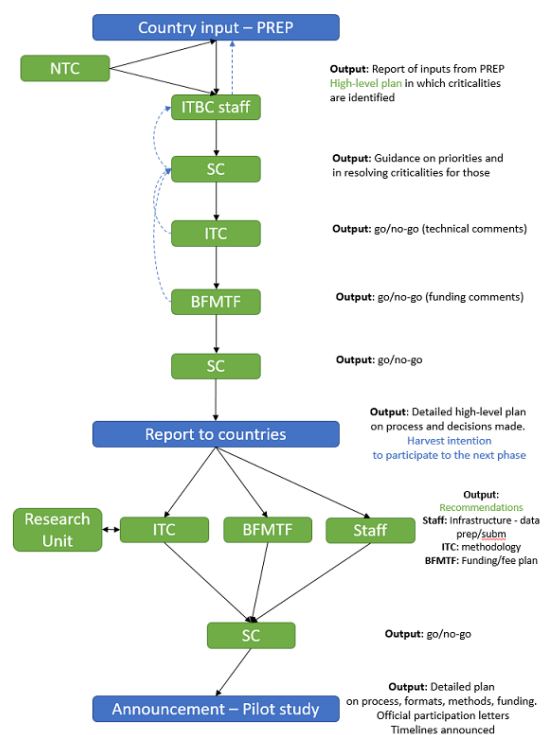
new ones as free text. Once the trait is selected, the form aims at collecting general information regarding its definition and unit of measurement. Then, for each of the breeds selected (as there could be important differences per breed), information regarding the amount of data available, how it's being used (options are: only data collection, genetic and/or genomic evaluations under development or in place) and an expression of interest on having the trait included in an international evaluation (and what type of service envisioned) is requested. In case there are no/slight differences across breeds, an ad-hoc database tool facilitates copying the answers from one breed to the other(s).

### The new traits pipeline

Defining a new traits pipeline has been defined as goal # 2 of the 2020-2023 Interbull Strategic Plan. A dedicated working group was appointed in 2021 with the main task of identifying key decision factors for implementing new traits. The main objective of the pipeline is to help Interbull Centre increase its awareness of its members' needs, increase the dynamics for expansion of Interbull portfolio, and provide the right service(s) to members (Figure 1). Any potential new service should be financially viable and take full advantage of tools already available at Interbull Centre.

The PREPdb becomes, therefore, a pivotal part of the new traits pipeline by allowing member countries to routinely provide information on other traits of interest available at the national level. Periodically, Interbull Centre will extract, review and report to the Steering Committee (SC) the breed-trait combinations that appear suitable for an international evaluation. The assessment will be based on the number of countries reporting it, availability of data, number of breeds reported, presence of a national evaluation in place. The SC will evaluate the report and, if considered promising, will delegate to the Interbull

Technical Committee (ITC) the task to collect more detailed information on the type of data available and decide on the type of service that could be feasible. The Business Funding Model Task Force (BFMTF) will then look at the fee structure or business model required, and finally both ITC and BFMTF will report back to the SC which, upon review of all the information collected, will take the final decision on whether to proceed on the investigation/development.

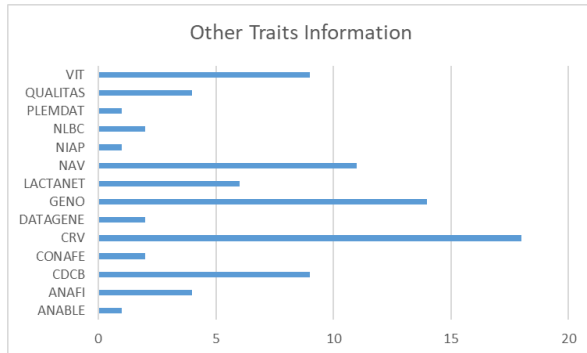


**Figure 1.** Schematic description of the new trait pipeline

### Technical Workshop: Panel and group discussions

In preparation for the Interbull Technical workshop, Interbull Centre members were encouraged to fill in the PREP's Other Traits form with as many nationally evaluated traits as possible. The objective was to identify the three most reported traits as a base for further discussion during the panel and group sessions, in order to assess their eligibility for an international evaluation. A total of 22 Other

Traits forms, each addressing one new trait, were filled in by 14 organisations (Figure 2).



**Figure 2.** Distribution of Other Traits information collected per participating organisation

The twenty-two different traits collected varied greatly by level of information provided, often only limited to the breeds they were available for, as by number of organisations reporting them (Figure 3a and 3b)

Total New Traits Reported	22	Notes
....By 1 organisation	1	
.... By 2 organisations	12	Level of information varies
.... By 3 organisations	3	Level of information varies
.... By 4 organisations	3	Level of information varies
.... By 5 organisations	2	Level of information varies
.... By 6 organisations	1	Level of information varies

**Figure 3a.** Overall view of information collected

Trait	# Org
Feed intake	3
Metritis	3
Sub-clinical Ketosis	3
Clinical ketosis	4
Body Weight	4
Digital dermatitis	4
Hypocalcaemia/milk fever	5
Retained placenta	5
Gestation length	6

**Figure 3b.** Other traits reported by three or more organisations

As shown in Figure 3b, gestation length, retained placenta and hypercalcemia/milk fever were the traits most reported (as per February 2023), by 6 and 5 organisations, respectively. Therefore, these traits were selected for further discussion during the dedicated session of the Interbull Technical Workshop.

The session started with an introduction of the new trait pipeline and the PREPdb, followed by a panel session and group discussions. During the panel session, representatives from six countries (Italy, Germany, Switzerland, USA, Norway and Denmark-Finland-Sweden; the ones having reported the selected traits), were asked to discuss the following questions:

- What is the return value for the farmers/industry on evaluating such traits?
- Do you include them in your selection index?

After the panel session, the workshop participants were divided into six groups, with the task to provide answers to the following questions:

- What is the return value for the farmers/industry on evaluating such traits?
- What is your expectation for such traits on an international level?
- What are the pros and cons of an international evaluation?
- What is the role you envision for Interbull?
- What kind of service is expected (MACE, GMACE, conventional phenotype evaluation, SNP-based)?

A summary of the panel discussion and the groups discussion is presented in the following section.

## Results & Discussion

### *Gestation length*

Three out of the six countries in the panel did evaluate gestation length either as an auxiliary trait for calving or published it as part of a selection index. Both in the panel discussion and in the group discussions, it was emphasised that the trait was mainly of interest for countries

with seasonal calving, or in relations to beef on dairy breeding plans. Due to extended use of natural service and scarce use of AI, the trait was not considered possible for beef cattle. There was a general agreement that, due to the nature of gestation length as an intermediate optimum trait, the target for selection would be unclear and therefore of little interest for many countries. Although genetic correlations between gestation length and other traits (i.e. calving ease, still birth) do exist, there is a large variability in terms of interest expressed by the countries.

Several panellists commented that there are differences in gestation length between dairy x dairy and beef x dairy, with beef generally having longer gestation periods. However, it is difficult to know if these differences are due to direct genetic effects only or if there is also a maternal component. Switzerland, for example, commented that they used to have good results when applying a maternal grandsire model, but had some issues with a sire model. Norway mentioned that in their investigations they saw an increase of approximately one week in gestation length when a dairy cow was served by a beef sire, compared to a dairy sire. With the increased use of sexed semen, the sex-effect must also be taken into account, with about 2.5 days' longer gestation length for bull calves compared to heifer calves.

It was generally agreed that for the farmer, gestation length is mostly interesting from a management perspective and for accurate prediction of calving time. The greatest interest was expressed by the countries with seasonal calving. With this in mind, such trait might not be of interest for an international evaluation, although it was suggested as eligible for MACE as a country management tool for calving date prediction. Expansion to beef breeds used on dairy cows (AI-sires only) and other crossbreeding was also suggested, with possible interest to share phenotypes.

### ***Retained placenta and milk fever/hypercalcaemia***

Retained placenta, milk fever and health traits in general, were considered to be of greater relevance than gestation length for all the countries in the panel. Health traits are important in relation to reduction of costs in a dairy farm. However, all countries also faced the challenge of scarce recordings, making genetic evaluations difficult. Three out of the six countries in the panel analysed one or both traits, but most of them pooled them in a health index with other diseases of similar nature (i.e. metabolic diseases, fertility diseases etc.). The other three countries did not evaluate these traits due to insufficient recordings leading to poor accuracies of national EBVs.

During the group discussions, several issues were raised in relation to analysing the selected health traits at the international level: Interbull Centre provides single trait evaluation, while health traits in many countries are evaluated as pooled traits or published as an index. Genetic correlations between countries would therefore be affected by which disease each country would include in their pooled traits or index. Missing information in many countries was also a concern. The question of trait definition across countries was also raised, with reference to the fertility traits currently evaluated in MACE where the use of substitute traits is negatively affecting the across-country genetic correlations.

Looking at other methodologies that are currently available at the Centre, it was considered that an approach based on phenotypes, following the Interbeef methodology, rather than EBVs (as in MACE), could possibly be a better alternative for analysing health traits for dairy. Likewise, approaches like SNP<sub>MACE</sub> or MACE-evaluation for SNP training were also mentioned as possible suitable ways to analyse health traits at the international level. Health traits are in general important both for economic, sustainability and animal welfare

reasons and it was suggested to test the possibility of international evaluation of such traits to investigate their possible benefits. Additionally, lameness and hoof traits were brought up in discussion as important traits of great interest. Attention is needed for trait definition and the way of sharing phenotypes in the current genomic era. The right business model is then of importance.

## Conclusions

It was agreed that more data in PREPdb was needed. Countries in the workshop reported there are other traits not yet in the database form that are considered important and should be investigated. The return value for organisations filling in the “Other Traits” form in PREPdb was considered to be the source of information of “who is evaluating what” together with easier comparisons’ tools for the trait definitions and usage of data. For the three traits discussed in the panel session and groups work, it was concluded that gestation length could be easier to implement but of less interest for the farmers, at least in most countries. Health traits would hold greater interest but also greater challenges on the way they would be recorded and analysed and, as previously mentioned, appeared to be more valuable within a general health index rather than as individual traits. The role of beef on dairy was considered to be important and should be addressed also at Interbull level. Although MACE is the targeted service for all traits introduced, it was brought forward that some traits could rather benefit from a different approach like, for example, phenotypic exchange or SNP exchange, due to scarcity of data available. Phenotype exchange would require coordination and involvement of Interbull Centre for data quality checks and exchange protocols. An interest in SNPMace was also expressed.

Interbull Centre will continue to encourage the collection of data about nationally evaluated traits via the PREP database and routinely review the amount of information collected. Based on this information Interbull would determine the needs and can decide to provide new viable services to its members.

## Acknowledgments

Interbull Centre would like to thank all members having filled in the Other Traits form and acknowledge the New traits pipeline working group’s members, all the panellists and workshop’s participants for their contribution to the discussion.

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