Golden Standard for Calving traits

Calving traits are stillbirth and calving ease. Stillbirth is defined as a birth in which an animal is born dead or dies during or within 48hr after parturition. Calving ease is defined as how easy/difficult the calving was. Both traits are seen from a direct (calf) and indirect (maternal) perspective. It's noted that these are general definitions, mainly used internally. When publishing this information different terms may be used that are more user friendly.

1. TRAIT RECORDING

Recording for stillbirth according to the Golden Standard requires ID's of all calves born.

All calving trait data is collected by farmers. To achieve the Golden Standard a 100% registration of calving ease data is needed. Calving ease should be scored in 4 classes, as is the ICAR standard. The classes should be well defined and allow easy determination of the class:

1. Unassisted/without pull
2. Easy pull
3. Hard pull, with or without veterinary aid
4. Caesarean/embryotomy

Sex of calf should always be recorded, as it has a strong influence on calving ease and the importance of including this in the evaluation model increases when sexed semen is used. This also includes the sex of stillborn calves.

In general, the following data should be ensured for calving traits:

- Herd
- Cow id
- Calving date
- Id of calf/calves; From Identification & Registration perspective all live animals should be identified within 48 hours, but regulations regarding calves born dead may differ between countries. A "dummy" ID needs to be assigned to stillborn calves that have not been assigned an official ID.
- Calf from embryo? (yes/no); if yes, specify if from IVF-OPU or MOET
- Sex of calf/calves; also of dead born calves
- Dead/alive at birth or within 48 hours
- Calving ease.
- Number of calves born at calving (twin information)

Indicator trait: Size/weight could be used as potential indicator trait. The importance of this information decreases as in genomic selection the effect on increasing accuracy is limited. Current research shows that OPU (ovum pick-up) causes more dystocia. Therefore, if OPU is used as a routine part of the breeding program this needs to be recorded. Usage of embryos gained from OPU should be recorded together with other fertility information. It's important to record in this case also the donor's age, as previously problems especially were seen when oocytes were derived from immature heifers.

In cases where embryos are used, ICAR recommendations should be followed. Their recommendations list several items that have to be registered for proper modeling and to be able to trace back embryos history and to establish parentage of calves born out of embryos prior to registration in the herdbook (see ICAR guidelines AI and ET). As described in the guidelines, registration should include females from which embryos are recovered, their sires and the recipient female whatever the technology used to produce embryos subject to future transfer, such as classical production technique, IVF, splitting, embryonic cloning.

2. DATA EDITS

Countries should have a clear protocol that describes how to validate quality of the data from each farm (as described in the chapter on data validation). For calving ease, a check on distribution of classes is needed. If a herd has a high percentage of all records in a single class the calving ease records from that herd period should be omitted. The periods to be checked should include a minimum of 12 months or a minimum of 50 calvings. If the frequency of observations in a single class is low in a specific stratum, the class can be combined at population or subpopulation (region) level. The strate used should be the same as used in computing Snell scores). If classes are combined due to the number of cases, data should continuously be carefully monitored. The limits here should follow local circumstances.

Other points that need to be considered for data checks and editing are:

- Herdbook registration and availability of pedigree, i.e. sire and dam (maternal grandsire) should follow the guidelines in the memo on ID, Pedigree and inbreeding.
- According to the Golden Standard, sex of calves should be known. If the sex of the dead born calf is unknown an average sex ratio should be included as covariate in the model, depending on usage of conventional or sexed semen (40/60% and 90/10% respectively for females/males).
- Check gestation length as extremely long or short gestations might result in an abortion or may be due to mis-recorded insemination information: The gestation length is considered extreme if it is 3 standard deviations above or below average, which is close to the bottom/upper 0.5%. Records with such extreme gestation lengths are discarded. Calvings that are regarded as abortions should be removed.
- Records of multiple births should be excluded.
- Calves coming from embryo transfer must be modelled correctly, as a direct effect is coming from the pedigree of the dam that provided the embryo, while the maternal effect (genetic and potentially permanent environment) is coming from the pedigree of the dam that carries the calf.

At least the first five parities should be included regarding first parity and later parities as separate traits, i.e. parity 2 and higher. Modeling later parities as repeated records does not impose any limit on the number of parities included as long as environmental effects associated with parity can be accurately estimated.

3. PREADJUSTMENTS AND METHOD/MODEL

The Golden Standard model for analyzing calving traits is a multivariate threshold animal model for stillbirth, calving ease and potentially calf size considering both maternal and direct genetic effects. Such a model is not possible yet and further development would be necessary for use in large scale genetic evaluation. Even though the ideal model requires additional research, in many cases the use of a linear multivariate animal model for these traits is possible with a small loss in reliability of resulting breeding values.

In case of a linear model, an approximation to a normal distribution – using Snell scores – can be used as described in the general memo on heterogeneous variance correction. Snell score should be done per year and sex, especially when sexed semen is used more frequently.

In a threshold model differences in class frequencies are handled simultaneously in the model.

As a minimum first and later lactations must be treated as different traits since the correlation between them is less than 1. If needed, more lactations can be regarded as different traits if this increases accuracy of predicted breeding values. The models used must include both direct and maternal effects for all calving traits

Handling of inbreeding of both dam and calf should be done following the general description in ID, Pedigree and Inbreeding.

4. ENVIRONMENTAL EFFECTS TO CONSIDER

- Herd*year*season
- Sex of calf*period
- Parity*Period
- Age at first calving*Period
- Year*month of birth
- OPU*period /MOET*period
- Permanent environmental effect of dam (for 2nd and later calvings)

If countries are using multi-breed evaluation including beef breeds, heterosis effect and effect of different beef breeds should be handled as described in the general chapter regarding Mixed populations. With the increased usage of sexed semen, older cows are more frequently inseminated with beef semen and beef*dairy crosses are increasing. Ideally beef and dairy are evaluated in a joint system, but the national data structure should allow this. It should be evaluated if the combination of all information doesn't create bias in the dairy purebred evaluation. If this is the case, separate evaluations can be done as it's not desired to compare dairy with beef breeds, but across beef breeds.

5. TRAITS DELIVERED TO INTERBULL

Traits that should be delivered to Interbull to comply with the Golden Standard are:

- Direct stillbirth parity 1
- Maternal stillbirth parity 1
- Direct calving ease parity 1
- Maternal calving ease parity 1