Guidelines for the validation and use of claw health data

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Abstract

Several countries have recently started to record claw health status at claw trimming on a routine basis, and large amounts of information are now available for genetic evaluation and for herd management. In 2015, the ICAR Claw Health Atlas with description of 27 claw disorders was published in order to harmonize and standardize data recording from claw trimming and contribute to collection of comparable high quality data within and across countries. To further enhance international collaboration on improving claw health, guidelines and recommendations for validation and use of claw health data are valuable. The objective of this contribution is to present the work of the ICAR WGFT and international claw health experts on data validation and strategies to improve data quality and utilization of claw health data for herd management and monitoring. The data validation process depends on the purpose of use as well as the information sources e.g. herd management analysis requires a less strict editing process than benchmarks for monitoring claw health based on phenotypic information. The origin of the data (type of data, documentation, and recording system) has an impact on the frequency of disorders. Incidence rates based on veterinary diagnoses on claw disorders are normally much lower than key figures based on claw trimming data. Monitoring of data quality according to its origin and use is essential to debug appropriately the data flow without having to delete unnecessarily large amounts of useful information. Several editing criteria at different levels are discussed: at trimmer or veterinarian level, at farm level, at animal level and at record level. These include

simple plausibility checks like correct animal-ID, correct codes of diagnoses etc.. Validation at herd level checks whether data documentation and recording can be assumed reliable for a certain herd and time period. Measures to ensure and improve data quality are described as well. One simple measure is to provide fast feedback (e.g. herd management reports) to the farmer to foster the use of the data by technicians and farmers. By this, mistakes in data recording can be discovered and corrected. If valuable tools for improved herd management are available the motivation for recording these data will increase. A useful benchmarking report should be straightforward and concise, supported by clear and informative charts. Incidence and prevalence rates are key parameters that can be used to monitor claw health and for comparisons within farm over time and between farms. A major challenge in calculation of these key parameters is to correctly define the reference animals (i.e. control animals). Another important issue is the proper definition of a case, how to distinguish between already existing cases and new lesions. Guidelines and recommendations on data validation, benchmarks for monitoring of claw health and best practices for herd management reports will enhance quality and use of claw trimming data.

Key words: claw disorders, data validation, benchmarking.

Introduction

Claw disorders have become a big concern for dairy farmers around the world because of their high incidence, severity and repetitiveness. Lameness compromises seriously farm profitability and animal welfare. The recording of claw health data during regular claw trimming has been identified as a valuable source of information for herd claw health management. It also provides data for genetic evaluations aimed at controlling and reducing claw disorders. The ICAR Claw Health Atlas, which in order to standardize and harmonize terminology and data recording from claw trimming describes 27 claw disorders (Egger-Danner *et al.* 2015), was published in 2015 and has so far been translated to 17 languages. The aim of the ICAR claw health atlas was to contribute to collection of comparable high quality data within and across countries. Recently, claw health recording systems have been established in several countries (Canada, Denmark, Finland, France, Germany, Norway, Spain, Sweden, United Kingdom, The Netherlands, etc.) and large amounts of claw health data are now available. In a meeting in Vienna in May 2016, the ICAR Working Group for Functional Traits (ICAR WGFT) and claw health experts discussed data validation and benchmarking of claw health data, including measures and techniques used to ensure and improve data accuracy, and types of feedback generated based on claw data for herd management and claw health monitoring.

The aim of this contribution is to present the work of the ICAR WGFT and international claw health experts on data validation and claw data can be used to generate a quick and useful feedback for farmers, trimmers, veterinarians and technicians.

Data validation

The validation of data is based on a comparison between collected data and valid references. The challenge of validation is to choose appropriate criteria and adequate levels in order to extract the reliable information from raw data. There are two main steps in data validation process: data screening and data verification.

Data screening consists of a series of basic checks on integrity, format and completeness. For instance, checks can be made on ID plausibility for animals, herds and diagnosis codes, which are necessary to avoid suspect values. Other checks can be on the plausibility of dates, verifying dates of birth, calving and diagnosis in order to eliminate typing errors. Data screening is usually implemented as data filters, routines or algorithms applied when entering data (included as default in pc-tablet applications or when new data is uploaded to the central database) or manually when new data is added to an existing claw database.

Data verification consists of checking the correctness of data. It depends on the purpose of use as well as on the sources of information. For instance, herd management analysis requires as much data as possible. Therefore, this type of validation is usually less restrictive since it mainly checks the completeness of the data. If the data are used by the farmer, a basic data check is done on farm. However, when it comes to data for research and routine genetic evaluation, data validation needs to be more exhaustive to use only information that can be assumed reliable. Data must also be checked for representativeness when used to calculate benchmarks and to monitor claw health based on phenotypic information. In addition, the origin of data (type of data, documentation and recording systems) has an impact on the reference levels used to check data quality. Depending on the recording system, claw health data are recorded by trimmers, veterinarians and/or farmers. Indeed, a large proportion of data is usually provided by trimmers who register claw data during routine, preventive visits, while veterinarians register mainly the most severe cases. Thus, the majority of claw health data are recorded either by claw trimmers or herd owners and not veterinarians. Therefore, the data provided by trimmers or collected by farmers show a higher incidence rate than the data supplied by veterinarian. The diagnoses of veterinarians and claw trimmers, however, may be more accurate than those of farmers. The routine collection of information via claw trimmers may provide a much more reliable picture on prevalence of claw disorders in dairy cattle. Several editing criteria have been reported within each level of data:

Trimmer/veterinarian data validation

In general, data on claw disorders are collected by hoof trimmers or veterinarians during regular or emergency visits. A minimum number of records should be required per trimmer to ensure continuity and representativeness of the collected data (Perez-Cabal and Charfeddine, 2015). Besides, incidence rate for each disorder could be calculated and compared with the overall incidence rate of other trimmers (in the same area/country and time period) and checked whether it is within the range of e.g. two standard deviations (to assure uniformity in recording and to detect under- or over-reporting).

Herd level validation

Routines for claw trimming vary, but trimming is often done once or twice a year for each cow. Typically the farmer selects the cows to be trimmed, that is why a minimum number of records per herd per year and a minimum percentage of present cows trimmed per herd and year are required in order to avoid selection bias (e.g. Van der Spek *et al.*, 2013). Incidence rate for each disorder or at least for overall claw disorder could be compiled within each herd and year. Depending on the use of data, a minimum frequency could be required to avoid using data from herds that under-report, (mainly used for genetic analysis and benchmarking calculation). Additional checks at herd-trimming day are used to ensure that a minimum percentage of present cows are trimmed and that there are a minimum number of animals without disorder per visit

(e.g. van der Waaij *et al.*, 2005). Because herd sizes, data structure and management practices vary among countries the level of minimum incidence rate or number/ percentage trimmed cows that are required need to be defined accordingly to avoid a massive elimination of useful data.

Animal validation

Checks at animal level are focused on verifying unique identification, age at calving, sire of the cow and, parity status. Claw disorders are generally recorded for each claw. Moreover in some recording protocols they differentiate between inner and outer claw. In some countries, claw disorder trait is defined at claw level, while in others the trait is defined at animal level and the score assigned to each animal is the highest value in case that the cow shows the same disorder in different claws.

Record validation

A claw disorder record describes the status of the claw at given day. To validate a new record, we need to answer to the question whether this record defines a new episode with the same diagnosis or is a just a control of the same case. There is no simple answer. The time intervals used to define the following diagnosis as a new disorder event depend on the recovery period of each disorder, which depend on the kind of disorder and the severity degree of the lesion. In the bibliography different intervals have been reported, and they range from 7 to 28 days (Perez-Cabal and Charfeddine, 2015; Webber *et al.*, 2013, ICAR recording Guidelines (2016)). Furthermore, only records taken within an interval period after calving are considered. Different intervals have been reported and they range from 365 to 500 days after calving (Laursen *et al.* 2009; Buch *et al.* 2011; Chapinal *et al.* 2013). For genetic evaluation, a minimum number of records by herd trimming day are required.

Benchmarking analysis

The claw health data can be used for herd management, to improve the herd claw health status and to monitor population prevalence rate. Claw health reports for farmers can be used to monitor the evolution of each disorder within their herd. Benchmarking has been proved to be a useful tool to compare performance and illustrate the need for improvement (Bradley *et al.*, 2013). Besides, it also helps to prove the potential benefits that such improvement might offer, as well as means to motivate producers to adopt preventive practices and to foster the documentation of claw data. The success of any benchmarking process depends on the use of appropriate benchmarks. Incidence and prevalence rates are key parameters that can be used to make comparisons among and within herds over time (Dohoo *et al.*, 2009).

Incidence rate is defined as the number of new cases of a specific claw disorder in a specified time period divided by the sum of the time each animal was observed; meanwhile prevalence rate is defined as a proportion of individuals affected by a disorder at a particular time point or during a specified time period. So, prevalence includes new and pre-existing cases whereas incidence includes new cases only. Prevalence rate, being a fixed picture, is appropriate to show the magnitude of the spread of a disorder within a given population at a certain point of time. Incidence rate highlights the speed at which new cases of a disorder occur and is therefore more applicable to herd management reports. Although incidence rate deals with "new cases", it does not necessarily imply just the "first case" within an animal but whether it is the

"first case" within the given time period. Incidence rates can for example be calculated per period, such as year, season or lactation, by severity degree of the lesion, by parity, age, or stage of lactation.

One of the challenges of a benchmarking process for claw disorders is to define properly the reference animal. The concept of healthy animal used as reference level is not the same for all disorders. For genetic evaluation purposes, traits are often scored as present or not and each animal without a recorded disorder can be considered as a non-affected animal. However, for herd management purpose, an animal showing a certain disorder is not necessarily a lame cow, or a cow suffering from discomfort, or a cow in need of immediate treatment. Thus, the concept of healthy animal should be defined for each disorder and possibly also depending on its severity grade. There is another challenge related to the calculation of incidence rate: how can we define the denominator? By definition it should be equal to the number of cows at risk. However the concept "cows at risk" is tricky because not all cows are trimmed and the inventory of present and discarded cows is not very reliable in some countries, as we are hardly dealing with a closed herd.

Another key point of any benchmarking process is to compare with the appropriate benchmarking group and establish a target related to this group. This is why it is important to define a comparable herd reference level (e.g. by herd size, production level or geographic location).

Claw disorders are often recurrent in the same cow. Then, for herd management it is important to define the concept of chronic case and new cases.

A useful benchmarking report should be straightforward and concise, supported by clear and informative charts showing a still-photograph or a tendency of incidence or prevalence rate as pie chart, bar chart and/or radial chart.

Conclusions

An efficient and systematic validation process for claw health data is essential in order to ensure reliable data for herd management as well as genetic analysis. Claw health data are more likely to be accurate as technicians involved in data collection and farmers use them frequently and understand its value. Fast feedback is essential to foster its use and therefore to improve data quality. Benchmarking the claw health status of dairy herds offers a useful tool to compare herds and monitor improvement within herds over time.

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