

Implementation of differential somatic cell count as a new parameter for improved udder health monitoring through routine milk recording

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The aim of this study is to describe the experience and the status quo on implementing the new Differential Somatic Cell Count (DSCC) parameter as a new service to milk-testing clients of Qnetics through routine milk recording.

Abstract

Milk samples from all dairy herds enrolled to milk recording in the federal state Thuringia, Germany, were analysed on CombiFoss 7 DC. A total number of 416,198 test days was available for data analysis in our study. The udder health status of cows was categorised into four different groups depending on SCC and DSCC results: Udder Health Group A – healthy, SCC <200,000 cells/ml and DSCC ≤ 65%, B – onset of mastitis, SCC <200,000 cells/ml and DSCC >65%, C – (subclinical) mastitis, SCC >200,000 cells/ml and DSCC >65%, D – chronic mastitis, SCC >200,000 cells/ml and DSCC ≤ 65%. Linear mixed effect models were applied for statistical analysis of the data.

Briefly, the performance of cows in the different Udder Health Groups was investigated and cows in group A revealed the highest performance (e.g. milk weight, fat and protein). While the performance was lower in group B, it decreased significantly in group C. Cows in group D turned out to be evidently less productive compared to cows in groups A-C. The distribution of cows among the four different Udder Health Groups was investigated for the whole population as well as for each individual farm. Interestingly, the distribution varies hugely between farms, indicating and revealing different farm management practises.

In a next step, multiple dairy farms were selected and their farm management practises were further investigated. Beyond that a pilot phase, where the selected farms regularly receive a new udder health report based on SCC and DSCC results, was initiated. First feedback confirms new possibilities for udder health management and optimising herd health and performance based on the new udder health report. The learnings from the pilot phase confirm the added value of DSCC for udder health management and will be used to further roll out the new service.

Keywords: DSCC, udder health, milk recording.

Introduction

The company Qnetics offers various services to dairy farmers in the German federal state of Thuringia. Among other things, these include the organisation and execution of DHI testing for dairy cows, ewe, and dairy goats, milk payment analysis, and advisory services for herd management, dairy cow nutrition and milk quality challenges. Beyond that, breeding services such as raising of own bulls, sperm production and artificial insemination services are offered.

Dairy farming in Thuringia

A total number of 94,548 dairy cows was kept on 282 dairy farms in Thuringia in 2020. The vast majority (98.2%) of these farms are utilising dairy herd improvement services on a regular basis. The average annual production per cow was at 9,978 kg milk, 404 kg fat, and 345 kg protein in 2020. The average herd size is at 335 cows and approximately 60% of all cows are kept on 25% of all farms.

The average productive lifetime of cows is a key figure investigated every year and was at 2.3 lactation in 2020 and at comparable levels in previous years. Delving into when and why cows are culled revealed that nearly 50% of cows are culled in their first or second lactation and udder health challenges was the top 2 culling reason (13.8%) after reproduction. Given that this is critical from an economic and ethic perspective, CombiFoss 7 DC technology including the DSCC parameter was acquired. The key motivation was to be able to provide farmers with better DHI-based services for managing udder health, in particular earlier detection of udder health issues.

Udder health group concept

A data base consisting of 416,198 test days generated between August 2019 and January 2020 has been used for initial data analysis. More specifically, cows were categorised into four different udder health groups (UHG) depending on their actual SCC and DSCC test day result as follows:

- A – healthy: SCC \leq 200,000 cells/ml and DSCC \leq 65%,
- B – onset of mastitis: SCC \leq 200,000 cells/ml and DSCC $>$ 65%
- C – (subclinical) mastitis: SCC $>$ 200,000 cells/ml and DSCC $>$ 65%
- D – chronic mastitis: SCC $>$ 200,000 cells/ml and DSCC \leq 65%

The SCC cut-off of 200,000 cells/ml used is according to IDF recommendations (IDF, 2013). The DSCC cut-off of 65% has been identified as optimal cut-off in a study where the actual udder health status of cows as defined by bacteriological testing was available (Schwarz *et al.* 2020a).

Interestingly, the analysis of the data base revealed that the dairy cow performance of cows differed significantly between cows in the four different udder health groups. These differences, in turn, indirectly confirm the interpretation of the four groups. Cows in group A showed the highest performance, which was to be expected as they are healthy based on their low SCC and low DSCC test day results. Cows in group B showed a significantly lower performance than those in group A, which is explainable based on inflammatory processes (i.e. high DSCC values) consuming energy that is then not available for milk production anymore. This confirms that cows in group B might be in the early stage of mastitis. Presences of mastitis pathogens and inflammatory processes has been described in such cows before (Schwarz *et al.*, 2011a,b; Pilla *et al.*, 2012; Schwarz *et al.*, 2020a). Lower performance of cows with elevated SCC have been described before, but we could observe significant differences between cows in groups C and D. Those in group D performed significantly worse than cows in group

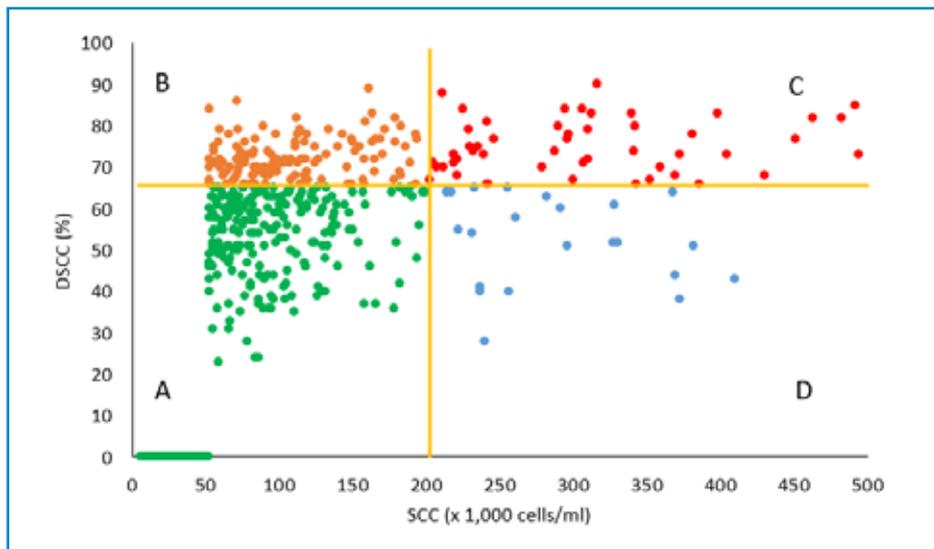


Figure 1. Dairy herd improvement results of one dairy farm (random example) to illustrate the four different udder health groups: A – healthy, B – onset of mastitis, C - (subclinical) mastitis, D – chronic mastitis.

C. Cows in group D are considered to experience chronic mastitis and it is well-known that such chronic infections lead to destruction of milk producing tissue explaining the low performance.

This study including more results from Austria, China, Estonia and Spain has been published elsewhere (Schwarz *et al.*, 2020b).

Based on our data base it became evident that the distribution of cows among the four different UHG varied hugely between farms. We selected farms with different proportions of cows in the four groups and visited them to better understand management practises and associations with the UHG concept. At the same time, we introduced the new DSCC parameter and a new SCC and DSCC-based udder health report to the farms and invited them to join a pilot project where they would get access to the new report for a period of 1 year.

A total number of 11 dairy farms with 150-900 lactating cows agreed to join. Observed changes in terms of proportions of cows in the UHG over time were discussed with the herd managers and clear associations with herd management practises were found. Particularly cubicle management and hygiene as well as milking procedures and hygiene were identified as key factors.

All of the participating dairy farms agreed at the end of the pilot phase that “the information provided through the new report and the arising possibilities aid in improving animal health and, at the same time, lead to better usage of resources and higher animal performance.” Versatile application of the new udder health report was observed as can be seen based on the following quote of herd manager: “..we already introduced

Pilot project to build up practical experience

Experiences from pilot phase and next steps

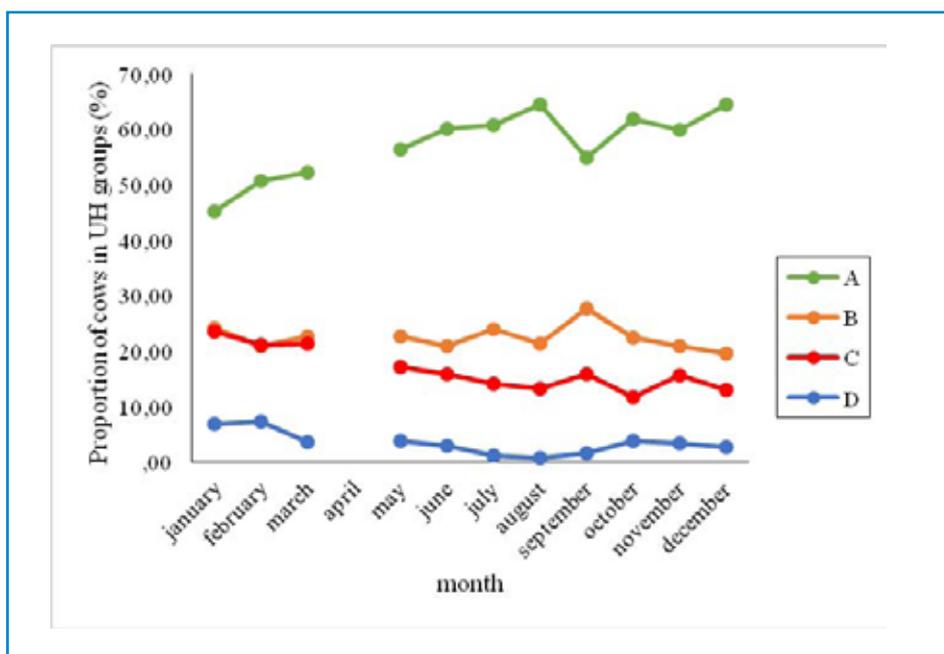


Figure 2. Development of proportions of cows in each of the four udder health groups (A, B, C, D) over the 12 months pilot phase in a herd with 850 lactating cows.

improvements to have cleaner and drier cubicles end of 2019 and could see the positive effects based on the new report in detail, praise our staff and motivate them for keeping up the extra effort. All this resulted in less antibiotic treatments, less wasted milk, better animal health and performance.” Herd manager. The positive developments in terms of udder health on this farm are illustrated in Figure 2. Another herd manager reported: “..we use the report two fold: on herd level and on individual cow level. The report helped us to optimise the management of our cubicles and maintain a high level of hygiene and comfort. Daily production per cow and the amount of milk delivered increased. We further use the report to better monitor individual cows, mostly those in UHG B and D. Fresh and late-lactating cows are of particular interest. Cows with stable udder health falling in UHG A before dry-off are dried off without antibiotics.” The manager of a 170 cow herd emphasized: “Particularly cows in group B are of interest for us because here mastitis can be spotted at a very early stage.”

In a next step, a newly developed online tool (vit verden) for presenting the udder health report based on SCC and DSCC information is being trialled. Subsequently, the tool will be rolled out to all farms participating in DHI programmes.

Conclusions

Mastitis is still a huge challenge on dairy farms and is one of the key reasons for premature culling of dairy cows. Our pilot project on working with a new SCC and DSCC based udder health report revealed that it helps dairy farmers to better manage udder health in their herds. Improvements in terms of dairy cow health, welfare, and performance and less antibiotic treatments were already seen during the pilot project. In the long run, improvements regarding cow longevity and milk quality in general can also be expected.

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