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Development of an objective and uniform scoring method to evaluate the quality of rearing in Dutch dairy herds

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ABSTRACT

Young stock rearing is an essential part of dairy management, and it is important that the quality of rearing can be monitored and altered if necessary. In this study, a young stock rearing quality system (KalfOK) was developed with the aim to provide an objective and standardized means to evaluate and monitor the quality of young stock rearing in Dutch dairy herds. In the project, 201 dairy farmers participated. Twelve key indicators were defined that were related to calving and successful rearing, antimicrobial use, and herd health. For each of the key indicators, the value was calculated per herd and quarter of the year between January 2014 and April 2017. Benchmark values were determined to compare herd-specific results and for selection of threshold values. Each of the key indicators was graded when the value scored above the threshold. Combining the grades resulted in the herd specific KalfOK score, which could vary between 0 and 100. Subsequently, 100 of the participating dairy herds were visited and the quality of young stock rearing was scored by a trained veterinarian. Using principal component analysis, the results of the herd health checks were combined into a factor score that represented the observed quality of young stock rearing during the visit. The amount of variance in observed quality of rearing during the herd health check that was explained by the key indicators in KalfOK was evaluated. Additionally, the validity of KalfOK to distinguish herds with an excellent or insufficient quality of young stock rearing was assessed by comparing the top and bottom 10% herds in the herd health check with the proportion of herds with a KalfOK score above or below a prespecified cutoff value. The results of the linear regression model showed that

the key indicators included in KalfOK accounted for 56% of the variation in the score of the herd visits by a veterinarian. The moving average of the annual KalfOK score, which was the sum of the grades of all key indicators, was 77 points (25th percentile = 71, 75th percentile = 85 points). The combination of the sensitivity (88%, 95% confidence interval = 47–100%) and specificity (67%, 95% confidence interval = 54–78%) of KalfOK to correctly classify herds with an excellent quality of young stock rearing was highest when a cutoff value of 80 points was applied. Detection of dairy herds with an insufficient quality of young stock rearing was best at a cutoff value of 70 points (sensitivity 86%, 95% confidence interval = 42–100%; specificity 77%, 95% confidence interval = 66–86%). The KalfOK score that was based on routinely collected herd data provided an indication of the quality of young stock rearing in individual Dutch dairy farms. The KalfOK score illustrates how such data can be transferred into herd-specific information in support of animal health and welfare. Given the increasing availability of automatically assembled data, the development of similar monitoring tools seems a feasible option to enhance herd-specific management.

Key words: dairy calves, young stock, rearing management

INTRODUCTION

Young stock rearing is an essential part of dairy management given that calves are raised as replacement for milking cows. A faster growth rate during the first 6 mo of life results in a younger age at first calving and a higher productivity as milking cow (Ettema and Santos, 2004; Hultgren and Svensson, 2009). An important indicator of the quality of rearing is the calf mortality rate (Ortiz-Pelaez et al., 2008; Kelly et al., 2013). A higher mortality rate in young calves is known to be associated with poorer young stock rearing practices and results in a deterioration of animal welfare (Sandgren et al., 2009; de Vries et al., 2011). Previous studies showed

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that purchase of cattle, a larger herd size, disease status at the herd level, and not using separate housing for sick calves were associated with a higher calf mortality and a subsequently lower health and welfare during the rearing period (Santman-Berends et al., 2014; Seppä-Lassila, et al., 2016). One of the general recommendations of those studies was that tailored management advice at individual herd level was needed to improve the quality of rearing (Santman-Berends et al., 2014; Seppä-Lassila, et al., 2016; Van Eetvelde and Opsomer, 2017). Santman-Berends et al. (2014) also concluded that a lack of knowledge about calf health indicators exists among farmers. Farmers were frequently unaware of performance indicators such as calf mortality in their own herd and whether it was high or low compared with other herds. Therefore, a need exists for supporting tools for dairy farmers to stimulate improvement of the quality of young stock rearing. These tools should inform farmers and their veterinarians about the performance of their calves compared with a benchmark of colleagues. Insight in detailed aspects of young stock rearing should provide guidance where to adapt the rearing management to improve calf and young stock health.

The aim of our study was to develop a young stock rearing quality system (**KalfOK**) that provides insight in the performance of key indicators with regard to the quality of young stock rearing in the individual herd. Prerequisites were that the key indicators could be calculated based on routinely collected data, that the selected key indicators were associated with calf and young stock health and rearing, that the system was easy to use and understandable for farmers, and that it would result in a tool that was informative and would reveal both the strengths and weaknesses in the herd-specific young stock rearing management.

MATERIALS AND METHODS

In this study, young stock rearing was defined as the period between birth and moment of first calving and was stratified into 4 different time periods. (1) The perinatal period included calves from the moment of birth until ear-tagging. In the Netherlands, farmers are allowed to ear-tag their calves at an age of at most 3 d old. In general, calves are about 24 h old at moment of ear-tagging. (2) The postnatal period of young calves began the moment of ear-tagging up to 14 d of age. In the Netherlands, it is prohibited to move calves off-farm for live trade before 14 d of age. (3) The second postnatal period of calves was from 15 d of age until 56 d of age (moment of weaning). (4). The final period in which older calves were followed was from 56 d up to young stock of 2 yr of age.

Study Population

In August 2016, 1,200 randomly selected dairy farmers were contacted with the request to participate. Criteria for participation were (1) that the farmer allowed the researchers to use routinely collected data from the herd for the development of the tool and (2) that they agreed with a possible herd visit by a veterinarian, during which the quality of young stock rearing was scored for validation purposes of KalfOK. Participants were asked for feedback during the study and an incentive for participation was that they would receive their herd-specific KalfOK report once the tool was finished. The herds of the first 201 responders were included in the study, from which 31 outsourced their calf young stock rearing. These 201 dairy herds comprised 1.2% of the total Dutch dairy population. It was expected that a group of more than 200 herds would have sufficient variation in quality of young stock rearing to enable development of a valuable evaluation tool. From these young stock raisers, additional agreement for participation was obtained and a combination of a dairy herd and its young stock rearing herd were considered 1 epidemiological unit.

Available Data

From each of the participating herds, routinely collected data were available from 5 different data sources from January 1, 2014, until March 31, 2017. Registrations on animal movements were available from the identification and registration system (I&R, RVO Assen, the Netherlands), in which each animal and its movements between Dutch cattle herds are registered. Mortality records were available for perinatal calves, postnatal calves (up to 1 yr of age), and older cattle from the rendering plant (Rendac, Son, the Netherlands). The herd health status for infectious bovine rhinotracheitis (**IBR**), bovine viral diarrhoea (**BVD**), *Salmonella*, neosporosis, paratuberculosis, and mineral status of the bulk milk were available from GD Animal Health (Deventer, the Netherlands) and medicine use was obtained from the MediRund data system (Zuiv-eiNL, The Hague, the Netherlands).

Dutch veterinarians are obliged to register all supplies of antimicrobials in the MediRund system. Nevertheless, most veterinarians automatically register all other medicines and vaccinations that they supply to farmers as well. As part of this project, all participants were requested to deliver an overview describing the medicines that they had applied in their preweaning calves between July 1, 2015, and June 30, 2016. In addition, the veterinary registrations in MediRund were available during the same period to evaluate whether

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