



On-farm mortality and related risk factors in Estonian dairy cows

Kaari Reimus^{a,*}, Toomas Orro^a, Ulf Emanuelson^b, Arvo Viltrop^a, Kerli Mõtus^a

^a Institute of Veterinary Medicine and Animal Sciences, Estonian University of Life Science, Kreutzwaldi 62, Tartu, 51014, Estonia

^b Department of Clinical Sciences, Swedish University of Agricultural Sciences, P.O. Box 7070, SE-750 07, Uppsala, Sweden

ARTICLE INFO

Keywords:

Dairy cattle
Mortality
Unassisted death
Euthanasia
Survival analysis

ABSTRACT

Mortality (unassisted death and euthanasia) reflects the health and welfare state of the cows and is associated with undesirable financial consequences for the farmer. The objective of this retrospective observational study was to identify risk factors associated with on-farm mortality in dairy cows. Data for a study period between January 1, 2013 and December 31, 2015 were retrieved from the Estonian Agricultural Registers and Information Board and Estonian Livestock Performance Recording, Ltd. Cows from milk-recording herds with ≥ 20 cow-years were included. Analyses included data of 86,459 primiparous cows from 409 herds and 109,314 multiparous cows from 410 herds. Cows were followed from the day of calving until exit from the herd due to on-farm death or euthanasia (defined as mortality), slaughter, or selling. Associations between risk factors and mortality were assessed using Weibull proportional hazard models.

The mortality rate (MR) was lower in primiparous cows (MR = 5.09 per 100 animal-years, 95% confidence interval [CI] 4.93; 5.26) compared to multiparous cows (MR = 8.28 per 100 animal-years, 95% CI 8.13; 8.44). The early lactation period was associated with greater mortality hazard.

Animal-level factors significantly associated with higher mortality hazard in primiparous and multiparous cows were Holstein breed, older age at first calving, having an assisted calving or stillborn calf. In multiparous cows, male sex of the calf, birth of twins/triplets, older parity, longer previous inter-calving interval and milk somatic cell count over 200,000 cells/ml at the last test-milking of the previous lactation were associated with greater mortality hazard. Lower milk yield, somatic cell count over 200,000 cells/ml and fat/protein ratio over 1.5 at first test-milking were associated with greater mortality hazard during the lactation.

Cow mortality risk was greater in larger herds, in herds with lower cow conception rate and poorer longevity of cows. Also, lower herd average milk fat/protein ratio and decreasing herd size (for multiparous cows) as well as Northeast region were herd level risk factors.

This study outlines the importance of herd management and good health of the cows at dry-off and during early lactation and ensuring easy calving to reduce mortality of cows.

1. Introduction

On-farm mortality (unassisted death and euthanasia) is a premature loss of an animal and an undesirable event affecting the economic efficiency of the farm. Mortality should be discriminated from ‘culling’ which is defined as removal of a live cow from the farm for immediate slaughter (Compton et al., 2017). High on-farm mortality indicates compromised animal health and welfare status (Raboisson et al., 2011). Increasing dairy cattle mortality has been reported in many countries (Raboisson et al., 2011; Alvåsen et al., 2014; Compton et al., 2017) simultaneously with intensification of dairy production.

Previous studies have identified several herd- and animal-level risk factors associated with on-farm dairy cow mortality. Larger herd size,

Holstein breed herds, no summer grazing, increased proportion of purchased cows, lower herd milk yield and longer herd average calving interval in addition to regional differences were herd-level factors associated with greater on-farm mortality in dairy cows (Raboisson et al., 2011; Alvåsen et al., 2012). Animal-level risk factors associated with on-farm mortality were higher milk somatic cell count, Holstein breed, longer calving interval, dystocia, older age at first calving, and older parity according to previous studies (Alvåsen et al., 2014; Pannwitz, 2015). The first published research about dairy cattle mortality in Estonia confirmed the mortality rate to be roughly comparable to that found in other countries (Reimus et al., 2017). According to the Estonian national cattle registry data, Holstein breed, age over 36 months, Northeast region and herd size over 400 animal-years were associated

* Corresponding author.

E-mail addresses: kaari.reimus@emu.ee (K. Reimus), Toomas.Orro@emu.ee (T. Orro), Ulf.Emanuelson@slu.se (U. Emanuelson), Arvo.Viltrop@emu.ee (A. Viltrop), Kerli.Motus@emu.ee (K. Mõtus).

<https://doi.org/10.1016/j.prevetmed.2018.04.006>

Received 16 November 2017; Received in revised form 9 April 2018; Accepted 9 April 2018
0167-5877/ © 2018 Elsevier B.V. All rights reserved.

with greater mortality hazard in adult dairy cattle (Reimus et al., 2017). Risk factors confirmed in that study stratify the population into cohorts based on mortality risk differences, but in order to provide recommendations to lower mortality of dairy cows, more detailed research is needed. Approximately 95% of Estonian dairy cows are allocated into animal recording system collecting animal and herd-level information that could be easily used to find associations between several recorded factors and cow mortality risk.

The Estonian dairy cattle population is an example of an intensive, modern, and high-yielding dairy production. Estonian dairy cattle farms are relatively large in size. According to the data of Estonian Livestock Performance Recording Ltd., almost 72% of dairy cows were kept in herds with more than 100 cows in 2016 (Estonian Agricultural Registers and Information Board, 2016). The national average milk yield per cow per year has been over 8000 kg during the last five years, reaching over 9000 kg in 2016 (Estonian Animal Recording Yearbook 2016). Revealing risk factors for mortality in dairy cows in these ‘future’ herds would provide valuable information that could be used to prevent morbidity and mortality and improve cow welfare.

The aim of this study was to identify animal- and herd-level factors recorded in the milk recording register associated with on-farm mortality (unassisted death and euthanasia) in Estonian dairy cows.

2. Materials and methods

2.1. Study population

Data about all dairy cattle participating in the voluntary milk recording system with herd size of ≥ 20 cow-years during the study period from January 1, 2013 to December 31, 2015 was retrieved from the Estonian Livestock Performance Recording, Ltd. (called “milk recording register” hereinafter). Data from the Estonian Agricultural Registers and Information Board (government agency responsible for animal data collection in Estonia, referred as “animal register” hereinafter) was collected to retrieve information about the mortality events in these animals. In the milk recording register, an animal can have multiple exit events (e.g., heifers moving to production herd, selling to another herd in addition to death or slaughter). An exit event in the animal registry could be either of the following: death on farm, euthanasia, selling/export, slaughter, diagnostic slaughter, slaughter/killing to prevent disease spread and animal lost. In order to attribute a mortality event provided by the animal registry with each exit event reported in the milk recording register, these two datasets were joined based on the animals’ individual number and exit dates. Farmers are obligated by the law to report the births, movements, and exit of animals to the animal register within seven days (Riigi Teataja, 1999). In the milk recording register, the requirements for the notifications are not strictly specified, usually this information is forwarded by the farmers once a month after the monthly milk-testing. Due to the differences in reporting requirements between these two registers, a difference up to seven days in dates of the two datasets was allowed when uniting a failure event of the animal register with the exit event of the milk recording register.

2.2. Datasets

Separate datasets were composed for primiparous and multiparous cows. The cow’s lactation was the unit in the analysis and the follow-up period started from calving and lasted until the next parturition, failure or right censoring. In total, the datasets included all lactations of all cows participating in milk recording registers between years 2013 and 2015 meeting the criteria of herd size. For every cow its birth date, data about the birth farm and the farm the animal was located in, calving and exit dates, breed, conception method, parity, sex of the calf, presence of assisted calving, stillbirth or abortion, production data of the last test-milking of the previous lactation and first test-milking of

the ongoing lactation (date of test-milking, milk yield, milk fat, protein and urea content, fat/protein ratio, somatic cell count and milking method), age at first calving, number of inseminations per conception, length of the previous inter-calving interval, calving to conception interval at previous lactation, and length of the last dry period were obtained. Also, summarized herd-level data were requested separately for the three study years: number of cows, number of primiparous cows, number of stillbirths and abortions, herd averages for milk yield per cow per year, milk fat and protein content, milk somatic cell count and urea levels, age at first calving, averages of the length of calving interval, length of dry period, interval from calving to insemination, calving to conception interval, number of inseminations per conception, first insemination conception rate, number of lactations, age at first insemination in heifers, and also location of the herd.

2.3. Data editing

The datasets contained 19 and 26 duplicated observations for primiparous and multiparous cows, respectively. Comparing the birth-dates of cows between the datasets of animal registry and milk recording registry we identified 90 and 225 mismatches for primiparous and multiparous cows, respectively. The duplicate data rows and observations with mismatching birthdates were excluded. Some animals had a relatively young or old age at first calving. Age at first calving under 15 months and over 60 months were considered as biologically not feasible and therefore interpreted as recording errors and set to missing. This resulted in missing values for 25 observations in primiparous and 19 observations in multiparous cattle datasets. The final dataset used for statistical analyses included 86,459 primiparous cows from 409 herds and 177,712 lactations of 109,314 multiparous cows from 410 herds.

The variable “Calf” included categories female calf, male calf, twin or triplet, and the “missing” category including stillbirths and abortions. Two breed categories were created: Estonian Holstein vs. Estonian Red and Estonian Native breed. The two latter breeds were compiled into one category due to a low number of Estonian Native breed cows in the datasets. Counties were compiled into four regions: Northeast, Southeast, Southwest, and Northwest region. Variable “Season at calving” included four categories: winter (December–February), spring (March–May), summer (June–August) and autumn (September–November). The variable “Change of herd size” was created by determining categories based on the change of number of cow-years from 2013 to 2015. The categories were herds with no considerable change in the number of cow-years ($+/- 5\%$), moderate decrease (-5 to -15%), heavy decrease (over -15%), moderate increase (5% – 15%) and heavy increase (over 15%).

Continuous variables associated with first test-milking were categorized if a biological threshold for discriminating normal from pathological condition was present. The following cow level variables were thus dichotomized: “Milk somatic cell count” in the level of 200,000 cells/ml (Bradley and Green, 2005), “Milk fat/protein ratio” in 1.5 (Heuer et al., 1999) and “Milk urea content” in 19 mg/dl (Butler et al., 1996). Variable “Milk yield” was used as a continuous variable. For the herd-level production and reproduction data, three-year averages were calculated.

2.4. Statistical analyses

Statistical analyses identifying risk factors for mortality were conducted on the lactation level and the observation period lasted from one calving to another parturition. As the data was requested for all lactations reported to the milk recording register between January 1, 2013 and December 31, 2015, some lactations started before the start of the observation period. Left truncation of the data was taken into account in the analysis by specifying the beginning of the observation period (Cain et al., 2011). For this the ‘start’ date was specified as January 1,

Download English Version:

<https://daneshyari.com/en/article/8503418>

Download Persian Version:

<https://daneshyari.com/article/8503418>

[Daneshyari.com](https://daneshyari.com)