

ANALYSIS OF ANNUAL HEALTH RECORDS IN ONE DAIRY FARM

Dimitar Nakov¹, Metodija Trajchev¹, Daniela Belichovska², Emilija Krsteva¹

¹Faculty of Agricultural Sciences and Food - Skopje, University Ss. "Cyril and Methodius" in Skopje, Republic of Macedonia

²MIT University, Skopje, Faculty of Ecological Resources Management, Republic of Macedonia

Corresponding author: nakovd@fznh.ukim.edu.mk

Abstract

Modern technologies of dairy cows breeding is followed by a number of health problems. Perhaps no one single factor has the ability to affect the performance of animal populations as severely as diseases. The objective of this study was to obtain information about dairy cow's health challenges for intensive dairy farm and about the guidelines which should be improved. A one year retrospective study was performed for prevalence determination of the most common health disorders in one dairy farm. The survey included a total of 203 black-white dairy cows in lactation. Cows with health disorders were detected by clinical observation. The data for each cow were obtained from the reproductive board. The annual prevalence of health disorders was 50.25%. The most prevalent health disorder in dairy herd was mastitis (84.31%), than following arthritis (5.88), laminitis (2.94%), abscess (2.94%), indigestion (1.96%), pneumonia (0.98%) and diarrhea (0.98%). The highest prevalence was registered in winter season (88.89%) and the lowest in summer season of the year (38.16%). The older cows had the highest risk to suffer from such health disorder. During the survey, only cows that suffer from mastitis manifested repeated cases of disease during lactation. Regardless parities, the first case of health disorder in dairy herd occurred on the average 96.64 ± 8.532 days in lactation. The average period needed for treatment of diseased cows was 3.69 ± 0.121 days. The method of GLM, univariate procedure, was used to analyze risk factors which are responsible for occurring of health disorders in dairy farm. Among the risk factors that were found to affect the health of dairy cows, season of year had have significant influence at level $p < 0.001$, while total milk yield estimated for 305 days in lactation influenced at level $p < 0.01$.

Keywords: dairy cows, health disorders, risk factors.

Introduction

The mean output of milk per cow has risen steadily as a result of improved nutrition, breeding and management (LeBlanc et al., 2006). Economic margins of dairy herds are, however, narrow. Optimization of the economic results, therefore, becomes important, and the need for cost minimization at every level of production is accentuated. A means of reducing the costs of production is to decrease the incidence of production disorders, as such are associated with reduced production, veterinary costs, and increased replacement rate, and, consequently, give rise to economically less efficient herds. Dairy farmers are confronted every day with challenges regarding animal health and welfare (Kielland et al., 2010). Whereas some farmers focus mainly on high milk production, others concentrate on animal health, milk quality, or other issues (Bergevoet et al., 2004; Kristensen and Enevoldsen, 2008). There is an intuitive assumption that increasing milk yields may increase the risk of failures of cow health (Berry et al., 2003). Perhaps no one single factor has the ability to affect the performance of cattle populations as severely as infectious and production diseases. Petrujkić et al. (2009) list diseases related to the production and reproduction cycle of the cow: parturient paresis, retained fetal membranes and metritis, mastitis, indigestion, abomasal displacement during the periparturient period, ketosis and pneumonia. Other diseases which are largely pathogenic in origin can occur at any time during the production cycle. Bernabucci et al. (2002) describes how the high yielding dairy cow can be placed under severe metabolic stress in early lactation reducing her resistance to other metabolic and infective diseases. Among others,

mastitis and laminitis are of considerable interest because of its high incidence and the extensive costs associated with these diseases (Sulayeman and Fromsa, 2012; Nakov et al., 2014). Animal identity, production, and disease recordings are all essential parts of good dairy farm management and good prevention of disease and quality assurance systems. Traditionally, veterinary science relies on disease diagnosis based on a mix of physical signs such as temperature, heart and respiration rate mixed with clinical observations and occasionally laboratory methods for confirmation of pathological processes and biochemical status. In effect, the herds person and veterinarian have an experience model in order to augmenting the herds person's skill at detecting deviations from normal animal condition rather than replacing the veterinary skill of diagnosis. Deviation from the normal is largely detected by the observations of the herds person which usually correlated with changes in milk yield. A veterinarian may then be called to make a diagnosis based on his or her training and experience. Databases with animal-disease information are valuable resources in epidemiological research as well as for evaluation of genetic progress. The national animal disease-recording systems aims to monitor the incidence of disease in animal populations, provide data on national and herd disease status, include disease data in breeding goals and provide data for research. It is based on veterinary reporting and all species of animals are included, although the emphasis is on production animals. Several countries have recordings of production organized within an animal recording system (International Committee for Animal Recording, 2007). In some countries, systematic epidemiological surveys of disease incidences in dairy production have been organized, such as the National Animal Health Monitoring System in the United States (Kaneene and Hurd, 1990) and others in Canada (Sargeant et al., 1998; van Dorp et al., 1999). However, only a few countries have reported disease recordings from the majority of the dairy cattle population within the framework of an animal recording system, as are Nordic countries (Bartlett et al., 2001). Therefore, in order to show the importance of health records in the farm management, the main aim of the performed survey was to determinate the most prevalent clinical health disorders in one dairy farm registered by a veterinarian working on the farm and data imported in the reproductive board.

Material and methods

A one year retrospective study was performed for prevalence determination of the most common health disorders in one dairy farm for intensive breeding. Management practice in the dairy farm is production in loose-housing system with enclosed shed. Milking of cows is performed in milking parlour. Pre-milking and post-milking hygiene measurements were practiced in permanency. The data for each cow was obtained from the reproductive board. The survey included a total of 203 black-white dairy cows in lactation. The research was divided in four seasons during the year. Cows with health disorders were detected by clinical examination. The objectives of observation were health disorders related to reproduction, lactation, metabolism, locomotion disorders and disorders of digestion and respiration. The risk factors for occurrence of health disorders followed were: cow parity, days in lactation, individual lactation curve based on the monthly test day milk yield, days in lactation when the case of health disorders was diagnosed and days of treatment. Statistical procedures were conducted in SPSS 20.0 for Windows. Pearson's coefficient of correlation was used for calculation of interdependence between variables in the model. Data analysis was carried out with GLM-General Linear Model. Dependent variable in this analysis was binary value of health records which made difference between cows with case of some clinical disorder during lactation and healthy cows. Statistical significance was evaluated on level $p < 0.05$; $p < 0.01$ и $p < 0.001$. Analysis of variance in the model, used for determination of influence on independent variables on prevalence of health disorders, was made according equation:

$$Y_{ijk} = \mu + L_i + Y_{S_j} + DIM_k + M_{305_i} + e_{ijkl}$$

Where, Y_{ijk} = calculated overall prevalence of health disorders; μ = average; L_i = consecutive lactation or cow parity ($i = 1, 2, 3, 4$); Y_{S_j} = year season when the case of health disorder was diagnosed ($j = 1,$

2, 3, 4); DIM_k = covariance of days in lactation when case of clinical health disorders was diagnosed; M_{305} = covariance of test day milk yield per cow for 305 days in lactation; e_{ijkl} = error of the model.

Results and discussion

Table 1 showed data for annual prevalence of health disorders related to the seasons of the year. According the results, the highest prevalence of health disorders in dairy herd was recorded in the winter season (88.89%), while the lowest prevalence in summer (38.16%). The annual prevalence of clinical health disorders was 50.25%.

Table 1. Annual prevalence of health disorders by season of year

Season Year	n	Healthy cows	Cows suffer from health disorder	Prevalence (%)
Spring	35	18	17	48.57
Summer	76	47	29	38.16
Autumn	65	33	32	49.23
Winter	27	3	24	88.89
Year	203	101	102	50.25

When the cow parity was taken in consideration (Table 2), than the prevalence of health disorders was increased with increasing the cow parity, or consecutive lactation, beginning from cows in first lactation (46.55%) up to cows in the forth and higher lactation (57.14%).

Table 2. Annual prevalence of health disorders related to cow parity

Parity	n	Healthy cows	Cows suffer from health disorder	Prevalence (%)
1	58	31	27	46,55
2	76	37	39	51,32
3	34	18	16	47,06
4 \geq	35	15	20	57,14
Total	203	101	102	50,25

However, independently from the lactation, the prevalence rate of clinical disorders in dairy farm was high (50.25%). From analysis of showed results in Table 3, there might been noticed that mostly of the cows were suffered from clinical mastitis and the prevalence was 84.31%. Rarely, the cows suffer from laminitis, pneumonia, indigestion, diarrhoea, abscess and arthritis.

Table 3. Annual prevalence of health disorders in entire population

	n	%		n	%
Total observed cows	203	100,00			
Cows suffer from health disorder	102	50,25	Mastitis	86	84,31
			laminitis	3	2,94
			Pneumonia	1	0,98
			Indigestion	2	1,96
			Diarrhea	1	0,98
			Abscess	3	2,94
			Arthritis	6	5,88

In Table 4 is shown the number of cases of clinical disorders during lactation and occurrence of recurrent cases during the same lactation. Only the cows that suffered from the case of clinical mastitis during the lactation had a risk for manifestation of recurrent consecutive mastitis. The first parity cows had a longest period in lactation free form clinical disorders (114.37 \pm 16.359 days) but period in lactation free form health disorders decrease as cow parity increase. The average duration of treatment of illness cows was 3.69 \pm 0.121 days.

Table 4. Repeatability of health disorder cases per lactation

	1 case		2 cases		Total	
	n	%	n	%	n	%
Mastitis	78	90,70	8	9,30	86	100,00
laminitis	3	100,00	0	0,00	3	100,00
Pneumonia	1	100,00	0	0,00	1	100,00
Indigestion	2	100,00	0	0,00	2	100,00
Diarrhea	1	100,00	0	0,00	1	100,00
Apses	3	100,00	0	0,00	3	100,00
Arthritis	6	100,00	0	0,00	6	100,00
Overall cases	94	92,16	8	7,84	102	100,00

Table 5. Average days in lactation when case of clinical health disorders was diagnosed and average days of treatment of illness cows

Parity	H	DD*	DT**
		$\bar{x} \pm S_{\bar{x}}$	$\bar{x} \pm S_{\bar{x}}$
1	27	114.37±16.359	3.96±0.264
2	39	98.15±14.243	3.49±0.183
3	16	67.50±16.063	3.63±0.239
4≥	20	96.55±21.613	3.75±0.298
Total	102	96.64±8.532	3.69±0.121

*Days from beginning of lactation until the diagnosis of clinical health disorder

**Days in treatment of illness cows

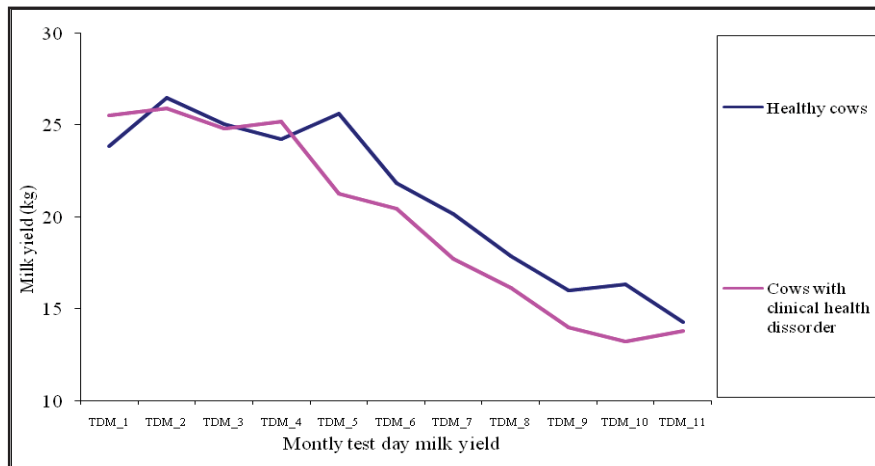


Figure 1. Lactation curves for healthy cows and cows with health disorder based on monthly test day milk yield control

The lactation curves indicate that healthy cows yielded more milk than did cows with some clinical health disorder. The milk yield of diseased cows dropped more sharply in the fifth milk control. However, in both groups of healthy and clinically diseased cow's milk yield began to decline in the sixth milk control and continued to decline in the next milk control up to the finish of the lactation.

Table 6. Average milk yield for 305 days in lactation and duration of lactation in healthy cows and cows suffer from health disorders

		Healthy cows	Cows with health disorder	Total
		n=101	n=102	n=203
M_305*	$\bar{x} \pm S_{\bar{x}}$	6401.67±159.366	5472.71±152.317	5934.90±114.683
DIM**	$\bar{x} \pm S_{\bar{x}}$	308.4±6.048	271.47±9.094	289.84±5.61

*Milk yield for 305 days in lactation based on monthly test day milk yield control

**Days in milking

There was statistical significant difference in the milk yield for 305 days in lactation between healthy cows and cows suffer from some clinical health disorders ($df=1$; $F=17.765$; $p<0.001$). Healthy cows had have a longer lactation than cows with health disorder ($df=1$; $F=11.386$; $p<0.01$). Estimation of interdependence between variables in the statistical model was performed with Pearson's coefficient of correlation, showed in Table 7.

Table 7. Pearson's coefficient of correlation for health risk factors

	Y_S	DD	DIM	M_305
L	0,061	0,056	0,086	0,058
Y_S		0,222**	0,182**	0,023
DD			0,232**	0,285**
DIM				0,557**

**significant at level $p<0.01$

In Table 8 is shown the statistical analysis of the factors considered in the model used for determination of influence on independent variables on prevalence of clinical health disorders.

Table 8. The influence of risk factors on health disorders prevalence

Dependent variable: prevalence of health disorders			
Source of variations	df	Mean square	F-value
Model	9	6,817	32,540***
L	3	0,150	0,715 ^{NS}
Y_S	3	1,775	8,471***
DIM	1	0,214	1,024 ^{NS}
M_305	1	1,832	8,742**
e	194	0,210	
Total	203		
$R^2 = 0.583$			

***significant at level $p<0.001$

**significant at level $p<0.01$

^{NS} non significant

There was statistical significant influence ($p<0.001$) of year seasons on prevalence of health disorders in dairy cows. The milk yield for 305 days in lactation showed statistical significant influence on health disorders prevalence. The cow parity and days in lactation didn't show statistical significant influence on health disorders prevalence in dairy herd. Value for $R^2 = 0.583$ in the model was high, which means that variance for prevalence of clinically health disorders in dairy cows can be explained by the source of variations. The health management of dairy herds is critically important part from the overall farm management as has direct influence on dairy cow's productivity and reproduction. Additionally, effective health management increases the cow's welfare (Kielland et al., 2010). Regarding the Sulayeman and Fromsa (2012), mastitis and laminitis have a major impact on economical losses in dairy farms. Costs due to clinical mastitis and laminitis arise from treatment, reduced milk production, increased risk of culling and increased risk of subsequent diseases (Petrovski et al., 2006). Mastitis commonly occurs in cows with high milk production and has a long lasting effect on milk yield. The disease has a big influence on productivity and utilization of genetic potential of dairy cows. The biggest milk yield losses were observed when clinical mastitis was occurred in early lactation (Hagnestam et al., 2007). The cows that were suffered from clinical mastitis never ever were reached current milk yield during the rest of the lactation. National data from countries which are the biggest milk producers, informed that annually 20 to 40% of dairy cows have expressed clinical mastitis during lactation (Bartlett et al. 2001). According the data from the research performed in Macedonia (Trajchev et al., 2013), the annual prevalence of clinical mastitis in dairy farms was 34.13% on cow level and 30.07% on lactation level. The increase in clinical mastitis

incidence is probably due to increased awareness on the part of farmers of the need to keep the bulk milk SCC at a low level to satisfy the requirements of the quality payment system. The incidence of hock lesions and arthritis in dairy herds is indicator for cow welfare and rearing discomfort (Rutherford et al., 2008). Aseptic pododermatitis is one of the most common health problem in almost all dairy farms during the year which primarily occurs due to introduction of large amounts of easily digestible carbohydrate feeds (rumen acidosis). Pododermatitis development can be contributed by other factors e.g. short and uncomfortable bed (Relić and Damnjanović- Radenković, 2009). Literature data reported different values for laminitis in dairy farms, ranged from 4 to 55 cases per 100 cows (Clarkson et al., 1996; Whitaker et al., 2000). According Lim et al. (2013), there is positive correlation between occurrence of arthritis and laminitis in dairy cows. The prevalence of arthritis in dairy farms was ranged from 47.3% to 81 % (Brenninkmeyer et al., 2012; von Keyserlingk et al., 2012). Gastrointestinal disorders make considerable losses in the dairy farm, especially in calves when are connected with body mass losses and increased calf mortality (Torsein et al., 2011). Diarrhea is a syndrome of complex etiology, resulting from the interaction of the environment, nutrition and the mutual action of several different infectious agents (Bojkovski et al., 2009). Respiratory diseases represent a constant problem with seasonal intensifying, especially in farms with poorly implemented zoohygienic measures (Bojkovski and Relić, 2012). Clinical mastitis is also the most common disease in other studies in the literature that present disease rates. A study from France (Fourichon et al., 2001) revealed that the most common disease in dairy cattle was clinical mastitis (with 44.1 cases per 100 calvings), locomotor disorders (with 10.9 cases), digestive disorders (with 5.1 cases), retained placenta (with 8.8 cases), dystocia (with 6.6 cases), milk fever (with 5.6 cases), and chronic metritis (with 5.1 cases). A British study covering 340 herds had 36.6% mastitis, 23.7% lameness, 5.3% hypocalcemia, 8.7% assisted calving, 1.3% digestive diseases, 0.7% hypomagnesemia, and 0.4% ketosis (Whitaker et al., 2000). The newest data revealed that there is improvement in the health management of dairy cows but further research is needed for determination of risk factors that influence the health status of dairy herds (Norman et al., 2009). Some of the diseases that are very frequent, such as mastitis, may occur several times during the lactation. Other diseases are more infrequent, but some of them when occur then it is very difficult to treat. Examples of these hard-to-treat diseases are arthritis, phlegmons, respiratory diseases, hoof diseases, and malignant catarrhal fever (Muller-Dublies et al., 2001). Diseases with a low number of treatments per diseased cow were those that respond very well to therapy or those that, when veterinarians are called, mean there is a problem that has to be solved at once. For some of these diseases, it is typical that if they cannot be cured, the animal will be slaughtered. The farmers should pay attention in reduced antibiotic treatment duration because of awareness of producers' organization to reduce the unnecessary use of antibiotics.

Conclusions

In accordance with previous work udder diseases, lameness, arthritis and occurrence of abscess were the most challenging health problems in dairy farm. When diseases are recorded under practical farming conditions, there will always be some reasons for misclassification. The errors could occur at the veterinary level, the farmer level, or the reporter level. Dairy farms need consultancy services in various aspects of animal health. There is an urgent need for good animal disease recording system in Macedonia as the need for health records increases for dairy farm management, breeding purposes and traceability. Good cooperation between farmers, veterinarians, and other institutions involved in livestock production is an important component in modern herd health management.

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