

Effect of maintenance system on the selected aspects of dairy cattle health

MAREK GAWORSKI, MAŁGORZATA KOWALSKA

Department of Production Management and Engineering, Warsaw University of Life Sciences – SGGW

Abstract: *Effect of maintenance system on the selected aspects of dairy cattle health.* There are presented the results of investigations on the effect of dairy cattle maintenance system on the animal health and welfare. The paper is mainly focused on observations on the effect of cowshed bedding on animals' physiological state. Methodic of investigations was based on observing the cow herd in four farms during eight months. The animal maintenance technologies in these farms were different. Prior to investigations, the breeders were interviewed in respect of technical parameters in the buildings for livestock. The results of investigations proved that maintenance system, type of bedding and technical parameters of the livestock building influenced evaluation of cattle health and potential hazards expressed by injuries.

Key words: dairy cattle, bed, maintenance system, injuries, health

INTRODUCTION

Animal production in the farms calls for observing a series of rules resulted from peculiarity of livestock maintenance technology and the requirements of living organisms in respect of shaping environmental conditions in the livestock buildings and their surroundings.

The friendly environmental conditions are favourable to dairy cattle; as a result the milk yield is increase, the cattle is more healthy and lives longer [Thomsen et al. 2007]. Every animal must be provided with appropriate conditions for its

entire life, not only within indispensable minimum determined by law, but – first of all – the conditions that allow for its growth without stress. According to Schleitner [1995], the cows of annual milk yield above 6000 kg call for particularly comfortable lying place. The bed should have good thermal insulation, it cannot cause injuries or discomfort and should be dry to assure [Nawrocki 2009].

Keeping hygiene in the buildings, thus, on the beds is connected with type of bedding. There are two types of cattle maintenance: with litter and without litter. Four basic criteria should be taken into consideration in selection of litter: type of production, utility value of bedding material and its cost, and availability of litter raw material [Grodzki Ed. 2011].

The clean and comfortable box for lying directly affects the cattle health and frame of mind, therefore, it promotes bigger amount of milk and its quality [Winnicki et al. 2007]. The problem of bed condition becomes a live issue in the light of EU requirement. Quality of the box for lying directly affects the condition of animal health, since cows stay in the recumbent position for about half a day [Oprządek and Oprządek 2012]. The pasture grazing has been reduced in recent years. It is connected to limited

movement of animals and the increased occurrence of limb sickness, pain, and suffering [Kołaczkowski 2006].

Every animal should be treated humanely. The people that maintain livestock are obliged to provide animals with care and proper living conditions. It is forbidden to keep animals on ties that could cause injury or suffering and do not secure possibility of free movement. The animal breeding conditions must not cause injuries or other suffering [Winckler et al. 2003].

This work aimed at evaluation of the effect of milking cow maintenance system on animals' health and welfare. Particular attention was paid to the effect of bedding type on the hind limbs health and uterine diseases.

MATERIAL AND METHODS

The investigations were carried out in Masovian Province during 8 months in four livestock buildings. The observations were connected with various types of animal maintenance systems:

- stall system on shallow litter,
- free-stall system on shallow litter,
- free-stall system on deep litter.

The developed form enabled to interview the farm owners that maintained milk cows. There were determined technical parameters of livestock buildings: cowshed dimensions, windows' dimensions, number and dimensions of lying boxes for dairy cattle, types of ties, types of bedding, building ventilation system, type of lighting. In addition, there were collected the basic information on animal herds and systems of their maintenance, milk cows' maintenance technology and routines.

A key step in the investigations were every-month observations of animal health condition, with special consideration to the number of mechanical injuries of legs and body, as well as hoof inflammation and mastitis. The obtained results were taken as a basis for substantial discussion.

The detailed specification of analyzed objects, including the stock of particular animal groups and annual milk yield of cows, is presented in Table 1.

TABLE 1. General specification of investigated objects

Farm	Maintenance system	Stock of animals (annual average)			Milk yield of cows [kg/year]
		Cows [pcs]	Heifers [pcs]	Calves [pcs]	
I Szreńsk	Stall cowshed on shallow litter	40	40	15	7,000
II Szreńsk	Stall cowshed on shallow litter	19	40	8	7,000
III Szreńsk	Free-stall cowshed with boxes on shallow litter, solid floor, liquid manure channel covered with slotted floor within waiting area	37	13	10	8,000
IV Zgliczyn Glinki	Free-stall cowshed on deep litter, liquid manure channel covered with slotted floor within feeding area	50	17	10	8,000

Source: own elaboration.

In the investigated farms the cows of Holstein-Friesian breed were predominant; the cows of Simmental and Jersey breeds took a small share. Age of majority of cows did not exceed seven years.

RESULTS AND DISCUSSION

It is evident from carried out investigations, that the hoof injuries in milk cows varied in the considered period of eight months. The highest number of hoof injuries was found in February and March. It occurred most often in object III (free-stall cowshed with shallow litter), while the least number of these injuries occurred in object IV (free-stall cowshed with deep litter) – Table 2.

It is evident from carried out investigations, that most of mastitis cases were found in farms I and IV; together in these farms there were found five cows with

mastitis in March and April each. In the remaining farms this disease was observed in 1–2 cows per month. Considering the period of eight months one can find that the least mastitis cases occurred in farm III, where only three cases were found (Table 3).

It is evident from carried out investigations, that cases of body injury occurred less often in the farms, when compared to health problems presented previously. However, these injuries occurred in objects I, II and IV in February, March, May, June and September, most often in farm II. During period of investigations, five milk cows suffered from mechanical injuries in this farm, while the herd in object III was free from these injuries (Table 4).

The sum of all injuries in investigated objects is presented in Table 5.

It is evident from carried out investigations that the most injury-generating

TABLE 2. Hoof injuries

Object	Number of injuries in month							
	February	March	April	May	June	July	August	September
I	1	–	–	–	1	1	1	–
II	2	2	–	–	–	1	1	–
III	2	2	–	1	1	1	–	–
IV	–	–	–	1	1	–	–	–

Source: own investigations.

TABLE 3. Distribution of mastitis cases in investigated farms

Object	Number of injuries in month							
	February	March	April	May	June	July	August	September
I	2	2	3	1	1	–	–	2
II	1	2	2	1	1	–	–	–
III	1	1	–	–	–	–	1	–
IV	1	3	2	–	–	–	1	2

Source: own investigations.

TABLE 4. Distribution of cases of mechanical injuries of cows' bodies in investigated farms

Object	Number of injuries in month:							
	February	March	April	May	June	July	August	September
I	1	1	–	–	–	–	–	1
II	2	1	–	–	1	–	–	1
III	–	–	–	–	–	–	–	–
IV	–	–	–	1	2	–	–	–

Source: own investigations.

TABELA 5. The sum of all injuries (hoof, body and mastitis) in investigated objects

Month	Number of injuries in objects				Sum	Share of injuries in month in all injuries during eight months [%]
	I	II	III	IV		
February	4	5	3	1	13	22.41
March	3	5	3	3	14	24.14
April	3	2	0	2	7	12.07
May	1	1	1	2	5	8.62
June	2	2	1	2	7	12.07
July	1	1	1	0	3	5.17
August	1	1	1	1	4	6.9
September	2	1	0	2	5	8.62
Sum	17	18	10	13	58	100

Source: own investigations.

months were February, March and April. It was found that in summer months less than 10% of animals suffered from the health problems. March was found as the most injury-generating month, when the period from February to September was considered. Among the investigated group of cows amounted to 146 animals, 14 health problems were found in March. The least number of health problems was observed in July (only three animals). Average percent share of animals with health problems per month amounted to about 12%.

The percent shares of injuries were grouped into particular seasons of investigated period (winter, spring, summer), basing on data in Table 5. The average

share of injuries in particular seasons is presented in Figure 1. The course of changes presented in Figure 1 points out that number of injuries in milk cattle decreases as the pasture feeding system is applied. This confirms the importance of keeping animals outside the livestock buildings, where many injuries found in investigations are generated.

Basing on the collected results of investigations there was proposed to introduce to theory the injury-generation index (X), as a ratio between the number of specified injuries in considered period and the number of all milk cows in the object:

$$X = A/B [-]$$

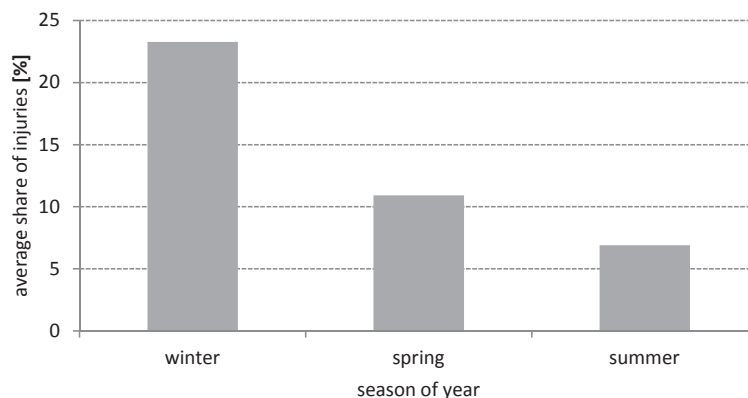


FIGURE 1. Average share of injuries in particular seasons in total number of injuries in investigated period

Source: own elaboration.

where:

A – number of injuries in considered period (eight months);

B – number of all milk cows in object.

The values of calculated injury-generation index are presented in Table 6.

Basing on the collected results of investigations, there was determined the index of specific injury-generation (Y), as a ratio between the sum of all specified injury cases in all objects and the sum of all animals investigated:

$$Y = C/D \text{ [-]}$$

where:

C – sum of all specified injury cases in all objects;

D – total number of all animals investigated.

The values of average specific injury-generation in the investigated group of objects are presented in Table 7.

The determined injury-generation index showed that most cases of various injuries occurred in the cowshed of tie type system with shallow litter. The animal health problems in this farm occur regularly every year. The main reason of this is the wrong building structure. First of all, there is a lack of proper ventilation, liquid manure outflow, and particular stalls are too short. After cross-compliance inspection, the farm will be forced to carry out modernization.

TABLE 6. Variability of injury-generation index (X) in investigated herds

Object	Hoof injuries	Mastitis	Body injuries
I	0.10	0.25	0.08
II	0.32	0.32	0.26
III	0.19	0.08	0
IV	0.04	0.18	0.04

Source: own investigations.

TABLE 7. Average specific injury-generation (*Y*) in investigated group of milk cattle

Type of injury	<i>C</i>	<i>D</i>	<i>Y</i>
Hoof injuries	19	146	0,13
Mastitis	29	146	0,2
Body injuries	10	146	0,07

Source: own investigations.

Modern technologies of cattle breeding aim not only at production profitability, but also at fulfillment of physiological requirements of animals [Schleitzer 1995]. High productivity of present cattle breeds is at the same time a source of many health problems, e.g. diseases of legs, hoofs, udder, and the decreased period of animal utilization [Nogalski 2006].

Considering various technical and technological solutions one can undertake an attempt towards determination of their effect on the animal health. Under various maintenance systems one can more or less affect the level of animals' welfare [Drissler et al. 2005]. However, even the best technological solution will not ensure the animals' welfare without appropriate human supervision.

In the course of carried out investigations, numerous transgressions in animals' daily care and service were found. The building technical parameters that differed from standard requirement, lack of proper ventilation, restrictions on animals' free movement, stock too large, low number of windows, low intensity of artificial light and lack of regular cowshed renewal caused deterioration of animal comfort in the objects. In respect of hygiene and safety, the two investigated objects generally departed from standard minimal cross-compliance requirements.

The investigations were focused mainly on the effect of bedding type and maintenance methods on milk cows health and their welfare. It is evident from analysis of the four objects that bedding on which the animals move affects the hoof injuries and udder cleanliness. No-litter system with grates, that was introduced not long ago, affects the legs unfavourably, since animals have difficulties in keeping balance on such floor. The young animals entering such stalls for the first time cannot keep the balance and they slip; this often leads to injuries. However, animals kept on a deep litter suffered more often from mastitis. These health problems were caused by pathogenic bacteria that occur in great number in the warm and moist bedding. Observations made in free-stall cowshed on a deep litter point out at frequent occurrence of mastitis, caused by too large stock and deterioration of litter. Unfortunately, such maintenance system calls for particular attention in respect of bedding cleanness. In consideration of animal hygiene and health, the best was free-stall cowshed with shallow litter, where least injuries were found during eight months. These injuries were caused by hydraulic scrapers operation. The frequent hoof mechanical injuries occurred during cattle passing on field ways in the spring-summer period.

Analyzing length and width of the boxes for lying, the least stall comfort was found in the tie cowsheds that were modernized. The old-type cowsheds that were built about 30 years ago were adapted to maintaining animals of smaller body dimensions. The current milk cows are characterized by bigger body weight; the boxes for lying that are too short cause body injuries of cows. Most of such health problems were found in the herd of object II. The abrasions of hind limbs and sternum were found. Such problems can be prevented only by skillful modernization of individual stalls for animals. The appropriate technical parameters of individual boxes for the cows affect positively the results of observations made in the free-stall cowshed with individual boxes.

CONCLUSIONS

Results of investigations in the period of eight months pointed out at distribution of injuries between particular months, containing both the winter and summer months. Most of injuries in the entire group of animals were found in February and March. During these months the animals stay for twenty-four hours in the livestock building, where they have no access to outside run and they lie on uncomfortable individual stalls; this creates numerous health problems, including also the deformed hoofs problem. It leads to forming the painful ulcers. Least health problems in investigated herds occurred in summer months: July and August. This period best favours the proper animal growth and maintaining hygiene in the cowsheds.

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Streszczenie: *Wpływ systemu utrzymania na wybrane aspekty zdrowotności bydła mlecznego.* Celem pracy była ocena wpływu systemu utrzymania bydła mlecznego na stan zdrowia oraz dobrostan zwierząt. W pracy skupiono się głównie na obserwacji wpływu podłoża w oborze na stan fizjologiczny zwierząt. Metodyka badań opierała się na obserwacji stad krów w 4 gospodarstwach

przez okres ośmiu miesięcy. Technologie utrzymania zwierząt w tych gospodarstwach były zróżnicowane. Przed przystąpieniem do badań przeprowadzono wywiady z hodowcami na temat parametrów technicznych budynków inwentarskich. Wyniki badań potwierdziły, że zarówno system utrzymania, rodzaj podłoża, jak i parametry techniczne budynku inwentarskiego wykazują wpływ na ocenę zdrowotności bydła i potencjalne zagrożenia wyrażane urazami ciała.

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Authors' address:

Marek Gaworski
Katedra Organizacji i Inżynierii Produkcji
SGGW
ul. Nowoursynowska 164
02-787 Warszawa
Poland
e-mail: marek_gaworski@sggw.pl