

Evaluation of the Hooves of Dairy Cows in Connection with Trimming and Culling

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Summary

The aim of this study was to investigate the effect of regular hoof trimming on the incidence of hoof diseases and their impact on the culling of dairy cows. The experiment was carried at the farm located in northern Slovakia, at an altitude of 1000 m asl. The farm kept cattle Red and Black Holstein, Slovak Spotted, Slovak Pinzgau and their cross breeds. The status of hooves was assessed during each hoof trimming. During the first hoof trimming in December 2011, 130 dairy cows were evaluated. During the second trimming in May 2012 114 cows and during the third trimming in November 2012 105 cows were treated. The overall incidence of hoof diseases and the overall incidence of diseases attributable to animal was evaluated (animal was evaluated as sick if at least one limb was affected). The incidence of hoof diseases were assessed in whole herd (all animals), in group of culled cows and in the basic herd (cows treated in all three hoof trimmings – 86 cows). The highest incidence of all diseases was observed in culled animals during the study (46%, 45% respectively). The most common illnesses were ulcers and dermatitis. In the course of all three hoof trimmings the reduction in the incidence of disease in whole herd (mainly due to culling) and also in basic herd (due to the positive impact of hoof trimming) was confirmed. The work highlights the importance of regular hoof trimming in the effective reduction of hoof diseases on the farms.

Key words

cows, culling, dermatitis, disease, hoof, ulcer

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Introduction

Lameness is defined as a change in movement and position of animals caused by pain and discomfort of feet (Flower and Weary, 2009). Lameness represents serious problem in dairy farms with negative impact on welfare (Whay et al., 1998; Winckler and Willen, 2001) and economic income (Alban et al., 1995; Fabian et al., 2014). Up to 85% disorders are caused by hoof lesions and the remaining 15% disorders are caused by traumatic injuries of limbs (Radostits and Blood, 1985; Monstvilienė et al., 2004). This fact is confirmed by the positive correlations between the incidence of lameness and hoof lesions occurrence (Kielland et al., 2009). Negative impacts of lameness were detected on reproduction (Sprecher et al., 1997), production (Rajala-Schultz et al., 1999; Warnick et al., 2001; Green et al., 2002; Juarez et al., 2003; Booth et al., 2004) and the relationship was also found between the incidence of hoof lesions and the incidence of other injuries and diseases of the body (Fulwider et al., 2007). Therefore, the culling of dairy cows due to low production and poor reproduction parameters (Beaudeau et al., 1995) may be related to hoof diseases (Booth et al., 2004).

Currently, regular functional hoof treatment (hoof trimming) is the most used way to eliminate the incidence of hoof diseases. On the other side the hoof trimming can also have a negative effect (Pesenhofer et al., 2006) due to the increase of the locomotion score shortly after trimming (Chapinal et al., 2010; Van Hertem, 2014). However positive effects are more relevant – decreasing the incidence of lameness in the long term period (Hernandez et al., 2007), reducing the incidence of hoof lesions (Manske et al., 2002a), increasing the average age of cows in which the lameness occurs first time (Brayen et al., 2012), higher fat and protein content in the milk of cows with trimmed hooves (Nishimori et al., 2006).

Hypothesis of this study was that the regular hoof trimming reduces the incidence of hoof diseases. The aim of presented work was to investigate the effects of regular hoof treatment on the occurrence of the diseases and find out the impact of these diseases on culling of cows on selected farm without previous regular hoof treatment in dairy practice.

Materials and methods

The experiment was carried at the farm located in northern Slovakia, at an altitude of 1000 m asl. The farm keeps cattle Red and Black Holstein, Slovak Spotted, Slovak Pinzgau and their cross breeds. The breed structure is shown in Table 1. Milk yield and basic composition of milk from milk recording service are shown in Table 2. Cows were housed in loose housing system on deep litter. Paddocks were available for cows. Dairy cows grazed on adjacent pastures in the summer season during the day. Grazing season lasted from late May to late October. Dairy cows were fed with winter feed ration during all three hoof trimming, which was composed of feed concentrate: a mixture of corn meal and scrap of triticale, and fodder: meadow hay and silage (mixture of clover grass and leguminous – cereal).

The status of hooves was assessed during each hoof trimmings, which were performed in three periods: December 2011 (first), May 2012 (second) and November 2012 (third). The incidences of hoof lesions were evaluated by Král et al. (1977). The regular

Table 1. Breeds structure on the farm during first hoof trimming

Breeds	Number (pcs)
Holstein	88
Slovak Spotted (SS)	19
Slovak Pinzgau (SP)	13
SS:SP (50:50)	6
Origin unknown	5

Table 2. Milk yield per year and milk composition on the farm

Parameters	Year	
	2011	2012
Milk yield (kg)	5768	5355
SCC ¹ (x 1000 cells/ml)	109	34
TBC ² (x 1000 bact./ml)	25	49
Fat (%)	3.99	4.10
Proteins (%)	3.31	3.90

¹Somatic cells count; ²Total bacterial count

hoof treatment was not performed before above mentioned first hoof trimming, so the results for first trimming could be considered as initial (control) state.

After the cow was fixed in hoof trimming crush the identification number, the situation of hoof diseases (lesions) and the affected limb were recorded. The incidence of disease was recorded as a binary variable that takes the value 1 if the animal had the disease or 0 if the animal was free of disease. The following diseases were evaluated: dermatitis, ulcers, fissures, double wall, interdigital hyperplasia, and tumor. Furthermore, the total incidence of diseases per animal (animal was considered as sick if at least one limb was affected) and repeatability of the disease were studied (the animals affected by the same disease during the three hoof trimming).

During the first hoof trimming 131 dairy cows were evaluated. During the second hoof trimming 114 cows were treated and in the third 105 ones. During the study period several cows were culled for different reasons (26 cows were culled between first and second trimming (1C) and 20 cows were culled between second and third trimming (2C)). In the farm the routinely culling of cows was done on the basis of complex evaluation (mainly milk production, reproduction and health) of the animals' performance. On the other side, new fresh calved cows were included into the herd (9 cows were included between first and second trimming and 11 cows were included between second and third trimming). Therefore, the animals were divided into two groups: group "the whole herd" included all cows during each individual hoof trimming (each of hoof trimming was performed with different number of cows) and group "the basic herd" contented the cows treated in all three hoof trimming (86 pcs).

In statistical evaluation, the average incidence of all diseases and then separate the average incidence for ulcers and dermatitis

(these diseases were most frequently detected) were calculated for the whole herd, basic herd and culled cows. Digital and interdigital dermatitis were evaluated as one disease (under the name "dermatitis"), because they are nearly identical disease differing only in localization (Manske et al., 2002b). Mann-Whitney U test was used to determine the statistically significant differences (as an alternative for nonparametric one-way analysis of variance) (Olechnowicz et al., 2010). Statistic analysis was performed using SAS program.

First, dependence between qualitative variable (order of hoof trimming) and quantitative variable (incidence of all diseases and particularly incidence of ulcers and dermatitis) was determined by the Mann-Whitney U test in the whole herd and basic herd. The aim was to confirm or refute the hypothesis that hoof treatment affected the incidence of diseases. Further the relationship between qualitative variables (basic herd, 1C, 2C) and quantitative variables (incidence of all diseases and particularly incidence of ulcers and dermatitis) was detected.

Results and discussions

During the experimental period a decrease of incidence of affected cows in the whole herd and also in basic herd was recorded (Figure 1). However, statistically significant results were not found between the order of hoof treatment and incidence of lesions. There was found a different tendency in diseases occurrence when whole and basic herd was compared.

Clear reduction in the incidence of hoof diseases in the whole herd compared to basic herd was caused due to culling of animals. In that farm almost half of culled animals suffered from hoof diseases detected during hoof trimming. Important is also the findings that up to one third of culled cows after second hoof trimming had hoof diseases already during the first trimming. Significantly higher incidence of hoof diseases in first and second culled groups of cows (46% and 45%) was found compared to the hoof status in basic herd during first and second trimming (21% and 20% resp.) ($P < 0.05$). Also, other authors confirmed that lameness and hoof lesions were often associated with culling (Milian-Suazo et al., 1988; Sprecher et al., 1997). Therefore, as it was mentioned in introduction, the reason of culling cows in our

herd could be probably related to the hoof health because hoof diseases could induce the other health or production problems which were the reasons of cow culling. Booth et al. (2004) also pointed out the possibility of higher risk of animal culling due to hoof lesions. Certain effect of the reduction of hoof diseases in our farm could be also explained by entering fresh calving cows with healthy limbs into the whole herd.

Reduction of the incidence of hoof disease was slight in the basic herd during observed period (Figure 1). This reduction is interesting also from the age point of view. Cows were almost a year older during the third trimming as compared with the first one. Some authors reported an increasing incidence of lesions with the age (Booth et al., 2004; Bryan et al., 2012). Therefore regular hooves trimming had positive effects on the maintenance of their good health. Bruijnjs et al. (2013) found out similar results. Manske et al. (2002a) also reported that cows which were treated twice, compared with dairy cows which were treated only once a year, had a lower incidence of acute cases and some diseases (ulcers, double wall, separating the white line, hemorrhage sole and white line). Conversely, Huang et al. (1995) pointed out that even very common routine hoof trimming may not be beneficial. The authors found out that regular hoof trimming in four-month intervals may cause higher incidence of certain diseases repeatability (heel erosion, interdigital dermatitis, laminitis, white line separation). It means that most recommended frequency of hoof trimming could be considered twice a year.

In the whole herd as well as in the basic herd the most prevalent hoof diseases were ulcers and dermatitis. The mentioned diseases were recorded as the most frequently also by some other authors (DeFrain et al., 2013; Akin et al., 2013; Pampariené et al., 2014; Kasarda, 2015).

The high incidence of ulcers was recorded in both groups (whole and basic herd) during the first hoof trimming (Figure 1) with following clear reduction in the second trimming. In the whole herd this reduction could be due to culling because culled animals had significantly higher incidence of ulcers after the first treatment compared to animals of basic herd (27% vs. 10%, resp.). Possible effect on the whole herd could be related to entering fresh calving cows as mentioned above. In the basic

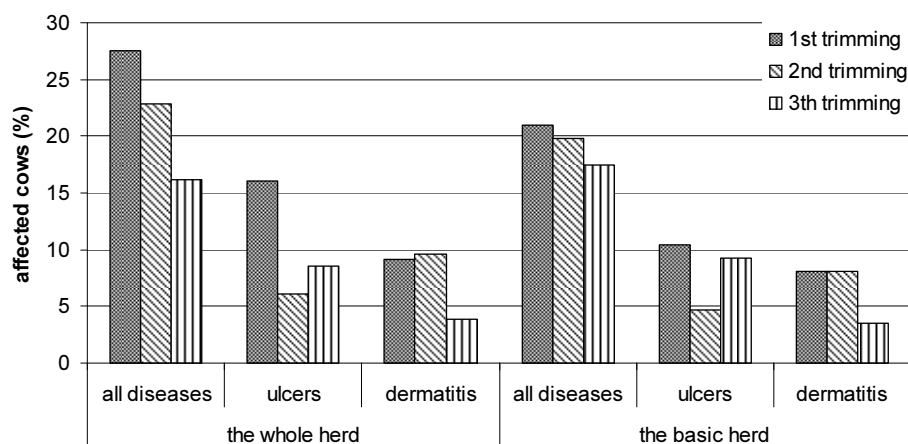


Figure 1. The incidence of all evaluable hoof diseases, ulcers and dermatitis in the whole and basic herd related to the order of trimming

herd reduction of ulcer could be partially caused by regular hoof treatment. The positive effect of regular trimming, entering a fresh calving cows and culling surprisingly was not confirmed in both whole and basic groups during third trimming. This could mean that incidence of ulcers was probably dependent also on the season because the first and a third hoof trimming took place around the same time of the year (autumn). Similarly, Huang et al. (1995) recorded the highest incidence of ulcers in the same months.

The incidence of dermatitis was at the same level in the basic herd during first two hoof trimming (Figure 1) with the clear reduction during the third one. The similar value and tendency was also in whole herd. That means that incidence of dermatitis had less impact on the culling than the incidence of ulcers. This was confirmed by non-significant differences ($p > 0.05$) in the incidence of dermatitis which was found between culled cows and cows in basic herd after first (15% vs. 8%) and second (20% vs. 8%) hoof trimming. The decrease of dermatitis during the last treatment was also very interesting. This reduction could be due to effect of treatment. Huang et al. (1995) found out that the highest incidence of dermatitis was in March and De Frain et al. (2013) recorded the highest incidence generally during the coldest term of year.

In the overall assessment we found out, that during three hoof trimmings 43% cows of basic herd had at least one of the detected diseases. Seventy percent of these cows had the hoof disease during one trimming, 25% of them during two ones and 5% of them during all three trimmings. During studied period ulcers were found in 22% cows of basic herd (77% with one ulcer, 18% with two and 5% with three ulcers) and dermatitis was found in 17% cows of basic herd (88% with one case and 12% with two cases). It is interesting that only one ulcer and two cases of dermatitis appeared repeatedly on the same leg (on the same cow respectively) from all cases. Low repeatability of hoof diseases in our farm indicates the ability of animals to overcome the diseases during one year study which could be supported by regular trimming. Repeatability of diseases recorded Manske et al. (2002a). They found more than two-thirds of cows with dermatitis and one-third with sole hemorrhage in both following trimming periods (in autumn and spring). Repeatability of other diseases was much lower in above mentioned work. These values differ from ours, because they investigated higher number of cows which had higher incidence of diseases.

Conclusion

Our results support general view that cows with hoof diseases have a higher probability to be culled from the herd than cows with healthy legs. Low repeatability of hoof diseases indicates ability of animals to overcome the diseases, and it could be supported by regular trimming. Regular hoof trimming is effective way against the most frequent diseases of hoofs. It also should be noted that hoof treatment is only one of many other tools that can be used for eliminating of hoof diseases. The importance of other tools that affect hoof status as footbath, selection, floor and bedding material in stable, and nutrition could be the subject of further studies in our practical conditions.

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