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Full Research Article

SIDE PREFERENCE OF DAIRY COWS IN THE MILKING PARLOUR AND ITS IMPACT ON DAILY MILK YIELD

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Abstract

Monitoring of the side preference of dairy cows in the milking parlour was performed in a group of 40 dairy cows (Czech spotted cattle). Twenty milking sessions were evaluated for each cow, and the composition of the monitored group of cows was kept constant. A significant side preference was found in 26 (65%) cows. The results show that in the dairy herd, a significant percentage of cows prefer one side of the milking parlour. Furthermore, in dairy cows with a significant side preference, their milk yield on the preferred and non-preferred side of milking parlour was compared and a statistically significant difference was found. When the dairy cows were milked on their preferred side of the milking parlour, higher milk yield was achieved (12.21 vs. 10.38 kg).

Key Words: behaviour, dairy cattle, milking, welfare

INTRODUCTION

Cattle farming is one of the most important branches of agricultural production. In recent decades, increased demands have been placed on animals. Genetic selection has improved dairy cattle performance (Peñagaricano, 2020). However, the welfare of dairy cows on conventional farms is often compromised (Bergman et al., 2014). Current dairy farming practices intervene in the social behaviour of animals and increase

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stress. Animals housed indoors are more dependent on human care. Furthermore, several times a day, dairy cows are exposed to close contact with caregivers, who can positively or negatively affect their well-being (Shahin, 2018).

The best milking parlours allow the cow to enter and choose the stall, without being forced by the caregiver. The cows enter the milking parlour usually in the same order, which corresponds to the existing hierarchy of animals in the herd (Doležal, 2006). Dairy cows develop preferences to enter a certain stall at the milking parlour at a certain time (Varlyakov et al., 2011). If they are prevented from doing so, their heart rate increases (Hopster et al., 1998). Animals must not feel fear when being moved to the milking parlour or during milking. In response to stress, milk excretion from the alveoli is inhibited (Borell, 2001). Acute stress during milking reduces milk production through central inhibition of oxytocin secretion and the peripheral effects of catecholamines. Oxytocin, a hormone secreted by the central nervous system into the bloodstream, is a major mediator of milk ejection reflex. Oxytocin secretion is essential for optimizing milk production. Various acute stressors, such as social isolation, new surroundings (especially for heifers) or fear of people present during milking, lead to inhibition of milk ejection (Temple et al., 2014). Adrenaline completely inhibits the secretion of oxytocin by smooth muscle contractions, closing the ducts and blood vessels and preventing oxytocin from reaching myoepithelial cells (Doležal et al., 2000). The presence of an averse caregiver during milking leads to an increase in residual milk by 70% (Temple et al., 2014). Incomplete udder emptying can lead to pathological changes (Borell, 2001).

The aim of the study was to evaluate the side preference of dairy cows in the milking parlour, the impact of lactation order on the side preference and the impact of side preference on the daily milk yield.

MATERIALS AND METHODS

The monitoring was carried out on a selected dairy farm in the Czech Republic. The number of dairy cows (Czech spotted cattle) on the farm was approximately 130, and average annual milk yield was 7200 kg per cow. The stable was brick and provided litterless housing with elevated lying boxes, along with automatic removal every two hours of manure from manure corridors. Dairy cows were fed a mixed feed ration twice a day in a feeding trough. Water was provided by waterers with float drinkers located in the outer passages. The cows were supplied with mineral lick *ad libitum*. Cow scratching brushes with vertically and horizontally placed brushes were available in the stable.

The milking parlour was herringbone with a capacity of 2 × 5 milking stalls. The waiting area was directly connected to the stable. Cow milking took place twice a day and was carried out by two workers; one conducted the milking and the other moved

the cows. Both sides of the parlour were identical and cows had access to the parlour through manually operated gates. At the start of milking, cows had access to both sides of the parlour. Then, the left or right side was opened depending on the end of milking of the previous cows. The milking parlour was operated by the Farmsoft program (Farmtec a.s., CZ) that collected and analysed the data including the milking position of each cow and milk yield. Dairy cows were identified and monitored using pedometers that were attached to the hind limb. Monitoring of the side preference of dairy cows in the milking parlour was performed in a group of 40 dairy cows. During the monitored period, 20 milking sessions were evaluated for each cow. The composition of the monitored group of cows was kept constant.

The results were statistically analysed using the statistical program Unistat 6.5. (Unistat Ltd., London, UK). The differences in the frequency of the categorical variables of interest (preference for milking parlour side) were tested on the basis of a Chi-square test (with Yates correction) within the 2 × 2 contingency table procedure (Zar, 1999). When the frequencies in the contingency table were lower than five, the Fisher's exact test was used instead of the Chi-square test. A paired t-test was used to assess the difference in average milk yield in dairy cows during milking on the left and right sides of the milking parlour. The average milk yield on the right and left side of the milking parlour was compared separately for dairy cows in which a preference for a particular side of the milking parlour was demonstrated and for dairy cows in which a preference for a particular side of the milking parlour was not found.

RESULTS

Table 1 shows the number of milkings on the right or left side of the milking parlour for each monitored dairy cow. A statistically significant difference ($p < 0.05$) between the occurrence of milking on the right and left side of the milking parlour was found in 26 (65%) dairy cows. In 14 (35%) dairy cows, no statistically significant side preference in the milking parlour was seen ($p > 0.05$).

Among dairy cows preferring a particular side of the milking parlour, 15 dairy cows preferred the left side of the milking parlour and 11 dairy cows preferred the right side of the milking parlour. The difference between the numbers of dairy cows preferring the right and left side of the milking parlour was not statistically significant ($p > 0.05$).

Table 2 shows the numbers of dairy cows preferring and not preferring a particular side of the milking parlour divided according to their lactation order. When comparing the side preferences of dairy cows depending on their lactation order, no statistically significant difference was found ($p > 0.05$).

Table 1. Cow preference for a position in the milking parlour

Dairy cow no.	Position in the milking parlour				p-value
	Left side		Right side		
	Number	%	Number	%	
1	12	60	8	40	0.2059
2	9	45	11	55	0.5271
3	3	15	17	85	< 0.0001
4	11	55	9	45	0.5271
5	5	25	15	75	0.0016
6	14	70	6	30	0.0114
7	20	100	0	0	< 0.0001
8	6	30	14	70	0.0114
9	4	20	16	80	0.0002
10	3	15	17	85	< 0.0001
11	10	50	10	50	1.0000
12	11	55	9	45	0.5271
13	18	90	2	10	< 0.0001
14	14	70	6	30	0.0114
15	10	50	10	50	1.0000
16	11	55	9	45	0.5271
17	14	70	6	30	0.0114
18	5	25	15	75	0.0016
19	13	65	7	35	0.0495
20	4	20	16	80	0.0002
21	10	50	10	50	1.0000
22	12	60	8	40	0.2059
23	13	65	7	35	0.0495
24	13	65	7	35	0.0495
25	13	65	7	35	0.0495
26	8	40	12	60	0.2059
27	10	50	10	50	1.0000
28	11	55	9	45	0.5271
29	14	70	6	30	0.0114
30	13	65	7	35	0.0495
31	20	100	0	0	< 0.0001
32	6	30	14	70	0.0114
33	3	15	17	85	< 0.0001
34	8	40	12	60	0.2059
35	12	60	8	40	0.2059
36	4	20	16	80	0.0002
37	18	90	2	10	< 0.0001
38	14	70	6	30	0.0114
39	1	5	19	95	< 0.0001
40	20	100	0	0	< 0.0001

Table 2. Effect of lactation order on the side preference of a position in the milking parlour

Lactation order	Total number of cows	Number of cows not preferring one side	Number of cows preferring one side
First	17	5	12
Second and third	13	6	7
Fourth and over	10	3	7

Table 3 shows a comparison of milk yield on the preferred and non-preferred side in dairy cows that significantly preferred one side of the milking parlour. A comparison of the average milk yield on both sides of the milking parlour shows that dairy cows milked on their preferred side achieved statistically significantly higher ($p < 0.0001$) milk yields than when they were milked on their non-preferred side.

Table 3. Milk yield on the preferred and non-preferred side of milking parlour in cows significantly preferring one side

Dairy cow no.	Average milk yield on the preferred side (kg)	Average milk yield on the non-preferred side (kg)
3	7.66	5.36
5	16.65	14.32
6	16.21	13.71
7	11.05	-
8	10.40	8.90
9	5.50	7.30
10	13.31	10.25
13	9.60	6.00
14	12.04	10.88
17	11.77	10.36
18	10.81	9.16
19	13.05	11.90
20	13.30	11.53
23	14.30	11.93
24	9.12	7.91
25	13.10	11.00
29	12.70	10.80
30	12.59	10.76
31	13.59	-
32	15.92	13.53
33	10.69	9.30
36	13.85	12.48
37	12.29	9.00
38	14.86	11.73
39	11.96	10.70
40	11.18	-

Table 4 shows a comparison of milk yields achieved on the right and left side of the milking parlour in dairy cows that did not prefer any side of the milking parlour. No difference in milk yield was found in these dairy cows when they were milked on the right and left sides of the milking parlour ($p > 0.05$).

Table 4. Milk yield on the right and left side of milking parlour in cows not preferring any side

Dairy cow no.	Average milk yield on the right side (kg)	Average milk yield on the left side (kg)
1	15.91	15.85
2	10.29	10.51
4	12.16	12.99
11	16.32	16.91
12	14.44	14.85
15	10.56	10.83
16	16.42	15.78
21	13.83	13.17
22	11.32	11.99
26	11.65	11.35
27	10.76	10.87
28	6.43	6.88
34	15.03	15.60
35	11.83	11.91

DISCUSSION

The results of our study confirm that a significant percentage of cows prefer a particular side of the milking parlour during milking. In our study, side preference was demonstrated in 65% of dairy cows. According to Hopster et al. (1998), the constant choice of one side of the milking parlour documents the existence of routine. Berry and McCarthy (2012) suggest genetic factors are also involved. The milking routine (moving animals to the milking parlour, udder hygiene, milking etc.) can affect the welfare of the cows (Arave and Albright, 1981; Seabrook, 1984; Fraser and Broom, 1997; Friedman and Honig, 2020). Grasso et al. (2007) observed preferences for entering a milking parlour on a specific side of the parlour in 30-50% of cows. In contrast, Varlyakov et al. (2011) found 64-66% of dairy cows without side preferences in the milking parlour. Some dairy cow behaviour persists over time despite changes in group composition, lactation phase and time of the year, but side preference is a trait seen in individual animals, among which big differences can be found depending on their ability to adapt their behaviour to changes in the environment (Hopster et al., 1998). Arave and Albright (1981) explain side preference in some cows by natural

laterality, and they compared it to some cows showing left laterality in lying. Another reason for side preference in dairy cows could be a dairy cow's varying experience during milking on different sides of the milking parlour, which could lead to their choice of a more attractive side or, conversely, avoiding the less pleasant side based on the cow's feelings (Grandin et al., 1994; Hosoi et al., 1995). Factors that can potentially affect side preference in the milking parlour include interactions between the worker and the cow during milking (Seabrook, 1984). Hopster et al. (1998) found that despite the similarity between the two sides of the milking parlour, there were functional differences, such as the distance from the exit gate, which could have caused their cows to choose a certain side. On the farm we monitored, the left side of the milking parlour had a shorter exit distance and the dairy cows tended to prefer the left side of the milking parlour (15 cows preferred the left side and 11 cows preferred the right side); however, the difference between the number of dairy cows preferring the left and right side of the milking parlour was not statistically significant. It is possible the difference would be more pronounced if a larger group of dairy cows was monitored. The number of dairy cows observed in our study was limited by the selection of a constant group of monitored cows, due to efforts to eliminate the effects of mixing different animals and changes in the hierarchy potentially affecting access to the milking parlour.

Our results did not confirm the hypothesis that lactation order would affect side preference, i.e. that older dairy cows would have a stronger side preference. The ratio of dairy cows preferring and not preferring a certain side of the milking parlour did not differ depending on the lactation order. However, the effect of the low number of monitored dairy cows in individual lactation groups must be taken into account.

The existence of a preference for a certain side of the milking parlour was significantly reflected in the performance of dairy cows. In dairy cows preferring a certain side of the milking parlour, a difference was found in milk yield between milking the cows on the preferred and non-preferred sides. Dairy cows milked on their preferred side had a higher milk yield, which proves the importance of allowing cows to enter the milking parlour on their preferred side, not only in terms of cow welfare but also from an economic point of view. According to Tanner et al. (1994) and Hopster et al. (1998), factors that prevent the cows from choosing their preferred side can cause stress during milking. Stress is known to inhibit the secretion of oxytocin necessary to release milk from the udder (Leonhard-Marek, 2012). If, for some reason, dairy cows cannot take a place on their preferred side of the milking parlour, their milk yield is probably affected by stress. Hopster et al. (1998), who examined cows milked on their non-preferred side, found a reluctance to enter this side of the milking parlour, a decrease in milk yield, and an increase in heart rate in the monitored cows. The authors attributed their findings to the absence of symmetry between the two sides of the milking parlour. The milking parlour monitored in our study was symmetrical on both sides, except for the exit distance. However, we also measured the consequence of lower milk yield when the cows were forced to enter other than their preferred side of

the milking parlour. Interestingly, recent research also documented a side preference in buffalo cows (Polikarpus et al., 2014), and the authors suggest that management practices that disturb their choice should be avoided in order to minimise stress during farming routines.

However, not all cows show a preference for a particular side of the milking parlour, and no difference in milk yield was found when cows not preferring any side were milked on the different sides of the milking parlour.

CONCLUSION

A significant percentage of dairy cows prefer a particular side of the milking parlour. In dairy cows significantly preferring one side of the milking parlour, higher milk yield was achieved when they were milked on their preferred side than when they were not allowed to take their preferred position and were milked on the opposite side. The results of the study suggest that if dairy cows are not milked on their preferred side of the milking parlour, their performance is affected, likely due to stress. For both economic and welfare reasons, whenever possible, the cows should be allowed to take a position in the milking parlour according to their preference.

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Authors' contributions

VR and EV designed the content and wrote the manuscript; VV participated in manuscript writing, translations and revised it critically. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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DNEVNA PRODUKCIJA MLEKA U IZMUZIŠTU U ZAVISNOSTI OD STRANE SA KOJE SE PRILAZI KRAVAMA

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Kratak sadržaj

Praćena je dnevna produkcija mleka u izmuzištu u zavisnosti od toga sa koje strane se prilazilo kravi (simentalka). Uzimano je u obzir 20 muža po kravi, pri čemu je raspored krava u grupama bio nepromenjen. Utvrđeno je da je kod 26 krava (65%) strana prilaza bila signifikantna za dnevnu produkciju mleka. Rezultati su prikazali da značajan procenat krava u mlečnom krdu pokazuje bolje rezultate ako im se prilazi sa određene strane u izmuzištu. Kod ovakvih krava je utvrđena značajna statistička razlika kada im se prilazilo sa jedne strane. U tim slučajevima je zapažena veća produkcija mleka sa jedne u odnosu na prilaz sa druge strane (12,21 napsram 10,38 kg).

Ključne reči: ponašanje, mlečna goveda, muža, dobrobit