Study of Behaviour Adaptation of Dairy Cows after Regrouping and Facility Change

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Abstract
The objective of this study was to examine the influence of relocation dairy cows to different housing on some indicators of their maintenance behavior. Three days observation (72 hours) of 40 Holstein cows was done. The behaviour activities were registered at intervals of 10 minutes. The times of lying and ruminating showed steadily rising with each day (P<0.001). The time of standing was decreasing (P<0.001) from the first day to the third day after relocation. Period's number differed also significantly in day's comparison. Number of periods of total lying (7.34; 14.07; 16.34), and ruminating (14.32; 15.75; 18.58) were increasing (P<0.001). The converse trend (P<0.001) was showed in the variables of feeding (17.46; 12.73; 9.54) and total standing (24.93; 18.19; 12.41; P<0.001).

Keywords: behaviour, cow, housing, relocation.

1. Introduction

Dairy cow housing may take more forms, but this examination was focused on the cow comfort in the free-stall barn, which represent the dominant housing system in many different climates around the world. Stay in a free-stall presents the environment with many challenges. Generally, this housing type creates good welfare [1, 2]. The change of housing type from tie-stall to loose housing with free-stalls will increases the freedom of movement for the animals and thereby they get better opportunities to express natural behaviour [3-6]. The design and dimensions of the stall are also very critical. According to Phillips [7] cows spend nearly half of their lives lying down, so providing a well-designed space for this behaviour is important. After reconstruction, cows benefited from the visual contact and the flexible use of the feeding trough and free-stalls for improving the social stability within the group. Management procedures such as feed delivery and milking are not always consistent [8, 9].

Introducing a group of animals into an established herd or making a new herd affects the social relationship; not only for the introduced cattle or group but also for the whole herd [10]. Hasegawa et al. [11] showed that regrouping of young cattle increased aggression and changed maintenance behaviour. High stocking densities at the feed bunk increase aggressive competition and keep subordinate cows away from feed. A reduction in the time cattle spend resting can lead to physiological changes associated with stress and can, ultimately, have a negative impact on health [12, 13].

The objective of this study was to examine the influence of relocation dairy cows to different housing on some indicators of their maintenance behaviour. We hypothesized that regrouping and

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changing housing would affect lying behaviour and feeding behaviour.

2. Materials and methods

We assessed 41 Holstein cows on first and second lactation with the average age of 1260 days (from 1080 to 1380 days, 36 to 46 months). Cows were observed for 72 hours after moving into the new barn with free-stall housing and behavioural observations were recorded at 10-minutes intervals. Based on this data, time spent lying (on the left and right side), standing (with or without movement, including time spent in milking parlour), feeding, ruminating (ruminating while standing plus ruminating while lying) as well as the number of activity bouts were calculated. The cows were moved into the new barn from the old barn with tie-stall housing.

The new facility was group housing with concrete alleys (2.6 m). Free-stalls (1.15x2.0 m) were bedded with straw. Cows were kept in a two pens (movement area 7.4 m^2 per animal). Both pens were continuously illuminated throughout the experiment. The mean daily air temperature and relative humidity in the housing facility were 15.1ºC and 80.2% during the experimental period of three 24 hours observations.

The cows were fed a mixed ration consisting of maize silage, lucerne haylage, lucerne hay, barley straw, brewer's grain, sugar-beet pulp, and concentrate mixture for high-yielding cows. Feeding was allowed throughout the 24-h period, except during milking. These cows were driven up to a milking parlour when milked. All cows were milked in the milking parlour (2x5).

The data were analyzed using a General Linear Model ANOVA by the statistical package STATISTIX [14]. There were evaluated factors of day (first, second, third day). The normality of data distribution was evaluated by the Wilk-Shapiro/Rankin Plot procedure. All data conformed to a normal distribution. Significant differences between groups were tested by Comparisons of Mean Ranks. Values are expressed as mean±SD.

3. Results and discussion

An important criterion in the evaluation of dairy cows welfare is their maintenance behaviour. Dairy cows have been kept individually in the tie-stalls, but concerns about animal welfare have led to increased interest in group housing. This type of housing can promote production through an increased feed intake caused by a social facilitation. However, it could influence agonistic behaviour and aggravate lying behaviour [15, 16].

At the present work the times of recorded maintenance behaviour's lying and ruminating showed steadily rising with each day (Table 1).

Table 1. Maintenance behaviour during three days after relocation

Times in minutes	Day			P	Significance
	1 $\bar{x}$ ± SE	2 $\bar{x}$ ± SE	3 $\bar{x}$ ± SE		
Total lying	336.3±171.1	628.0±181.2	756.1±140.3	0.0000***	1:2,3***; 2:3**
- left side	196.8±139.4	345.1±153.1	429.0±186.6	0.0000***	1:2,3***
- right side	139.5±106.1	282.9±160.7	327.1±149.7	0.0000***	1:2,3***
Feeding	306.1± 84.5	302.4± 91.8	304.9±83.1	0.9812	
Ruminating	318.0± 58.7	325.4± 74.1	440.5±77.4	0.0000***	1:3***; 2:3***
Standing	1103.7±171.1	811.9±181.2	683.9±140.3	0.0000***	1:2,3***; 2:3**
Number of periods					
Total lying	7.34±4.54	14.07±4.72	16.34±4.41	0.0000***	1:2,3***
- left side	4.05±3.48	7.85±3.99	8.51±3.88	0.0000***	1:2,3***
- right side	3.29±2.86	6.22±3.53	7.83±4.18	0.0000***	1:2,3***
Feeding	17.46±3.56	12.73±3.48	9.54±2.86	0.0000***	1:2,3***; 2:3***
Ruminating	14.32±2.83	15.75±2.95	18.58±4.32	0.0000***	1:3***; 2:3***
Standing	24.93±4.51	18.19±4.44	12.41±3.44	0.0000***	1:2,3***; 2:3***

**P<0.01; ***P<0.001; SD=standard deviation

The differences were among days significant (P<0.001). The times of total lying (336.3±171.1 min.; 628.0±181.2 min.; 756.1±140.3 min.) and lying's on the left (196.8±139.4 min.; 345.1±153.1 min.; 429.0±186.6 min) and right side (139.5±106.1 min.; 282.9±160.7 min.; 327.1±149.7 min.) were increasing from the first day to the third day of observation. The cows lay longer on their left sides during all days. Similar course was found at rumination time (318.0 ±58.7 min.; 325.4±74.1 min.; 440.5±77.4 min).

The total time of standing was decreasing (1103.7±171.1 min.; 811.9±181.2 min.; 683.9±140.3; P<0.001) from the first day to the third day after relocation (Table 1). Data suggests that management changes, such as moving into the unknown barn with different type of housing, may cause changes in cow behaviour over the subsequent hours [17]. It is obviously that stressors such as disturbed rest may lead to altered levels of hormones in dairy cows [18], and could be increased the future risk of culling for lower milk production, and failed reproductive efficiency [19,20]. Veissier et al. [10] has reported a clear modification in the behavioural patterns of cattle immediately after regrouping. After regrouping, dairy cows increase physical competition and this increased competition can result in reduced lying and feeding time further compromising welfare [21, 22].

Period's number of designated parameters differed also significantly in day's comparison. Number of periods of total lying (7.34±4.54; 14.07±4.72; 16.34 ±4.41), lying on the left (4.05±3.48; 7.85±3.99; 8.51±3.88) and right side (3.29±2.86; 6.22±3.53; 7.83±4.18), and ruminating (14.32±2.83; 15.75±2.95; 18.58±4.32) were increasing (P<0.001). The converse trend (P<0.001) was showed in the variables of feeding (17.46±3.56; 12.73±3.48; 9.54±2.86) and total standing (24.93±4.51; 18.19±4.44; 12.41 P<0.001) (Table 1). Cows also spent more time standing idle in the low-comfort stalls. Studies of Tucker et al. [23] and Krawczel et al. [24] indicated that when a cow is uncomfortable, she is willing to stand for longer periods of time. Therefore, to improve welfare, comfort, and productivity, appropriate facilities and housing (stall size, design, bed surface) should facilitate increased lying time [25-27]. Our values are within the range found by other studies [28-32].

The few studies available on the effects of regrouping on feeding behaviour of dairy cows suggest that this practice may negatively impact feeding behaviour due to changes in social order and increased competitive behaviour [11, 21]. These disturbing factors are the result of the housing and the management at the majority dairy farm.

According to other authors, changes in behaviour due to regrouping typically return to normal in approximately 3 days after regrouping [21, 33]. However, Hill et al. [34] and Fregonesi et al. [36] found that cows moved into new barn with the same housing showed no significant difference in resting and feeding times, and number of meals on second day after relocation. Rumination decreased slightly at the second day after moving to the new facility.

Results indicate the negative effects of relocation and change of type housing on behaviour of dairy cows. Return to normal condition of behaviour can be 3 days after removing to different barn and housing.

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