

EFFECTS OF FATTENING BULLS REGROUPING ON THEIR MAINTENANCE AND ABNORMAL BEHAVIOUR

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ABSTRACT

The aim was to test the hypotheses that the behaviour of bulls after regrouping is influenced by the day of observation and sire. From 32 Holstein bulls kept in the loose-housing 5 were selected, originating from 3 fathers, having shown the fight, mounting, licking genitals, and pawing. These bulls were subject to another ethological observation in a different pen during three consecutive days. We tested if their behaviour varies depending on the day of the observation and sire lineage. Following treatments were evaluated: the new group formatting on the 1st day, coping on the conditions created during the previous day on the 2nd day, and re-littering the pen on the 3rd day. No significant differences between bulls were found in observed maintenance behaviours except of the time of feeding only ($P < 0.01$). Between observed days, statistically significant differences were noted in frequencies of aggressiveness and playing behaviour ($P < 0.05$; $P < 0.001$). Effect of sire was manifested in the frequency of licking ($P < 0.05$), aggressiveness ($P < 0.01$), and playing ($P < 0.05$).

Key words: bull; sire; maintenance behaviour; abnormal behaviour

INTRODUCTION

Animal husbandry is often affected by various factors, which has a negative impact especially on animal welfare, health, and production. The focus should be on behavioural abnormalities that indicate a problem in the herd. Sometimes it appears to be closely related to adverse situation, where animals are frustrated or restricted, while in other cases does not occur, or persists even when the environment is improved (Appleby and Hughes, 1997). An abnormal behaviour pattern may be a novel behaviour or an otherwise normal behaviour that is exaggerated in terms of frequency or intensity, disoriented in relation to the stimulus, or occurring in the absence of normal eliciting stimuli (Houpt, 1987).

Typical behavioural abnormalities in a herd are fighting between bulls, mounting on other bulls, licking genitals of other bulls, screaming and pawing the litter as expression of the most aggressive bulls (Albright and Arave, 1997; Laister *et al.*, 2011). Abnormal behaviours

are really components of normal behaviours directed toward inappropriate stimuli. Social aggression or territorial behaviour is typical for animals housed in groups. Unusually high levels of aggression are typically observed when unfamiliar animals are placed together for the first time (Houpt, 1991). Pawing behaviour by bulls creates bare patches of earth, and these patches located through his territory are clearly a claim to possession of given area (Albright and Arave, 1997). Two factors seemed to affect the establishment of social dominance and a hierarchy: adjusting to a new environment and the presence of unknown animals (Kilgour, 2012). Dominance in cattle depends on age, weight, sex, breed and presence of horns (Brouček *et al.*, 2008). Ishiwata *et al.* (2007, 2008) found that the proportion of walking was much lower in the pen condition compared to pasture conditions, but grooming, investigating, tongue playing, and licking objects were higher. Some bulls kept in intensive housing are prone to mount herd mates (Albright and Arave, 1997). Kooijman

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et al. (1990) reported that deprivation of roughage can increase an excessive manipulation of pen equipment and playing behaviour by the young cattle. The other behavioural disorder in fattening bulls is licking the genitals of other bulls. Sucking the penile sheath can stimulate urination which, if ingested, can depress the animal's appetite (Haupt, 1991).

Abnormal behaviour activities can often result in stereotypes, behaviours tied to a psychological disorder believed to be caused by the cattle frustration. Prepuce or scrotum sucking, and urine drinking are behaviours commonly referred to as stereotypes in bulls (Lawrence and Rushen, 1993; Albright and Arave, 1997).

The aim of the work was to test the hypotheses that the maintenance, comfort, playing, and abnormal behaviour of fattening Holstein bulls are influenced by sire and day of observation.

MATERIAL AND METHODS

A group of 32 Holstein bulls weighing 524.17 ± 44.31 kg on average 24.5 months ± 1.5 months were examined. The bulls were weighed once a month and during every change of the housing. Bulls were kept in the loose-housing barn, in 2 pens measuring 15 x 9 m, without outside yard 2 weeks before measurement. Floor space per bull was 8.4 m². Each pen was for accommodating 16 bulls. Both groups had the same age and similar live body weights.

Behaviour was monitored for 10 hours daily (from 8:00 am to 18:00 pm) during five consecutive days. The time of daily activities of bulls (lying, standing, moving, eating and ruminating) was recorded in 15 minute intervals. The frequency of following abnormal activities was recorded continually - fight (combat encounters between two or more bulls), licking (licking genitals of itself and other bulls), mounting (jumping on the other bulls in the group), pawing (pawing litter with screaming and mooing), and aggressiveness (jostling horns to other bulls, head movements, that indicated - wants of combat contact, inverted protruding eyes and finally also fight) as a manifestation of the most aggressive forms of behaviour. Also, play (running, blowing the straw, jumping on the spot) and comfortable behaviour (licking himself, throw straw on their backs, rubbing the head of straw - cleaning himself) were noted.

Only five bulls (15.6 %) were selected having shown the abnormal behaviour (an excessive and disproportionate fight, mounting, licking genitals, and also pawing with screaming). Comparison of the bulls with the regime of the group, it was found that they differ in almost all daily activities. These bulls descended from 3 bulls (Sire 1, n=3; Sire 2, n=1; Sire 3, n=1). Other manifestations of 27 remaining

animals showed no abnormal activities. The origin of the father of these remaining bulls were as follows - Sire 1, n=11; Sire 2, n=7; Sire 3, n=9.

Selected bulls were subjected to another ethological observation in a different pen with the same size of 15 x 9 m. We tested if their behaviour varies depending on the day of the observation and sire lineage. Observation lasted 3 consecutive days, animals were affected by external environmental factors like formation of new group related with stocking on the 1st day, coping on the conditions created during the previous day, and re-littering the pen at 7.50 a.m. on the third day, which was typical for the farm (littering every other day). Weight of straw was 24 kg per pen (4.8 kg per animal). Behaviours were recorded for 10 hours daily (from 8:00 am to 18:00 pm).

Descriptive methods were used for statistical evaluation. The data were analyzed using a General Linear Model ANOVA (2 ways with the interactions) by the statistical package STATISTIX, Version 9.0.:

$$Y_{ijk} = \mu + ai + \beta j + \gamma_{ij} + \epsilon_{ijk}$$

where Y_{ijk} is a dependent variable, μ is the overall mean, ai is the effect of factor A (day) on the level i , βj is the effect of factor B (sire) on the level j , γ_{ij} is the interaction between factor A on the level i and factor B on the level j , and ϵ_{ijk} is the residual error.

The dependent variables were ethological parameters and the independent variables were factors such as the day of observation, and the sire lineage. Values are expressed in minutes (min.) as means \pm SE. The normality of data distribution was evaluated by the Wilk-Shapiro/Rankin Plot procedure. Significant differences between groups were tested by Comparisons of Mean Ranks through Tukey's test.

RESULTS AND DISCUSSION

No significant differences were noted between bulls in observed behaviours. Times of moving were gradually from the first to the third day and it did not increase significantly, while significant differences were recorded at the time of feeding only ($P < 0.01$) (Table 1). Between observed days, no statistically significant differences were noted in frequencies of aggressiveness and playing behaviour (7.20 ± 1.06 , 8.60 ± 0.75 , and 10.20 ± 1.02 , $P < 0.05$; 1.00 ± 0.63 , 1.80 ± 0.37 , and 4.40 ± 0.68 , $P < 0.001$) (Table 2).

Also, no significant differences were found among sires in maintenance behaviour (Table 3). Effect of sire was manifested in the frequency of licking ($P < 0.05$), aggressiveness ($P < 0.01$), and playing ($P < 0.05$). Descendants of sire 3 showed the highest aggressive expression compared with the descendants of the sires

Table 1: Times of maintenance behaviour according to days (mean ± SE)

	Day			P	
	1	2	3		
Lying	87.00 ± 17.36	87.00 ± 14.54	63.00 ± 12.00	0.4280	
Standing	280.00 ± 19.62	258.00 ± 15.29	273.00 ± 3.01	0.6092	
Ruminating	210.33 ± 18.37	192.00 ± 12.90	171.00 ± 10.17	0.1538	
Moving	213.00 ± 25.81	255.00 ± 25.10	286.00 ± 12.59	0.0871	
Feeding	171.00 ± 25.81	117.00 ± 11.02	117.03 ± 9.94	0.0071**	1:2,3*

Eating: Day*Sire = 0.0297*

N = 5; *P<0.05; **P<0.01

SE = standard error of mean

Table 2: Frequency of behaviours according to days (mean ± SE)

	Day			P	
	1	2	3		
Fight	15.20 ± 2.15	17.20 ± 1.56	19.60 ± 2.87	0.4779	
Lick	7.00 ± 2.86	6.80 ± 2.80	6.40 ± 2.64	0.9814	
Mount	22.40 ± 3.29	16.40 ± 0.87	15.80 ± 2.51	0.1152	
Paw	4.80 ± 3.50	4.40 ± 3.29	4.40 ± 3.69	0.9950	
Aggressiveness	7.20 ± 1.06	8.60 ± 0.75	10.20 ± 1.02	0.0241*	1:3*
Comfort	1.00 ± 0.45	1.40 ± 0.40	2.20 ± 0.20	0.1160	
Play	1.00 ± 0.63	1.80 ± 0.37	4.40 ± 0.68	0.0005***	1:3***, 2:3**

N = 5; *P<0.05; **P<0.01, ***P<0.001

SE = standard error of mean

Table 3: Times of maintenance behaviour according to sire (mean ± SE)

	Sire			P
	1	2	3	
Lying	90.00 ± 12.74	60.00 ± 8.66	65.00 ± 5.00	0.3076
Standing	273.89 ± 12.29	270.00 ± 25.98	260.00 ± 5.50	0.8386
Ruminating	203.33 ± 13.02	165.00 ± 0.03	180.00 ± 0.09	0.1570
Moving	237.22 ± 21.34	270.00 ± 17.32	275.00 ± 5.76	0.3827
Feeding	130.00 ± 7.90	150.00 ± 60.00	135.00 ± 8.66	0.4989

n = 5 (Sire 1, n=3; Sire 2, n=1; Sire 3, n=1); SE = standard error of mean

1 and 2 (7.78 ± 0.52 , 8.33 ± 1.85 , 11.67 ± 0.66 , $P < 0.01$) (Table 4). Bulls after Sire 1 had the least expressed licking behaviour and the most playing activities (3.67 ± 1.84 , 11.33 ± 0.66 , and 11.33 ± 0.67 , $P < 0.05$; 3.11 ± 0.65 , 1.33 ± 0.88 , and 1.33 ± 0.88 , $P < 0.05$).

Behaviour of an animal is an essential reflection of its well-being (Lidfors, 2005). The results of Fraser and Broom (1997), Broom and Fraser (2007), and Brouček *et al.* (2012) indicate that a well-balanced proportion of behaviours for cattle can be assumed by making

Table 4: Frequency of behaviours according to sire (mean \pm SE)

	Sire			P	
	1	2	3		
Fight	17.22 \pm 1.79	17.00 \pm 4.16	18.00 \pm 1.73	0.9714	
Lick	3.67 \pm 1.84	11.33 \pm 0.66	11.33 \pm 0.67	0.0459*	
Mount	17.44 \pm 1.46	19.33 \pm 4.33	19.33 \pm 4.33	0.7756	
Paw	7.55 \pm 2.71	0.00 \pm 0.00	0.00 \pm 0.00	0.1941	
Aggressiveness	7.78 \pm 0.52	8.33 \pm 1.85	11.67 \pm 0.66	0.0071**	1:3**, 2:3*
Comfort	1.67 \pm 0.33	1.67 \pm 0.37	1.00 \pm 0.57	0.4889	
Play	3.11 \pm 0.65	1.33 \pm 0.88	1.33 \pm 0.88	0.0149*	1:2,3*

n = 5 (Sire 1, n=3; Sire 2, n=1; Sire 3, n=1); *P<0.05; **P<0.01
SE = standard error of mean

comparisons of time budget of behaviours and activity pattern between various rearing conditions. Broom (1996) described a variety of behaviours expressed as one measure in a list of good animal welfare indicators.

In the present study, times of movement gradually increased from the first to the third day; however, feeding time was the longest on the first day. This seems to defy logic, as animals were expected to move the most and eat the least on their first day in an unfamiliar pen, where they were mixed with other animals. Dairy cattle must learn to cope with environments vastly different from the habitats to which their ancestors were adapted (Brouček *et al.*, 2011).

Behavioural disorder is any deviation from the normal natural behaviour of animals. However, not all the behaviour that is abnormal in the first sense is pathological (Appleby and Hughes, 1997; Fraser and Broom, 1997). Abnormal behaviours are considered behavioural response of the organism to unfavourable conditions in the life of animals. When interpreting abnormal behaviour it is often found to be similar to a natural behaviour that has not been fulfilled (Lidfors, 2005). Krohn (1994) argues that constantly tethered housing changes normal behaviours and increases incidence of abnormal behaviour. Animals used in the current study were not tethered, but they had a limited area without outside yard. Since the animals did not run, nor had enough space to perform certain activities (comfort behaviour, playing) they could have expressed behavioural disorders. Bulls in a pen environment under a restricted feeding period might compensate for a lower amount of time spent feeding by performing non-nutritive oral behaviour. However, the level of non-nutritive oral behaviours was enough to compensate for the lack of feeding behaviour (Ishiwata *et al.*, 2007).

In present study, the addition of fresh straw litter on the third day was a huge intervention in the behaviour of

the animals. That's what caused the increase in movement and the decrease in the length of eating. This explanation is also corroborated by the enormous increase in playing on the third day (P<0.001).

Statistically significant differences in frequencies of aggressiveness and playing behaviour were found during the observation days. This could be attributed to the enrichment of the animal surroundings on the third day. The pen was bedded, which triggered the animals' playing with straw and their throwing it in all directions. The movement of animals increased at the same time as their competitiveness, which may have caused an increased aggression in their interaction. However, the frequency of aggressive interactions declined rapidly as dominant-subordinate relationships were determined. Because this phenomenon is relatively common in nature as well as on farms and ranches, it should probably not be considered abnormal (Houpt, 1987).

Lawrence and Rushen (1993) and Mason and Rushen (2006) showed that mounting is abnormal sexual behaviour in fattening bulls. We recorded this disorder in all five bulls (from the group of 32 bulls it is 15.6 %). The level of sexual behaviour displayed is determined by genetics, physiological factors, environmental factors, health and previous experience. Bulls of dairy breeds are generally more sexually active than those of the beef breeds (Bouissou *et al.*, 2001; Kilgour, 2012).

Our results showed that cattle under any environmental conditions engage in some sort of oral behaviours for a certain proportion of the daytime. Especially in an intensive pen environment, cattle might perform more oral behaviours other than eating to compensate for the lack of occurrence of feeding behaviour. In addition, it is indicated that cattle in pen conditions under a restricted feeding period might compensate for a lower time spent feeding by performing other oral behaviour. The lack of oral behaviours caused

by the loss of eating might be compensated by oral behaviours except for eating as compensatory behaviours. In cattle in an intensive environment, the ingestion of the concentrate diet should stimulate oral behaviours and increase the motivation to perform oral behaviours (Phillips and Rind, 2001; Ishiwata *et al.*, 2008).

The aggressive behaviour (fighting and butting) did not seem to be very serious, because it most often occurred with low intensity. This supports the fact that in well-established groups of cows, threats and passive avoidance are the main patterns of agonistic behaviour used to maintain social rank (Krohn, 1994). The findings of Laister *et al.* (2011) suggest that relaxation effects induced by social licking differ between performers and receivers and are affected by the bull's basic activity. In receivers, there were clear indications of a calming effect implying the experience of positive affective states. In performers, such calming effects during social licking were not identified. Mixing-induced aggression is inevitable in group-housed animals, regardless of space allowance, group size, bedding, pen design, or feeding regimens. High frequencies of social disturbances are observed when the animals are mixed. Mixing leads to an increase in aggression as a new hierarchy has to be established (Bouissou *et al.*, 2001; Laister *et al.*, 2011).

In bulls, the increased aggression is accompanied by an increase in homosexual mounting. The most aggressive animals mount more often than the others and the rate of mounting increases dramatically when new steers are introduced in the group. The syndrome is seen most frequently when groups of animals are mixed, especially in crowded conditions (Laister *et al.*, 2011).

Cattle appear to have the fewest stereotyped behaviour of the various species of farm animals. Possible explanations are that animals are often kept in less confined environments and they spend a large portion of their time ruminating, a behaviour that may impede the development of stereotyped behaviours (Houpt, 1987).

The genetic influences on behaviour can be clearly manifested by the study of influence of sires. The sire lineage influences a large part of the population and hence its genetic qualities are effective as a stabilization factor. The sire is effective in the herd during a relatively short period, so the complex of factors to which its daughters are exposed during rearing should not be of such variability. In the present study, effect of the sire was manifested in the frequency of licking, aggressiveness, and playing. It appears that activities, aggressiveness and playing are easily influenced by the mood and welfare of the animals. The reason as to why licking is affected by the father is puzzling. In the present study mother effects were not evaluated.

CONCLUSIONS

The results of this study revealed that among observed days with different treatments differences were noted in frequencies of aggressiveness and playing behaviour. Effect of sire was manifested in the frequency of licking, aggressiveness, and playing behaviour.

Further experimental investigations are needed to better understand the abnormal behaviour development in progressed management.

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