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Eliminative behaviour of dairy cows at pasture

Lindsay Kay Whistance[a,*], Liam A. Sinclair[b], David Richard Arney[c], Clive Julian Christie Phillips[d]

[a] Faculty of Agricultural Sciences, Department of Animal Health and Bioscience, University of Aarhus, Blichers Allé 20, P.O. Box 50, DK-8830 Tjele, Denmark
[b] Animal Production and Science Group, Harper Adams University College, Edgmond, Newport, Shropshire TF10 8NB, UK
[c] Estonian University of Life Sciences, Kreutzwaldi 46, Tartu, Estonia
[d] Centre for Animal Welfare and Ethics, School of Veterinary Science, University of Queensland, Gatton, 4343 Queensland, Australia

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ABSTRACT

Despite a strong avoidance of grazing near dung patches, cattle have traditionally been considered not to avoid bodily contact with faeces, regardless of any risk of disease. Little is understood of the behaviour of pasture-kept dairy cows at the time of defaecation and therefore, the eliminative behaviour of 40 Holstein-Friesian cows was observed at pasture for 6 h each day between morning and afternoon milking for a total of 24 h. Lying (l), standing (s) and walking (w) behaviours were recorded pre, during and post-elimination. Sequences of 3–6 changes in these behaviours were recorded if expressed within 30 s of an eliminative event. Intentional, incidental or no avoidance of faeces was also recorded for each event. Activity, characterised as static (lying, grazing or loafing), or active (moving to a different area of field, going to drink and catching up with herd) was also recorded. Of the 437 events recorded, cows rose from lying to defaecate a total of 215 times. Thirty-two different defaecation sequences were observed and cows stood to defaecate and then moved forward in 18 of these sequences. The most frequently expressed were sSws and wSws and lSw and lSws which included half of all observed events (uppercase letters denote behaviour during defaecation). In all recorded events, 383 stood and 54 walked whilst defaecating ($P < 0.001$). Activity indicated that cows most often stood to defaecate when performing static activities, such as loafing or grazing, before and after defaecating ($P < 0.001$) but not when they were active before and after eliminating ($P = 0.72$). Walking whilst defaecating was most likely to occur when cows were simultaneously engaged in an 'active' state, such as going to drink or catching up with the herd. Overall, standing to defaecate and moving forward was the predominant behaviour pattern of dairy cows at pasture, regardless of activity. Avoidance of bodily contamination with fresh faeces was shown at all observed eliminative events.

1. Introduction

Previous studies of eliminative behaviour of cows at pasture have aimed to improve pasture management and, in particular, minimize contamination of the ungrazed sward which causes rejection by grazing cows (e.g., Michel, 1955; Hutchings et al., 2002). Latrine behaviour has not been seen in cattle and any grouping of faeces at pasture occurs as an incidental consequence of the concentration of animals in space and time (e.g., Kilgour and Albright, 1971; White et al., 2001). Cattle have not traditionally been regarded to avoid bodily contamination with faeces and cleanliness has been largely considered to be a function of the system of management (Kilgour and Albright, 1971; Hafez and Schein, 1962). Unlike other mammalian species, cattle have not been trained to defaecate in specific

* Corresponding author. Tel.: +45 8999 1406; fax: +45 8999 1525.
E-mail address: LindsayK.Whistance@agrsci.dk (L.K. Whistance).

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areas, although they can be trained to recognise elimination events (Whistance et al., 2009). However, there is an apparent dichotomy between the well-documented aversion to grazing near grass contaminated with faeces (Broom et al., 1975) as a means of controlling parasite intake and the ostensible lack of regard for bodily contamination with faeces (Scott and Kelly, 1989), which also has health consequences particularly in relation to udder and hoof health. Although cleanliness levels do improve during the grazing season (Ellis et al., 2006), it is not clear whether this is due to cattle actively avoiding bodily contact with faeces or as an incidental consequence of more space per animal.

Little is currently understood about cattle eliminative behaviour, even though it has a close relation to health and welfare. Their posture during elimination is consistent with avoidance of corporal contamination: an arched back, hind legs wider apart and tail lifted, suggesting avoidance of faecal splashes (Albright and Arave, 1997). Aland et al. (2002) noted that cows stand to defaecate and then move forward a few paces, further reducing any likelihood of bodily contact through stepping in faeces. We reported recently that housed dairy cows show a distinct repertoire of behavioural sequences at the time of elimination and that in the majority of sequences bodily contamination with fresh faeces was minimized (Whistance et al., 2007). This suggests a level of awareness not previously attributed to housed cattle (Hafez and Schein, 1962) although moving away from freshly deposited faeces was less common than standing still.

Differences in the levels of avoidance of excreta in cows housed in cubicle or straw yard facilities further indicated that straw yards allow cows a greater freedom to exhibit faeces-avoidance behaviours (Whistance et al., 2007), but it is not known whether this is similar to the behaviour of free-ranging lactating dairy cows provided with access to pasture in between milkings. The aim of this study was therefore to investigate the eliminative behaviour of dairy cows at pasture.

2. Materials and methods

The experiment was conducted in October 2005 using a 120 cow Holstein-Friesian dairy herd at Rectory Farm, Overstone, Northamptonshire, UK. The institutional research committee provided ethical approval for the study.

2.1. Animals

The majority of cows in the herd calved in a six-month period from August to January each year. As normal management practice, lactating cows were separated into a high yield group (mean days in milk 44.9, SD 19.6, $n = 34$) and a low yield group (means days in milk 314, SD 48.4, $n = 31$). Twenty high yield cows (mean kg/day 38.0, SD 6.5) and twenty low yield cows (mean kg/day 17.0, SD 3.7) were selected as study animals and balanced for parity (mean parity 3.4, SD 2.2; T-test: $T = -0.07$, $P = 0.95$). Cows were identified by existing freeze-brand/ear tag numbers.

2.2. Herd management

The herd was housed in cubicles during the winter and were out at pasture during the summer. High and low yield groups were each given access to 10 ha of adjacent ryegrass/clover pasture (A and B) with high yield cows grazing on pasture A during the day and pasture B at night and the low yield group grazing in the reverse pattern. Both groups were provided with a total mixed ration (TMR) that was mixed and available *ad libitum* each day after the afternoon milking. The TMR for high yielding cows consisted of maize silage (45.6%), grass silage (36%), corn meal (6.7%), soyabean meal (6.3%), maize gluten (2.2%), molasses (1.6%), straw (0.8%) Megalac (Volac UK, Royston, UK) (0.6%) and vitamins and minerals (0.2%). The TMR for low yielding cows contained maize silage (37.7%), grass silage (44.3%), corn meal (8.2%), soyabean meal (3.8%), maize gluten (2%), molasses (1.3%), straw (2.3%) and vitamins and minerals (0.4%). After consuming the TMR, cows had returned to pasture within 1 h after the end of milking. The two groups were milked twice daily beginning at 05.45 and 17.45 h.

2.3. Experimental routine

Cows were observed for 6 h each day between the hours of 10.00 and 17.00, avoiding any disturbances associated with the milking procedure. A total of 24 h of observations were made for each of the groups, divided into four consecutive days. Low yielding cows were observed from 13 to 16 October and high yielding cows from 18 to 21 October 2005. Cows were accustomed to the presence of the observer and the same observer recorded all behaviour throughout the study standing at least 10 m away from the herd.

Each animal about to perform eliminative behaviour became the target animal for the duration of the behaviour (similar to the method of Wechsler and Bachmann, 1998). Pre-, during and post-eliminative behaviours of walking (w), standing (s) or lying (l) were recorded for the study cows and duration was measured with a stopwatch. A pilot study revealed that, upon rising, cows at grass did not eliminate as promptly as did housed cows and they also changed their behaviour more shortly after defaecating (Whistance et al., 2007). For example, a cow may walk forward a few paces after defaecating, stand for a short while and then lie down. Therefore, to ensure that the full sequence of behaviour was included, between three behaviours (1 pre, 2 during and 3 post) and six behaviours (1 pre-, 2 pre- [$\leq$10 s], 3 during, 4 post [$\leq$10 s], 5 post [$\leq$10 s] and 6 post) were recorded if they occurred within up to 30 s of a defaecation event.

Similar behaviour sequences were grouped (Table 1) and categorised as intentional, incidental or no avoidance of excreta prior to analysis (as described in Whistance et al., 2007). In brief, intentional avoidance was recorded for sequences in which cows stopped a specific behaviour to void and then moved away before resuming their pre-eliminative behaviour. Sequences were recorded as incidental avoidance of excreta when cows walked or stood during and/or after eliminating but were also engaged in a second activity. No avoidance of faeces was recorded for lying cows that remained lying down during and after