

THE EFFECT OF CONCENTRATE FEEDING ON COW BEHAVIOUR

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Abstract

In automatic milking systems, where the concentrate and forage components of the ration are offered to the cows separately, lack of control over intakes can result in difficulties balancing the forage and concentrate portions of the diet, leading to problems associated with high concentrate intakes and concomitant low forage intakes. In order to check this as a problem on a dairy unit, the feeding behaviour of a sample of cows was observed by video recording. As a pilot study, four Holstein Friesian cows (two at the highest yield and two at the lowest yield of the milk production range) were selected from sixty lactating cows on the Estonian University of Life Sciences' farm near Tartu, Estonia. The study took place from May 18th till November 4th 2014. The cows were robot-milked and fed a ration comprising, separately, concentrate feed from a robot and a feeder, and a grass/clover silage mix forage at the feed barrier. With the low number of samples the results are indicative and descriptive, but it appears from the raw data that individual variation in visiting times and times spent at the feed barrier are greater than the effect of level of production. Cows spent a significant portion of their time idling at the feed barrier, not actively feeding. It is concluded that care should be taken to presume behaviour from positional data, and there is no evidence that cows with higher and lower milk yields are differentially motivated to feed from a forage source.

Key words: feeding behaviour, concentrate feeding.

Introduction

“Feeding involves a complex series of decisions and depends upon an elaborate array of mental, motor and digestive abilities” (Broom and Fraser, 2007). Cattle spend about five hours a day eating (Broom and Fraser, 2007; Yeiser et al., 2012), and cows modify their feeding behaviour according to the feed supplied, and demonstrate clear preferences for feed (Broom and Fraser, 2007).

To ease feeding management, many producers supplement forage with concentrate based on the average requirement of the whole herd (Lawrence et al., 2015). This means that cows whose production is less than average will receive more concentrate than they require, and cows with milk production higher than the average will receive less concentrate than they need to support their higher milk yield. This means that some cows are overconditioned and others are too thin and are not able to achieve their full milk yield potential. Overconditioned cows at calving are at higher risk for dystocia and in particular retained foetal membranes, which might lead to infertility (Roche, 2006).

Cows feed intake is not only affected by the amount of concentrate given. It depends on lactation (Berry et al., 2006), health and position in the social hierarchy. Feed intake is at its peak in mid-lactation, increases in early lactation and declines at the end of lactation (Berry et al., 2006). Friggens et al., (1998) found that lactation stage affects the intakes of only those cows which are offered a high concentrate total mixed diet. Low concentrate total mixed diets showed no effect on dry matter intake as lactation progressed.

Health disorders show high initial effects on feed intake and milk production (Barreille et al., 2003), already prior to clinical manifestation. The total feed

intake decrease is highest during the first occurrence and the first recurrence of ketosis (Barreille et al., 2003), and cows with mastitis show a 1.2 kg day⁻¹ decrease in feed intake five days period before diagnosis (Sepúlveda-Varas et al., 2014). Cows with locomotion disorders also show small daily feed intake decreases before diagnosis (González et al., 2008).

The aim of this study was to see if those cows which receive more concentrates in their rations feed less on a partially mixed ration than those receiving a lower rate of concentrates.

Materials and Methods

The trial was carried out on Märja farm of the Estonian University of Life Sciences, Tartu, Estonia. In this pilot study four multiparous Holstein Friesian cows were observed. They were cubicle-housed and milked with an automatic milking system (DeLaval). The mean milk yield for cows which were not offered concentrates was 21.1 kg day⁻¹ (\pm SD 3.3) while for those cows which did, the mean milk yield was 37.7 kg day⁻¹ (\pm SD 5.3). All cows received concentrates at the milking robot, additional concentrate was offered in a partially mixed ration at the feed barrier. Rations contained grass and clover silage and a compound feed of barley, and rapeseed cake. Hay was used if needed to all cows. The percentage of dry matter in partially mixed ration was from 39.8%-48.9%. The concentrate offered at the robot milker contained barley, wheat, rapeseed cake, maize, soya flour, sugar beet, yeast, sunflower meal, rapeseed oil, molasses, salt and Premivit 0.2% Cattle. In the concentrate bin wheat flour, wheat bran and limestone were additionally added; yeast was not included. Metabolizable energy in the concentrate in the bin was 11.9 MJ and metabolizable protein was

112.8 g kg⁻¹, while at the robot there were 11.8 MJ and 103.8 g kg⁻¹, respectively. Four cows were selected for the trial, based only on their concentrate consumption from the concentrate feeding bin. Two cows (one in III and one in IV lactation) received no additional concentrate, while the other two (one in II and one in V lactation) received 2 kg and 4 kg day⁻¹. The automatic feeder brought forage to the feeding barrier twice a day. Cows were observed from a gantry above the feeding area, and feeding behaviour at the feed barrier was video recorded over a 24-hour period from June 2014 till November on 34 separate occasions. Two more cows were filmed, but their videos are currently being analysed.

Behavioural parameters recorded were: time spent feeding, standing and walking, grooming herself, grooming herself with the enrichment spinning brush, grooming another cow (allogrooming), nudging another cow (moving her away), pushing another cow (moving her away), nudged, pushed or scared (moved away) by another cow.

Descriptive statistics for each parameter were calculated with Microsoft Excel: the sum, mean, maximum and minimum.

Results and Discussion

Statistical analyses showed that the mean time spent feeding did not differ much between the treatments (low concentrate cows 4h 35 min and high concentrate cows 6h 15 min). The same thing can be said about the times spent standing (low 1h 28 min and high 2h 01 min), walking (low 18 min and high 26 min) and drinking (low 15 min and high 11 min) behaviours. Soca et al. (2014) and Lawrence et al. (2015) have found that cows receiving more concentrate in their diet feed less on forage. Since cows observed were fed from feeding barrier not bins, it is impossible to calculate individual cow dry matter intake.

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Aggression was also observed. Cows who did not receive concentrate from the feeders pushed other cows away more (mean 116 times) than cows who received concentrate from feeders (mean 70 times). When we looked at which group of cows were pushed away more from the feed barrier, it emerged, that cows which received concentrates were pushed away more often (a mean of 70 times) than cows which did not receive concentrates (a mean of 49 times). This was primarily because one of the cows that received concentrates, which was in its second lactation, was pushed away by the other cows more than the other three.

When we looked at individual cows, the oldest cow (V lactation) was the least aggressive. She pushed other cows away 61 times in 24-hour period. Other cows were also less aggressive towards her than they were to each other. She was pushed away from the feed barrier 29 times. The youngest cow (II lactation) received the most aggressive behaviour toward herself. She was pushed away 111 times. This may have been because she was established as an older member of the herd, or because her greater age established herself in a high position in the social hierarchy.

Conclusions

Because of the low number of samples it is not possible to confirm or otherwise comment whether those cows receiving a higher amount of concentrate spend less time feeding on forage. Aggression was observed several times near the feeding barrier. As expected, the oldest cow received very little and the youngest one received the most aggression. We are planning to observe and video record more cows to provide more reliable results.

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