2015

Determining Social Preference of Holstein Cows Based on Stall Selection

Yoona Kang

J. N. Andrews Honors Program
Andrews University

HONS 497
Honors Thesis

Determining Social Preferences of Holstein Cows Based on Stall Selection

Yoona Kang

March 30, 2015

Advisor: Dr. Katherine Koudele

Primary Advisor Signature: _____

Department of Agriculture/Animal Science

ABSTRACT:

Early behavior work with dairy cattle focused on the agonistic interactions and dominance structure. This current behavior project focused on determining social preferences rather than dominance. Two lots of 130 Holstein cows at the Andrews University Dairy were observed 8 nights over the course of 6 weeks. Data was collected in the evening after milking and feeding to allow the cattle time to retreat to the freestalls to ruminant and rest. The ear tag number of each cow that was lying down was recorded on a diagram of the lot in which all the stalls were numbered. The data collected was statistically analyzed to determine if any cows lay near another specific cow repeatedly, more often than would be expected by chance. This was used to determine then if the cows at the Andrews University Dairy Farm have specific herdmates that they prefer to lie next to or near. The analysis showed that the cows did not lie next to the same cow a significant number of times. The cows that did were too few in number to be considered significant. Stall occupancy was also analyzed and the feed aisle sections of the lots were more frequently occupied than others potentially indicating greater desirability.

INTRODUCTION & BACKGROUND:

In most domesticated farm animal species, social hierarchies or groups are known to be prevalent throughout the herd. The types of social interactions can vary from linear, triangular or more complex relationships depending on various characteristics of the herd. Cows are relatively mild-mannered but can show their dominance through physical contact with each other. This would include mounting, sniffing, rubbing, head butting, and other forms of aggressive behavior (Houpt, 2005). Depending on how the cows are separated and grouped, social hierarchies and dominance may or may not be exist. Based on previous articles written on the topic of social behavior within Holstein dairy cowherds, social preferences and dominance interactions among cattle in various groups affect performance and behavior of the herd as a whole (Bøe and Færevik, 2003; Dickson and Wieckert, 1967). Some of the articles included regrouping unfamiliar cattle and recording behavior, as well as observing the correlation between milk production and the dominance established within social groups. In most of these projects, altering the social groups of the cow resulted negatively with decreased milk production, increased aggression and reduced feed intake from this added stress. These findings have led to the now common practice of keeping cows in fairly stable social groups throughout the majority of their 10-12 month lactations.

This current research project sought to gain more detail about cow social groups at the Andrews University Dairy focusing on determining social preferences rather than dominance. Social preferences were inferred by which herdmates a cow chose to lie near at night. Also, recording which areas of the barn are more highly desirable or occupied than others based on stall occupancy.

METHODOLOGY:

The data collected was from Lots 1 and 2 at the Andrews University Dairy Farm. These include young cows (Lot 1), which are heifers – cows that are in their first lactation – and older cows (Lot 2). There are about 130 cows within each lot but considering turnover, a total of 350 cows were actually observed. These lots were chosen because they are the first two groups milked which would allow for data collection at times more conductive with a college student's schedule. The data was collected around 9:30PM-10:00PM using a diagram that shows the arrangement of the stalls within each lot (Figure 1). The stalls are numbered circling each section and ending at the lower end of the barn.

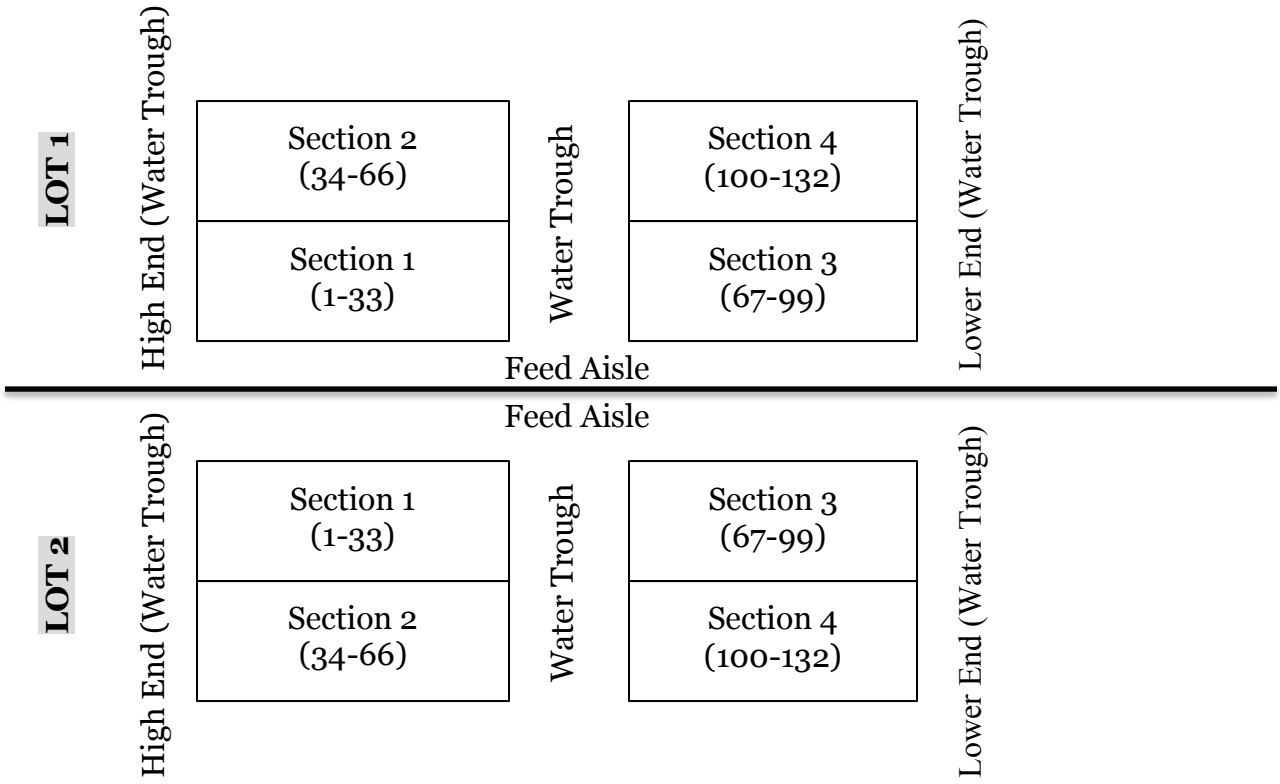

Figure 1: Diagram of the layout of the barn for observation and the labeled sections used for data collection.

The lots were milked at around 7:00-8:00 PM and therefore the time of the data collection allowed the cows to feed and then lie to rest and ruminate. The ear tag numbers of the cows lying down in each stall were recorded with the least amount of disturbance. Seven to eight observations were made in each lot and taken over the course of 6 weeks and the data was collected only when about 70% or more of the cows are resting and lying down, if not, data is not recorded for that night. The barn is on a 2% slope and the stalls at the upper end of the barn have shown to have a higher occupancy rate than the lower stalls thereby implying that they are more desirable (Koudele et. al, 2002). Therefore, the stall occupancy in certain areas of the barn was also considered and analyzed.

Since the lots are mirror images of each other, the data regarding stall number was combined. For example, section 1 of Lot 1 is located at the higher end of the barn and closest to the feed, identical to the location of section 1 of Lot 2. The data was analyzed using one-way analysis of variance for stall occupancy and frequency analysis was used to determine which cows lay near specific herdmates during the observations.

DATA & RESULTS:

After analysis of the results, there was no evidence of cows repeatedly lying next to the same cow. Over 70% of the recorded cows, or 250 cows, were found to never lie next to the same cow over the course of observations. Only 1 cow showed to lie next to the same cow four times out of fifteen observations (Figure 2).

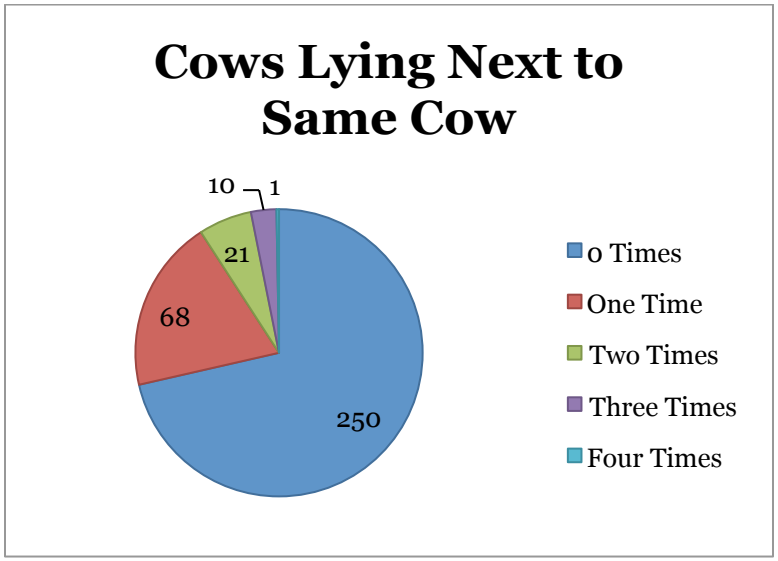

Figure 2: Data showing how frequently a cow rested next to the same cow.

This data was analyzed using frequency analysis measuring the cows that were in the 1-2 stalls away from a specified cow. The one cow lying next to the same cow repeatedly includes the two stalls on the right and on the left of the indicated cow. The fifteen observations are the combined data of both the lots. Stall occupancy was also measured using frequency analysis and found section 2 to be the least occupied. Stall 45 was the least occupied stall and resides in Section 2 of both lots. Stall 86 is recorded to be occupied every observation, being the single most occupied stall in both lots (Table 1). According to one-way analysis of variance, Section 2 is the least

occupied section – stalls 34-66 – on average, whereas Section 3 – stalls 67-99 – is the most occupied on average (Table 2). This data proved to be significance of 0.000.

Number of Recorded Occupancies	Number of Stalls
4	1 (#45)
5	3 (#41, 47, 50)
6	2
7	17
8	13
9	14
10	26
11	19
12	16
13	17
14	3 (#19, 108, 111)
15	1 (#86)

Table 1: The number of stalls occupied over the course of the observations and the stall number I assigned in the parentheses.

Section Number	Average Stall Occupancy
Section 1	10.67
Section 2	7.94
Section 3	10.88
Section 4	9.99

Table 2: Average stall occupancy within each section of the lots.

DISCUSSION:

This project explored a different area of cow behavior focusing on social preference in herdmates rather than dominance or aggressive behavior using stall selection as a determinant. From the data analysis, there is no significance in the cow's choice of stalls in relation to their social preferences. Since the data of the two lots were combined, it also showed that the turnover rate of the two lots seemed to be larger than anticipated. The cows were found to move between lots with addition and removal of some cows throughout the observational period. Therefore the movement of the cows over the course of the 6 weeks caused the accumulation of 350 cows total moving in and out of both lots. This might have played a role in the cows' choice of stalls and affected the data.

However, differences in stall occupancy among certain sections of the lot were significant. Although past research has shown that the high end of the barn to be more desirable due to the 2% slope, the low end has was more occupied for this experiment during this time and with these specific lots. Section 2 was the least occupied; it is placed at the high end of the barn away from the feed aisle and therefore assumed to be less desirable. Sections 3 and 4 are more occupied with cows wrapping around to fill in Section 4 after Section 3 was full and all the feeding areas were being used. Section 1 was the most occupied of all the sections since it is at the high end of the barn, close to the feed aisle and closest to the exit from the milking parlor. Also, considering the noise level, especially at night, may have swayed the choice of stalls when lying down to rest and sleep. The upper end of the barn tends to be much louder since it includes the entrance to the lots and exit to the milking parlor and other lots. In contrast, the lower end of the barn is much quieter with the open field and with no lights entering from that end.

CONCLUSION:

Preferred herdmates cannot be completely determined from this one method. The research proved inconclusive in that no cows lay next to certain other cows consistently. Factors influencing this behavior include small but frequent changes in the cow population, favored freestalls within the barn, and the fact that many of these cows had been together since calfhood and likely did not have specific preferred herdmates.

This project cannot prove cows do not have preferred herdmates. Further research can be done by looking at the order in which the cows come in for milking, observing smaller or larger consistent groups within the lots, or recording social interactions over a longer period of time. Although this project was purely for observation rather than for implementing changes in the dairy farm, it provided advantageous insight in the social dynamics of the cowherd at the Andrews University Dairy.

BIBLIOGRAPHY:

Arave, C., Albright, J., & Sinclair, C. (1974). Behavior, Milk Yield, and Leucocytes of Dairy Cows in Reduced Space and Isolation. *Journal of Dairy Science*, *57*(12), 1497–1501-1497–1501. Retrieved from http://www.journalofdairyscience.org/article/S0022-0302(74)85094-0/abstract?showall=true=

Bøe, K. E., & Færevik, G. (2003, February 23). Grouping and social preferences in calves, heifers and cows. *Applied Animal Behaviour Science, 80*(3), 175-190.

Dickson, D., Barr, G., & Wieckert, D. (1967). Social Relationship of Dairy Cows in a Feed Lot. *Behaviour, 29*(2), 195-203.

Duve, L., & Jensen, M. (2012, August 17). Social behavior of young dairy calves housed with limited or full social contact with a peer. *Journal of Dairy Science, 95*(10), 5936-5945.

Houpt, K. (2005). *Domestic animal behavior for veterinarians and animal scientists* (4th ed.). Ames, Iowa: Blackwell Pub.

Koudele, K. A., L. D. Birney, L. H. Adams. 2002. Cow distribution within two different types of free-stall barns at varying temperatures. J Anim Sci 80 (sup. 1): 27 / J Dairy Sci 85 (sup 1): 27.

von Keyserlingk, K. E., Olenick, D., & Weary, D. (2007, July 19). Acute Behavioral Effects of Regrouping Dairy Cows. *Journal of Dairy Science, 91*(3), 1011-1016.