J. Rakuno Gakuen Univ., 17(1/2): 17~23 (1992)

Relationships between Learning of Utilization of Automatic Feeding Station and Training Methods in Naive Steers

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(March, 1992)

Key Words: Naive steers, Learning process, Automatic feeding station.

Abstract

Nine non-experienced Holstein steers were used to study the effect of grouping with experienced steers and teaching by a human on the learning process for utilization of automatic feeding stations. The steers were a) reared alongside of experienced steers (OL treatment), b) taught the position and utilization of feeding station by a human (TE treatment), or c) reared with experienced steers and taught by a human (OL+TE treatment). The experiment started at 8:15 on the first experiment day and ended at 8:00, 4 days later. Using a video camera, we continuously recorded the behavior of steers near the feeding station. The durations from the start of the experiment to the first attempts to use both an automatic feeding station and the assigned station were shortest in the OL+TE treatment. The duration from start of experiment to first successful eating was also the shortest in the OL+TE treatment. The amount of dry matter intake in the OL+TE treatment was constant from the first to third experimental day, but that in the OL and TE treatment decreased in the first experimental day. We concluded that both learning from other cattle and from a human were important in learning to utilize the feed station.

Introduction

At present, automatic feeding stations are widely used in dairy management in order to eliminate or reduce labor on the farm[2]. There have been many reports dealing with the utilization of automatic feeding stations and related animal behavior. One aspect of automated feeding which has not been studied in detail is how the cattle learn to utilize the feeding station. The study of this learning process was necessary to facilitate the introduction of automatic feeding stations on dairy farms and to train individual cattle who use it for the first time.

The studies of this learning process in cattle indicated that learning by imitating experienced individuals was important[1]. Usually, the farmer does not help acquaint the cattle with the position and utilization of a new feeding station, and this may also be important in the learning process.

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This study was conducted to study the relationships between the cattle's learning to utilize the automatic feeding station and the training methods used. The time spent in the learning process, the first attempt to use the feeding station, the first detection of his own feeding station and the first eating at the station were compared for training methods. The daily variation of behavior in the non-experienced (naive) steer was examined.

Materials and Methods

Nine Holstein steers which had no experience of eating at an automatic feeding station (naive steer) and three experienced steers were used to study the relationships between learning to use such a station and training methods. Steers, with collars around their neck, were kept in a dry-lot (7.6 m × 29.6 m, Fig. 1) over an experimental period of 3 days per steer. The dry-lot had 4 automatic feeding stations. An automatic feeding station was assigned to each steer, and the steers could eat a mixed ration (hay : concentrate = 3 : 7) at the assigned feeding station. The mixed ration of 5.6 DMkg/steer/day was offered at 8 : 00 and 17 : 00.

The 9 naive steers, all of approximately the same liveweight were allocated to one of following three treatments, thus there were 3 naive steers in each treatment. a) OL treatment: One naive steer was put in with 3 experienced steers. There was no teaching by a human. b) TE treatment: The naive steer was kept alone. 10 minutes before the start of the experiment, a human taught the steer how to be use the automatic feeding station. In this teaching process, the steer was moved to his assigned feeding station position, his head was put into the feeding station and, after eating for a few seconds, his head pulled out of the feeding station. This process was repeated 5 times. c) OL+TE treatment: The naive steer was put in with 3 experienced steers to learn by imitation, and teaching by a human was also conducted, as in the TE treatment.

The experiment started at 8 : 15 on the first experimental day and ended at 8 : 00, 4 days later. At the start of the experiment, the steer was released at

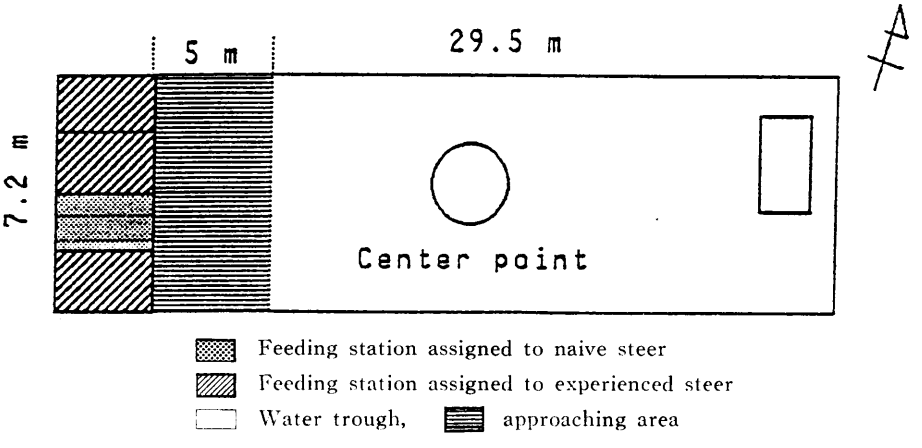

Fig. 1. Layout of the experimental lot.

the center point. Using a video camera, the behavior of the naive steer near feeding stations (5 m) was continuously recorded. Approaching the feeding station (5 m), attention to the feeding station, entering the head into the feeding station (attempt to use the feeding station) and eating of the ration were analyzed by the videorecord.

The statistical method used to compare the results of different treatments was the Wilcoxon-Mann-Whitney two-sample test[4].

Results

The learning process for utilization of feeding stations

Table 1 shows the learning process for utilization of automatic feeding stations in naive steers. The duration from the start of the experiment to the first attempt to use an automatic feeding station was shortest in the OL+TE treatment. The duration for the TE treatment was shorter than that for the OL treatment. The duration from the shart of the experiment to the first attempt to use the assigned automatic feeding station was shortest in the OL+TE treatment. The duration for the TE treatment was shorter than that for the OL treatment. The duration from the start of the experiment to the first eating was 8 minutes in the OL+TE treatment. This took 372 minutes in the OL treatment and 487 minutes in the TE treatment. The duration from the first attempt to use the assigned feeding station to the first eating was shorter for the OL treatment than for the TE treatment.

Table 1. The duration of leaning process of utilization of automatic feeding station in naive steer

Treatment	OL[1]	TE[2]	OL+TE[3]	SE[4]
	min.			
From start of experiment to first				
Attempt[5]	139[a]	83[a]	7[b]	50
Attempt to assigned[6]	173[a]	96[a]	8[b]	55
Eating	372[a]	487[a]	8[b]	70
From first success entering to first				
Eating	199[a]	391[b]	0[c]	53

Mean with different superscripts differ significantly ($P<0.05$)
1) with experienced steers, no teaching
2) isolated, teaching by a human
3) with experienced steers, and teaching
4) standard error
5) Entering head into feeding station, but not eating
6) Entering head into assigned feeding station

Table 2 shows behavioral frequency from the start of the experiment to the first eating. The behavioral frequencies of approaching the automatic feeding station, attention to the feeding station and attempt to use the feeding station

Table 2. Behavioral frequency from start of experiment to first eating

Treatment	OL	TE	OL+TE	SE[1)]
Approach[2)]	29[a]	19[a]	1[b]	5
Attention[3)]	22[a]	31[a]	3[b]	6
Attempt[4)]	9[a]	9[a]	2[b]	2

See footnote in table 1 about treatment
Mean with different superscripts differ significantly ($P<0.05$)
1) standard error
2) Within 5 m from feeding station
3) Attention to feeding station or trough
4) Entering head into feeding station, but not eating

were significantly ($P<0.05$) lower in the OL+TE treatment than those in the OL and TE treatment.

Daily variation of behavior and intake

Table 3 and 4 show the daily variation in the frequency of approach, attetion to the feeding station attempt to use the feeding station and eating at the assigned feeding station in naive steer. The frequency of approaching the feeding station, attention to the feeding station and attempt to use the feeding station decreased from the first to second experimental day, but that of the third experimental day was similar to that of the second day. The frequency of eating in the TE treatment increased from the first to the second experimental day, and remained constant from the second to the third day. In the OL+TE and OL treatment, the frequency of eating was constant from the first to the third experimental day.

Table 3. Daily variation of frequency of approaching and attention behavior to feeding station in naive steer

Treatment	OL	TE	OL+TE	SE
Approach				
1st day	46	37	30	5
2nd day	16	21	14	2
3rd day	14	22	14	3
Attention				
1st day	49	60	41	8
2nd day	27	30	16	8
3rd day	21	30	20	5

See footnote in table 1 about treatment
See footnote in table 2 about behavior

Table 5 shows the percentage of eating in naive steer. In all three treatments, the percentage of eating increased from the first day to the third day. The percentage in the TE treatment was lowest on the first experimental day and the highest on the second and third day.

Table 4. Daily variation of frequency of attempt and eating in naive steer

Treatment	OL	TE	OL+TE	SE
Attempt				
1st day	54	36	56	11
2nd day	35	29	31	5
3rd day	39	27	36	6
Eating				
1st day	19	11	24	5
2nd day	26	21	16	5
3rd day	21	24	21	4

See footnote in table 1 about treatment
See footnote in table 2 about behavior

Table 5. Daily variation of the percentage of eating to attempt in naive steer

Treatment	OL	TE	OL+TE	SE
		%		
1st day	35[a]	28[b]	43[a]	5
2nd day	45[a]	70[b]	52[a]	9
3rd day	58[a]	88[b]	59[a]	6

See footnote in table 1 about treatment
Mean with different superscripts differ signif cantly ($P<0.05$)

Table 6 shows the daily variations of feed intake in naive steer. The feed intake in the OL+TE treatment was constant from the first to the third experimental day. The feed intake in the TE and OL treatment increased from the first to the second day, and was constant to the third day. On the first day, the feed intake of the TE treatment was lowest.

Table 6. Daily variation of intake of naive steer

Treatment	OL	TE	OL+TE	SE
		DMkg/day		
1st day	3.9[a]	3.5[a]	5.5[b]	0.5
2nd day	5.5	5.5	5.5	0.1
3rd day	5.3	5.6	5.5	0.2

See footnote in table 1 about treatment
Mean with different superscripts differ significantly ($P<0.05$)

Discussion

All steers had learned to utilize the automatic feeding station within 12 hours of the start of the experiment. In this experiment, feed was given at 8:00 and

17 : 00. A few steers which learned to utilize the feeding station slowly, mainly those in the OL and TE treatments, did not take the first feeding of the experiment, and therefore the first day's feed intake was less than the second and third day's in the OL and TE treatment. Usually, cattle were kept in groups on daily farms using automatic feeding stations. The results of this study suggested if farmer didn't acquaint the inexperienced cattle with the utilization of the automatic feeding stations, the cattle had a reduction of feed intake on the first day. Feed intake is directly related to animal production; lack of teaching might lead to reduced production.

Karn and Clanton[3] reported that two weeks or more would be needed to train a group of 24 animals. In our experiment, all steers learned to utilize the automatic feeding station in a day. The steers in our study required less time to learn to utilize the feeding station than did those in Karn and Clanton's experiment[3]. Karn and Clanton[3] used the same type of automatic feeding station as we did, such that each individual was assigned a feeding station. When this type of feeding station is used, cattle had to find their own feeding station. Increasing the number of feeding stations caused difficulties in detecting their own feeding stations. In our experiment, OL and OL+TE treatment were group rearing, and there was only one non-experienced steer. If many non-experienced steers were reared together, confusion might occur. That is the primary reason the steers in our study learned sooner than those in the other experiment.

Karn and Clanton[3] conducted their experiment in the pasture, and their feeding stations provided only supplemental feed. The animals could eat roughage, if they could not use the feeding station. Our experiment was conducted on a dry-lot, and diet was offered only at the feeding station. The effect of food reward in our experiment was higher than that of Karn and Clanton's experiment[3]. This is the second reason that steers in our experiment required a shorter time to learn than cattle in their experiment.

We concluded that learning from other steers and from humans was important to learn to utilize feeding station. If a farmer does not acquaint his cattle with the utilization of feeding stations, feed intake on the first day of using the new feeding system will be reduced.

References

1) Hart, B. L., 1985: Animal learning, In The Behavior of Domestic Animals. pp. 264-299, W. H. Freeman and Company, New York.

2) Ipema, A. H., H. K. Wierenga, J. Metz, A. C. Smits and W. Rossing, 1988: The effect of automated milking and feeding on the production and behaviour of dairy cows, In Automation of Feeding and Milking: Production, Health, Behaviour, Breeding. (J. Unshelm and G. Schönmuth, eds.), pp. 11-24, Pudoc, Wageningen.

3) Karn, J. M. and D. C. Clanton, 1974: Electronically controlled individual cattle feeding. J. Anim. Sci., **39**: 136 (abstract).

4) Steel, R. G. D. and J. H. Torrie, 1980: Nonparametric statistics, In Principles and Procedures of Statistical: A Biometrical Approach. pp. 533-553, McGraw-Hill Book Company, New York.

要　　約

本試験では，個体識別飼槽の利用法を既に習得している去勢牛との群飼あるいは人による馴致が，未経験牛の個体識別飼槽の利用法習得に及ぼす影響を検討した。供試動物には，9頭の未経験去勢牛および3頭の経験去勢牛を用いた。処理区は，経験牛と群飼したOL区，人による馴致を行ったTE区，および経験牛と群飼し，さらに人による馴致も行ったOL＋TE区とした。飼料は乾草と配合飼料を3:7の割合で混合し，1頭当たり5.6 DM kg/日を給与した。試験期間は，未経験牛1頭につき3日間とし，飼槽付近の行動を72時間連続で調査した。得られた結果は以下の通りである。試験開始から，個体識別飼槽への最初の首入れまで，割り当て飼槽への最初の首入れまで，および割り当て飼槽での採食までの時間は，OL＋TE区で最も短かった。OL＋TE区における未経験牛の乾物採食量は，試験期間中に変化しなかった。これに対し，OL区およびTE区での試験第1日目の採食量は，第2および3日目に比べ少なかった。以上のことから，経験牛との群飼および人による馴致は，未経験牛における個体識別飼槽の利用法習得のために重要であると判断した。また，経験牛との群飼あるいは人による馴致のいずれか一方だけでは，利用法習得が遅れ，採食量が低下することも示された。