Influence of Early Social Learning on Later Feeding Behaviour for Novel Food in Calves

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Abstract The object of this study is to examine whether the early social learning experience influences later intake of three novel foods in calves. This study consisted of two phases : the learning period and the persistent testing period. In the learning period, Group I of six calves were exposed to novel food and ate together with their dams. Group O of six calves could see what their dams ate, but they could not eat the novel food. Group T of six calves were exposed to novel food alone. The novel foods used in this experiment were alfalfa haycubes which their dams had eaten before, and tofu lees which their dams had not previously experienced eating. The learning period to the novel food lasted for three days in each group. After the learning period, calves were weaned and fed on a basal diet for 12 weeks as the persistence period of learning. Intake of alfalfa haycubes tended to increase in Group I at almost significant level ($P=0.05$). Intake of tofu lees did not differ significantly among the three groups. Early social learning on novel food, even for only 60 min, influenced feeding behaviour after 12 weeks in calves.

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Social learning can occur either with immediate reinforcement or with delayed reinforcement¹⁴⁾. Social learning with immediate reinforcement is called imitational learning⁸⁾. Imitational learning has been demonstrated in monkeys⁶⁾ and rats⁵⁾. Social learning with delayed reinforcement is generally considered to be observational learning¹⁰⁾. Observational learning has been demonstrated in cats³⁾ and primates⁹⁾.

A previous paper⁴⁾ suggested that the existence of cattle which had experienced grazing brings psychological stability and social learning to unexperienced calves under the grazing situation. According to the previous study, calves with heifers or cows grazed more efficiently than calves alone. Many studies using sheep^{1, 2, 7, 12, 13)} suggested that social learning sustained longer than trial and error even if the young were separated from social models after learning. In the modern intensive animal production, novel foods such as food processing by-products, animal origin foods and woods are commonly presented to animals.

From the view of reducing stress and accelerating intakes, it is an important technique for animal production to make animals adapt to new foods smoothly.

The object of this study was to examine whether the early social learning experience in cattle influences the future intake of novel food in calves. This paper also discussed whether imitation or observation is more important in social learning.

Materials and Methods

This study took place from October 1996 to January 1997 at the Experimental Farm of Tohoku University. This experiment was divided into two phases, the learning period and the persistent testing period. Eighteen Japanese Black calves with their dams were assigned to three groups according calves' weight and sex (Table 1). All calves were born at June and July, 1996. The first group of six calves was an imitation model (I), the second group of six calves was an observation model (O), and the third group of six

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calves was a trial and error model (T). In the learning period, Group I were exposed to novel food with their dams and they ate together from same trough. Group O were separated from their dams by fencing, who were eating novel food. The calves could see what their dams ate, but they could not eat the novel food. Group T were separated from their dams by fencing, and exposed to novel foods alone.

Each group with dams was kept in a separate pen

Table 1. The number and body weight (kg) of calves in the learning period and testing period of each treatment

Group	n	Learning (16-20)* ¹	Testing (28-32)
Group I	♂ : 3 ♀ : 3	87 ± 21* ² (452 ± 51)* ³	144 ± 41
Group O	♂ : 3 ♀ : 3	85 ± 12 (422 ± 51)	145 ± 23
Group T	♂ : 3 ♀ : 3	86 ± 15 (441 ± 19)	143 ± 18

*¹ Weeks of age.

*² Mean ± standard deviation.

*³ Dams' weight.

and fed grass silage, corn silage and formula feeds as a basal diet throughout the experiment. The novel foods used in this experiment were alfalfa haycubes which their dams had previously experienced eating, and tofu lees which their dams had not previously experienced. Calves had eaten neither of the novel foods.

The learning period of each novel food started when calves were 16-20 weeks old and lasted for three days in each group. Calves in each group were exposed to each food for 20 min per day just before the ordinary feeding time. Food (fresh weight) proportional to about 0.1% of total body weight was available. These calves were weaned three days after the learning period and separated into three groups at random.

After the learning period, calves were fed a basal diet for 12 weeks. Persistent effects of the treatment were tested, when calves were 28-32 weeks old. Calves were individually given each food once (1.5 kg of fresh weight : about 1% of mean body weight) for 20 min and the amount ingested in grams was recorded.

The intake was compared by analysis of variance (GLM procedure ; Statistical Analysis Systems Insti-

Table 2. The amount offered and intake of two foods in the learning period of each treatment

Treatment* ¹	I	O	T
Animals measured	Group I + dams	Dams Group O	Group T
Alfalfa haycubes			
Amount of feeding (kg)	25.00	20.00	5.00
Intake (kg)			
'96/10/30* ²	14.55	11.79	0.07
10/31	13.64	12.28	0.11
11/01	18.33	12.40	0.75
Tofu lees			
Amount of feeding (kg)	25.00	20.00	5.00
Intake (kg)			
'96/10/30	0.49	0.15	0.05
10/31	0.37	0.49	0.05
11/01	0.33	* ³	0.02

*¹ Treatment I show values per unit of dam + calf and the others per unit animal.

*² Date observed.

*³ No data.

Fig. 1. Intake per 20 min of two foods in the testing period for each group. Each column and error bar represent mean and standard deviation, respectively.

tute Inc., 1997) in which the effect of the group was used as a fixed effect.

Results and Discussion

Intake of alfalfa haycubes and tofu lees in the learning period of each groups shown in Table 2. During the learning period, dams of Group I smelled the alfalfa haycubes and ate immediately. Group I watched their dams eating, and participated immediately. On the other hand, dams of Group I smelled tofu lees and ate little by little, but calves hardly ate any tofu lees. Dams of Group O behaved in the same manner as dams of Group I, and Group O watched their dams eating. Group T smelled alfalfa haycubes and tofu lees and ate little by little. Tofu lees, which the dams had not previously experienced, were scarcely eaten by the calves in all groups even in the learning period. Provenza and Balph¹¹⁾ suggested that the existence of the experienced animal reduced the novelty of the food. In this study, it was thought that social learning of novel food occurred only under eating of alfalfa haycubes not under eating of tofu lees.

The intake of each food in the testing period is shown in Fig 1. Group I ate alfalfa haycubes immediately, but Group O and T smelled alfalfa haycubes and ate little by little. The effect of the group on intake of alfalfa was almost significant ($F_{2, 15} = 2.57$,

$P = 0.11$). Group I tended to eat more effectively than Groups O and T (vs Group O ; $P = 0.10$, vs Group T ; $P = 0.05$) and there was no significant difference between Group O and Group T. Intakes of tofu lees, however, did not differ significantly among all three groups. Intake of tofu lees was too little, and four individuals of Group I, two of Group O and three of Group T did not eat at all in the testing periods.

There were no differences in the intake of each food by Group O and Group T. Labot *et al.*⁷⁾ suggested that familiarity with the novel food by sight played an important role in acceptance of the novel food. In this experiment, however, the intake of the novel food did not improve by observation only. Thohallsdottir *et al.*¹⁴⁾ reported immediate repetition enhanced the effect of observational learning. As there were 12 weeks between the learning period and the testing period in this study, observational learning did not occur or learning disappeared before the testing period under the usual feeding condition.

The intake of calves was improved by social learning with experienced dams, even for only 60 min during the nursing period. Observational learning did not prove to be effective for the learning of novel food. It is suggested that imitational learning improved the acceptance of novel food more efficiently than observational learning.

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