Are Litter Mates Needed for Each Piglet to Keep its Exclusive Teat after the Establishment of a Teat Order?

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Abstract Experiments were conducted to investigate how piglets discriminate between their exclusive teats on their dam's udder after the establishment of a teat order. Thirteen piglets from two litters were used. All piglets were tested from 1 to 3 weeks of age in the following two experiments. Experiment 1 : When the sow grunted to indicate suckling, her litter was moved to the next pen. The piglets were housed one by one in a starting box placed at the back of the lying sow. After a short period, the door of the box was opened and each piglet started to seek its dam's udder without its litter mates. Experiment 2 : When the sow grunted to indicate suckling, her litter was moved to the next pen. The front teats, on both the left-hand and the right-hand sides, were covered by an elastic cloth which was skin color. The piglets were housed in a starting box placed at the back of the lying sow. After a short period, the door of the box was opened and the piglets started to seek their dam's udder. In experiment 1, 76.9% of the piglets were able to reach their dam's udder within 3 min, and 83.3% of them reached their exclusive teats ($P < 0.01$). In experiment 2, the piglets that had occupied the front teats could not find their teats since they were covered with a cloth. The piglets were in a flurry and did not reach any other teats. All the other piglets were able to reach their proper teats within 3 min. These results indicate that piglets might be able to discriminate between their exclusive teats from other teats in an absolute position, but not in a position relative to other litter mates.

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Newborn piglets show a strong tendency to preferentially occupy the anterior teats. However, most piglets return to the same part of the udder and fix onto their one or two exclusive teats during the first few days. The consistent position which piglets occupy on the udder is generally called the 'teat order'⁸⁾.

Piglets usually have to find a teat without the assistance of their dam. Therefore, their auditory, visual, olfactory and tactile senses are well developed immediately after birth⁶⁾. The teat seeking behavior of the piglets requires a wide variety of sensory cues^{2-4, 10)}. We have shown that the visual stimulus is the most important aspect of teat seeking behavior by the piglets, and that olfactory interception has a lesser effect than the visual and auditory senses⁹⁾. However,

the relative importance of the existence of litter mates to keep their teat order has not been studied.

The objective of the present experiment was to investigate how piglets discriminate between their exclusive teats on their dam's udder, especially the relative importance of the existence of litter mates, after the establishment of a teat order.

Materials and Methods

Animals and experimental period

Experiments were carried out to investigate how piglets discriminate between their exclusive teats on their dam's udder after the establishment of a teat order (7 days of age). Thirteen crossbred piglets (Landrace × Large White × Duroc) from two litters were used. Litter 1 consisted 4 males and 6 females,

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Table 1. Time spent on teat seeking behavior in Exp. 1 (min/sec)

Individual No.		1st wk	2nd wk	3rd wk	mean
Litter 1	1-1	1'33	1'41*	1'29*	1'34
	1-2	2'31	1'48	<i>N</i>	2'10
	1-3	1'56	<i>N</i>	2'20*	2'08
	1-4	1'04	<i>N</i>	1'38	1'21
	1-5	<i>N</i>	1'46	2'10	1'58
	1-6	2'46	1'45*	1'46*	2'06
	1-7	1'56	2'28	1'46	2'03
mean		1'58	2'01	1'51	1'54±'26
Litter 2	2-1	<i>N</i>	1'31	1'23	1'27
	2-2	1'14	2'22	1'09	1'35
	2-3	<i>N</i>	2'48	<i>N</i>	2'48
	2-4	1'42	1'08	1'11	1'20
	2-5	2'28	2'32	2'12	2'24
	2-6	<i>N</i>	<i>N</i>	2'48	2'48
mean		1'48	2'04	1'45	1'53±'40

*, reached another (not exclusive) teat.

N, did not reach any teats.

and 7 healthy piglets (2 castrated males and 5 females) of them were used. Litter 2 consisted 5 males and 3 females, and healthy 4 castrated males and 2 females of them were used. All piglets were tested from 1 to 3 weeks of age, one session per week, in the following two experiments. Experiments 1 and 2 were done on every Monday and Thursday morning, respectively. Both experiments were conducted in the farrowing crate (210 cm × 223 cm) with a feeder and a waterer for the sow and a feeder and a heater for the piglets.

Experiment 1

When the sow grunted to indicate suckling, her litter was moved to the next pen. The piglets were housed one by one in a starting box (40 × 45 × 40 cm) placed at the back of the lying sow. After a short period (< 1 min), the door of the box was opened and each piglet started to seek its dam's udder without its litter mates.

The piglets' behavior was observed directly for 3 min by the experimenter behind the starting box. The route used and time spent on teat seeking were recorded for each piglet. The number of piglets which could not reach their dams' teats in 3 min was

also counted. Piglets generally reached their dams' teats and sucked in less than 1 min, and there was no case that the teat seeking took more than 3 min in the pre-experiment. Therefore, one session lasted 3 min.

Experiment 2

When the sow grunted to indicate suckling, her litter was moved to the next pen. The front two teats, on both the left-hand and the right-hand sides, were covered by a belt of elastic cloth, the color of skin. The piglets were housed in a starting box placed at the back of the lying sow. After a short period (< 1 min), the door of the box was opened and the piglets started to seek their dam's udder.

The piglets' behavior was observed for 3 min using the same method as experiment 1. The route used and time spent on teat seeking were recorded for each piglet. The teat number each piglet occupied was also recorded.

Results

Experiment 1

The time spent on teat seeking behavior, and the number of piglets which were able to reach their dam's

How Piglets Keep their Teat Order

Fig. 1. The number of piglets which were able to reach their dam's udder within 3 min in Exp. 1.

udder are shown in Table 1 and Fig. 1, respectively. In Litter 1, six, five and six out of seven piglets reached the udder at the first, second and third week, respectively. These piglets took 64–166 sec (mean 114 ± 26 sec) to reach the teats. In Litter 2, three, five and five out of six piglets reached there at each week, respectively. They took 68–168 sec (mean 113 ± 40 sec) to reach the teats. In total, 76.9% (30/39) of the piglets were able to reach their dam's udder within 3 min, and 83.3% (25/30, $P < 0.01$) of them reached their exclusive teats.

Experiment 2

Table 2 shows the teat numbers which were occupied by each piglet. The piglets that had occupied the front teats (Piglets No. 1–4, No. 1–7 and No. 2–5) started for their teats and hung around there, but could not find their teats since they were covered with a cloth. These piglets were in a flurry and did not reach any other teats (Fig. 2). All the other piglets were able to reach their proper teats within 3 min.

Discussion

For most of the piglets, teat order becomes stable 7 days after birth, regardless of the litter size. Sex, birth weight and birth order have no influence on teat

order⁷⁾. On the other hand, Miyakoshi *et al.*⁵⁾ reported that the heavier piglets tended to occupy the anterior teats. And he showed that 98% of the piglets established their individual teat order by 3 days of age⁵⁾. However, if a piglet that had occupied the anterior teats died, the litter mates moved to the frontal teat positions, and the teat order was re-formed. This suggests that teat order is affected by the existence and/or absence of litter mates.

In experiment 1 in this study, most of the piglets sucked their exclusive teats even if all teats were available when they sucked without litter mates. Some piglets, however, reached the other teats, but most of them were adjoining teats. This means that the piglets are able to discriminate their exclusive teats from others without litter mates, and have a tendency to suck them.

In experiment 2, if the relative positions of piglets were important for them to keep their teat order, the piglets that had occupied the front teats should reach the second teats and the other piglets shifted to next ones. However, those piglets hung around their dam's udder, and they did not reach any teats in spite of the second teats were not occupied by others in most cases. This means that the piglets might not keep their teat order as a relationship between the next

Table 2. Teat numbers which were occupied by each piglet in Exp. 2

Individual No.		Exclusive teats ¹⁾		Reached teats ²⁾		
		Right	Left	1 w (L)	2 w (R)	3 w (R)
Litter 1	1-1	L5, L6	R6	R6	L5	L6
	1-2	R3	L3	L3	R3	R3
	1-3	L7, R7	R7	R7	L7	R7
	1-4	L1	R1	N	N	N
	1-5	L3	R2, R3	R3	L3	L3
	1-6	L2, R2	L5, R5	R5	L2	L2
	1-7	R1	L1	N	N	N
		Right	Left	1 w (L)	2 w (R)	3 w (L)
Litter 2	2-1	L5, R5	L5, R5	L5	L5	R5
	2-2	L7	L7	L7	L7	L7
	2-3	R2, R3	L2, L3	L3	R2	L3
	2-4	L4, L5	L4, R4	L4	L4	R4
	2-5	R1	R1, R2	R2	N	N
	2-6	L2, L3	R3, R4	R4	L3	L2

¹⁾ Exclusive teat numbers occupied by 7-day old piglets when the dams lay on their both sides.

²⁾ Teat numbers occupied by each piglet in Exp. 2.

L, left ; R, right ; 1-7, order from the front ; N, did not reach any teats.

Fig. 2. The examples of the route used for teat seeking behavior of piglets that had occupied the front teats in Exp. 2.

ones.

On the basis of these results, it was concluded that the piglets might be able to discriminate between their exclusive teats from other teats in an absolute position, but not in a position relative to other litter mates after the establishment of a teat order. We have shown that the visual stimulus is the most important aspect of teat seeking behavior by the piglets aged 5–12 days⁹⁾. Therefore, the piglets might find their exclusive teats with the help of a feature and/or relative positions of the teats themselves.

In addition, these findings agree with the previous results⁷⁾ that the piglets have a tendency to fix their exclusive teats just after birth, but it takes about 7 days to establish a stable teat order. However, we observed only 2 litters which consisted small number of piglets. Hemsworth *et al*¹⁾ showed that the litter size affected on the stability of teat order. Therefore, the difference between the results of Miyakoshi *et al*.⁵⁾ and this study should be attributed to the difference of the piglets' age and litter size.

Additional research will be need to clarify the various factors of how piglets keep their teat order.

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