

STUDIES ON NURSING AND MILK PRODUCTION OF DOES AND MILK INTAKE AND SUCKLING
BEHAVIOUR OF THEIR KITS

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Introduction

Pre-weaning viability of young rabbits, litter weight gain and some other productive traits e.g. post-weaning mortality and weight of growing rabbits etc. depend on the milk yield of does. Increasing of milk production during lactation period and more knowledge about suckling behaviour of kits contribute to the success of rabbit production.

According to the literature data (Lebas, 1975; Hudson and Distel, 1983; Miller and Brooks, 1983) does only nurse their litters once a day and suckling is accomplished within 3-4 minutes. The milk production of doe and the milk consumption of kit depend on the litter size (Szendrő, 1977; Torres et al., 1979; McNitt and Lukefahr, 1990), temperature (Papp et al., 1983), breed (Lebas, 1975; Lukefahr et al., 1983), nutrition (Maertens and DeGroot, 1988), parity (Kalinowski and Rudolph, 1975; Lukefahr et al., 1981) and re-mating interval (Lebas, 1972; Szendrő et al., 1985; Maertens et al., 1988).

Materials and Methods

Recent work was carried out in Kaposvár at the research farm of the Pannon Univ. Agric. Sci. 20 Californian does and 168 kits were studied according to the nipples number (8 and 10) and litter size (6, 8 and 10) of does during the first 3 weeks of lactation.

The rabbits were housed in flat-deck wire cages. The nest boxes were suspended on the front of the cages on 2-3 days before parturition. Wood chips were used as bedding. The door of nest box was closed except for the nursing time. When the door was opened, the doe jumped in the nest box, nursed her litter, and left it. In the restricted nursing system the rabbit could enter the nest box once a day during the morning hours (between 8.00 and 9.30 am). The rabbits were given a commercial pellet and hay ad libitum. Water was supplied by automatic watering system.

Milk yield was measured by weighting the litter before and after suckling. Suckling time was taken between the doe jumped into the nest box and left

it. Rate of milk output was measured on the basis of doe's milk yield (g) consumed by litter per one minute. Rate of suckling was amount of milk (g) consumed by a kit per minute. Milk conversion rate was assessed by the quantity of milk intake for 1 gram body weight gain of litter. Examining the exact effect of litter size, after loss a kit another fostered one was transferred into the litter. Litter and individual weight was taken before suckling (empty body weight) for determining the daily weight gain.

Results and Discussion

Milk production of does and milk intake of kits

Data in Table 1 show the weekly and average milk production of does during the first 3 week period of lactation. The milk yield increased as litter size (LS) increased. Our results are in agreement with those reported by Szendrő (1977), Torres et al. (1979), McNitt and Lukefahr (1990). Milk production was similar during the first week of lactation but there were significant difference among groups in the 2nd and 3rd week.

According to the results of the experiment a bigger number of nipples (NN) appeared to be accompanied by an increase in milk yield. Our earlier results (Szendrő and Kampits, 1985) obtained were different, NN were not significant correlated with milk production. It is probably that in the case of present study not only NN but LS were also taken part in the results.

There were inverse differences among LS groups in milk intake per kit (Table 1). In the larger litters the individual milk consumption decreased better than in smaller ones. Similar results were obtained by Lebas (1975) and Szendrő (1977). Data of Table 1 also show that milk intake per kits increased by about 10 % for progenies of does with 10 nipples compared with those in the 8 NN group.

Nursing/suckling time

According to the data of literature the average nursing/suckling time is about 3-4 min once a day (Lebas, 1975; Hudson and Distel, 1983; Miller and Brooks, 1983). Benke and Szendrő (1991) investigated the nursing/suckling time during the first 3 week of lactation. It was found that the nursing/suckling time significantly reduced from 4.1-6.2 min on the 1st day after kindling to 2.4-2.5 min on the 19th day. Table 2 shows some results with regard to nursing/suckling time. The longest duration was obtained on the 1st day after parturition. The shortest time was observed on the 2nd week of lactation and a slightly increasing was occurred compared to the 2nd week.

Concerning to the long nursing/suckling time during the first few days after kindling, it seems to be connected with the nursing and suckling behaviour of does and kits (slow milk output of doe and slow milk intake of kit). But the duration of doe spend in the nest box is not the pure nursing/suckling time. It was observed by Hudson and Distel (1983) that of the 3-4 min daily nursing time, dams took an average 5.2 sec to assume the nursing posture and kits took 11.5 sec to contact belly fur and 6.0 sec to reach and secure a nipple. Pups released and switched teats frequently but their efficiency improved with age so that proportion of nursing time spend in suckling increased from approx. 47 to 72 % during the first 12 days.

The nursing/suckling time was affected by LS. It was observed that doe with smaller litter spend longer time in the nest box than those nursing larger litter. The amount of milk intake of kits varies considerably due to the competition with litter mates. If the LS is more than NN, it is not possible for all kits to reach a nipple at the same time, they have to suck faster and the competition is more fierce among them. If the NN is more than LS some of the kits have a chance to suck two nipples, probably the pups spend more time to switch teats searching for the most productive ones.

The nursing/suckling time was similar for both groups (8 and 10 number of nipples).

Rate of milk output (Table 3)

The milk output of doe per min increased rapidly during the first few days of lactation and became slowly in the following days. There was about 20 % difference between groups with LS 6 and 10 (54.0 vs. 64.3 g/min). Smaller difference was found between the group of does with 8 and 10 nipples (58.2 vs. 62.3 g/min). It can be concluded that rate of milk output depend on first of all the day of lactation and LS, the effect of NN was not significant.

Rate of suckling (Table 4)

The average amount of milk consumption by a kit per min increased gradually. Table 4 shows that the rate of suckling reach to about five times between the 1st and 21st day of lactation. The maximum rate was achieved by 11-12, 9-10 and 8-8.5 g/min in groups LS 6, 8 and 10 resp. It could be seen every part of the lactation that rate of suckling increased faster in smaller litter (group LS 6) than in the larger ones (groups of LS 8 and 10). Rate of suckling was affected by NN. In the group of does with 10 nipples it was faster compared with those in 8 teats group (7.61 and 7.75 resp.). The reason for this is the suckling time is the same but there is a sig-

nificant difference in milk intake between the two groups.

Milk conversion rate (Table 5)

The milk intake of kits in gram for 1 g body weight gain was similar to the results of Lebas (1975). The milk conversion was about 1.5-1.6, 1.75-1.85 and 2.0-2.1 in the 1st, 2nd and 3rd week of lactation resp. Neither LS nor NN influenced on the results.

Individual weight gain of kits (Table 6)

Daily weight gain of pups in group LS 6 was always superior to that of group LS 8 and 10 (13.0, 10.2 and 8.6 g resp.). About 8 % difference was found between group NN 8 and 10 (9.7 and 10.4 g resp.). The reason for this is there is a close correlation between milk intake and weight gain for suckling rabbits.

Conclusions of the experiment could be found in the summary.

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Table 1

Effects of LS and NN on the milk production of does and daily milk intake of kits

Days of lactation	Litter size (LS)						No of nipples (NN)				Overall mean	
	6		8		10		8		10			
	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}
Milk production of does, g												
1-7	4	840	8	818	8	845	8	821	12	842	20	833
8-14	4	1262	8	1319	8	1364	8	1290	12	1350	20	1326
15-21	4	1465	8	1549	8	1567	8	1483	12	1576	20	1539
1-21	4	3567	8	3686	8	3776	8	3594	12	3768	20	3698
Daily milk intake of kits, g												
1-7	24	20.0	64	14.6	80	12.3	70	14.0	98	15.3	168	14.8
8-14	24	30.0	64	23.6	80	20.4	70	22.2	98	24.5	168	23.6
15-21	24	34.9	64	27.7	80	23.4	70	25.6	98	28.6	168	27.4
1-21	24	28.3	64	22.0	80	18.7	70	20.6	98	22.8	168	21.9

Remarks: No = number of does or number of kits

Table 2

Effects of LS and NN on suckling time (min)

Days of lactation	Litter size (LS)						No of nipples (NN)				Overall mean	
	6		8		10		8		10		No	\bar{X}
	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}		
1	4/24	6.10	8/64	4.80	8/80	3.77	8/70	4.55	12/98	4.70	20/168	4.63
2	4/24	4.18	8/64	3.95	8/80	3.17	8/70	3.67	12/98	3.72	20/168	3.70
3	4/24	3.92	8/64	3.22	8/80	2.87	8/70	3.08	12/98	3.50	20/168	3.33
4	4/24	3.28	8/64	2.97	8/80	2.75	8/70	2.95	12/98	2.93	20/168	2.93
5	4/24	3.37	8/64	2.98	8/80	2.67	8/70	2.98	12/98	2.90	20/168	2.93
6	4/24	3.10	8/64	2.95	8/80	2.67	8/70	2.97	12/98	2.80	20/168	2.87
7	4/24	2.95	8/64	2.92	8/80	2.58	8/70	2.83	12/98	2.77	20/168	2.80
8	4/24	2.85	8/64	2.80	8/80	2.67	8/70	2.82	12/98	2.72	20/168	2.75
9	4/24	3.15	8/64	2.73	8/80	2.60	8/70	2.80	12/98	2.73	20/168	2.77
10	4/24	2.98	8/64	2.72	8/80	2.63	8/70	2.80	12/98	2.70	20/168	2.73
11	4/24	2.78	8/64	2.72	8/80	2.68	8/70	2.78	12/98	2.67	20/168	2.72
12	4/24	3.05	8/64	2.77	8/80	2.70	8/70	2.88	12/98	2.75	20/168	2.80
13	4/24	2.90	8/64	2.80	8/80	2.90	8/70	2.90	12/98	2.78	20/168	2.80
14	4/24	3.08	8/64	2.97	8/80	2.73	8/70	2.92	12/98	2.88	20/168	2.90
15	4/24	3.20	8/64	2.95	8/80	2.77	8/70	2.95	12/98	2.92	20/168	2.93
16	4/24	3.03	8/64	2.85	8/80	2.92	8/70	2.92	12/98	2.83	20/168	2.87
17	4/24	3.20	8/64	2.87	8/80	3.08	8/70	3.07	12/98	3.00	20/168	3.03
18	4/24	3.17	8/64	2.97	8/80	2.88	8/70	3.00	12/98	2.95	20/168	2.97
19	4/24	3.18	8/64	2.93	8/80	2.88	8/70	3.00	12/98	2.95	20/168	2.97
20	4/24	2.95	8/64	2.95	8/80	2.90	8/70	2.95	12/98	2.92	20/168	2.93
21	4/24	3.17	8/64	2.93	8/80	2.92	8/70	3.02	12/98	2.95	20/168	2.98
1-7	4/24	3.85	8/64	3.40	8/80	2.92	8/70	3.28	12/98	3.30	20/168	3.30
8-14	4/24	3.05	8/64	2.78	8/80	2.68	8/70	2.87	12/98	2.77	20/168	2.80
15-21	4/24	3.15	8/64	2.92	8/80	2.90	8/70	3.00	12/98	2.93	20/168	2.95
1-21	4/24	3.35	8/64	3.03	8/80	2.83	8/70	3.05	12/98	3:00	20/168	3.02

Remarks: No = number of does/kits

Table 3

Effects of LS and NN on the rate of milk output (g/min)

Day of lactation	Litter size (LS)						No of nipples (NN)				Overall mean	
	6		8		10		8		10			
	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}
1	4	13.3	8	14.5	8	20.9	8	16.3	12	17.2	20	16.8
2	4	21.9	8	18.0	8	24.4	8	21.1	12	21.5	20	21.3
3	4	27.4	8	31.0	8	35.8	8	33.6	12	31.3	20	32.2
4	4	36.5	8	42.7	8	45.6	8	45.6	12	42.8	20	42.3
5	4	43.4	8	48.2	8	53.2	8	53.2	12	49.7	20	49.3
6	4	44.4	8	50.9	8	60.0	8	60.0	12	56.3	20	54.3
7	4	52.9	8	55.3	8	62.0	8	62.0	12	58.8	20	57.5
8	4	57.4	8	59.8	8	67.5	8	60.4	12	63.7	20	62.4
9	4	53.3	8	63.4	8	69.2	8	61.7	12	65.0	20	63.7
10	4	59.9	8	66.2	8	73.4	8	67.0	12	68.3	20	67.8
11	4	64.6	8	70.3	8	73.4	8	68.5	12	71.6	20	70.4
12	4	62.0	8	68.7	8	75.8	8	65.9	12	73.0	20	70.2
13	4	63.5	8	74.1	8	76.3	8	70.5	12	74.4	20	72.8
14	4	64.9	8	72.2	8	71.1	8	62.1	12	75.8	20	70.3
15	4	60.8	8	73.9	8	77.8	8	69.7	12	74.9	20	72.8
16	4	65.8	8	81.1	8	75.5	8	75.8	12	76.0	20	75.9
17	4	64.0	8	76.1	8	73.1	8	67.9	12	75.5	20	72.5
18	4	67.6	8	73.9	8	80.4	8	72.4	12	77.2	20	75.3
19	4	69.6	8	76.7	8	82.1	8	70.8	12	71.8	20	77.4
20	4	73.1	8	77.5	8	81.0	8	74.2	12	80.6	20	78.0
21	4	67.5	8	72.7	8	71.1	8	66.9	12	73.8	20	71.0
1-7	4	34.3	8	37.2	8	43.1	8	38.3	12	39.4	20	39.0
2-14	4	60.8	8	67.8	8	72.4	8	65.2	12	70.2	20	68.2
15-21	4	66.9	8	76.0	8	77.3	8	71.1	12	77.1	20	74.7
1-21	4	54.0	8	60.3	8	64.3	8	58.2	12	62.3	20	60.7

Remarks: No = number of does

Table 4

Effects of LS and NN on the rate of suckling (g/min)

Day of lactation	Litter size (LS)						No of nipples (NN)				Overall mean	
	6		8		10		8		10			
	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}
1	24	2.23	64	1.83	80	2.10	70	1.87	98	2.13	168	2.03
2	24	3.64	64	2.25	80	2.46	70	2.45	98	2.74	168	2.62
3	24	4.57	64	3.88	80	3.62	70	3.99	98	3.74	168	3.84
4	24	6.10	64	5.32	80	4.65	70	4.95	98	5.46	168	5.26
5	24	7.24	64	5.97	80	5.47	70	5.74	98	6.31	168	6.08
6	24	7.42	64	6.37	80	6.14	70	5.99	98	6.89	168	6.52
7	24	8.81	64	6.78	80	6.36	70	6.50	98	7.40	168	7.04
8	24	9.58	64	7.46	80	6.93	70	7.16	98	8.05	168	7.71
9	24	8.86	64	7.88	80	7.23	70	7.36	98	8.24	168	7.83
10	24	10.00	64	8.27	80	7.72	70	7.93	98	8.70	168	8.42
11	24	10.79	64	8.75	80	7.65	70	8.24	98	9.10	168	8.71
12	24	10.33	64	8.59	80	7.96	70	7.85	98	9.31	168	8.71
13	24	10.59	64	9.22	80	8.00	70	8.48	98	9.39	168	9.01
14	24	10.84	64	8.99	80	7.58	70	7.57	98	9.69	168	8.83
15	24	10.06	64	9.22	80	8.12	70	8.44	98	9.35	168	8.98
16	24	11.02	64	10.14	80	8.18	70	9.18	98	9.82	168	9.55
17	24	10.69	64	9.48	80	7.63	70	8.21	98	9.47	168	8.94
18	24	11.26	64	9.23	80	8.37	70	8.70	98	9.76	168	9.33
19	24	11.60	64	9.59	80	8.58	70	8.50	98	10.31	168	9.56
20	24	14.24	64	9.63	80	8.48	70	8.92	98	10.21	168	9.69
21	24	11.26	64	9.08	80	7.43	70	8.15	98	9.39	168	8.89
1-7	24	5.20	64	4.30	80	4.21	70	4.26	98	4.64	168	4.48
8-14	24	9.85	64	8.49	80	7.60	70	7.73	98	8.86	168	8.42
15-21	24	11.08	64	9.48	80	8.07	70	8.54	98	9.77	168	9.29
1-21	24	8.45	64	7.21	80	6.60	70	6.75	98	7.61	168	7.26

Remarks: No = number of suckling rabbits

Table 5

Effects of LS and NN on milk-conversion of kits (g/g)

Days of lactation	Litter size (LS)						No of nipples (NN)				Overall mean	
	6		8		10		8		10			
	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}
1-7	24	1.57	64	1.51	80	1.52	70	1.48	98	1.55	168	1.52
8-14	24	1.85	64	1.78	80	1.78	70	1.76	98	1.83	168	1.80
15-21	24	2.01	64	2.02	80	2.07	70	2.08	98	2.01	168	2.04
1-21	24	1.81	64	1.77	80	1.80	70	1.77	98	1.80	162	1.79

Table 6

Effects of LS and NN on daily weight gain of kits (g)

Day of lactation	Litter size (LS)						No of nipples (NN)				Overall mean	
	6		8		10		8		10			
	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}	No	\bar{X}
1-7	24	10.4	64	7.8	80	6.5	70	7.6	98	7.9	168	7.8
8-14	24	13.7	64	11.1	80	9.6	70	10.8	98	11.2	168	11.0
15-21	24	14.8	64	11.8	80	9.8	70	10.6	98	12.2	168	11.6
1-21	24	13.0	64	10.2	80	8.6	70	9.7	98	10.4	168	10.1