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# TRIALS TO PRODUCE RABBIT YOUNG NURSED BY TWO DOES

## 1. MILK PRODUCTION OF DOES AND MILK INTAKE OF YOUNG

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### ABSTRACT

The authors investigated in 3 experiments, using different management systems, the possibilities of “double-suckling”. Every morning the young were allowed to suckle by their own mother, and in the afternoon by a second doe. Pseudopregnant does whose litters had been weaned at the age of 21 or 25 days were tested for their suitability as additional doe. Does in which pseudopregnancy was induced by means of GnRH treatment produced milk (nulliparous does less than does which had previously produced litters), but in conditions of controlled suckling they were not willing to suckle the young. In a subsequent experiment, does (n=44) were inseminated following a 42d reproduction rhythm in 2 batches with an interval of 21days. Weaning was performed at the age of 21 days and does could systematically serve as second mother for the litters born at the same day. The pregnant does soon dried up but those remaining empty produced substantial quantities of milk, which amounted to 56 % of the production of the natural mother during the first 3 weeks of lactation. In a third experiment, does (n= 49) were inseminated on the 18th day after parturition, and their litters were weaned when they were 25 days old. Also in this system weaning on the 25th day and the parturitions of the other batch of does occurred on the same day. The “additional” does who nursed the young in the afternoon produced 65 % of the milk quantity produced by the natural mother between days 0 and 21. The milk production was not negatively influenced by the early weaning because the lactation curve continued in a normal way when does changed from their own litter at weaning to become a second mother of a newborn litter. The subsequent lactation showed a normal pattern, without indications of negative implications.

### INTRODUCTION

In previous experiments (MCNITT *et al.*, 1988; SZENDRŐ *et al.*, 1998, GYARMATI *et al.*, 1999 and 2000) it has been demonstrated that rabbit young are willing to suckle from 2 does, in the morning and in the afternoon, respectively. As a result of the double suckling during the first 3 weeks of life, the young had access to 89 % more milk and reached a body weight of 2.5 kg 9 days sooner. However, the significance of these earlier experiments should rather be considered as theoretical, because each litter was nursed by two does which had littered at the same time, and thus one of the litters had to be sold or fostered by another doe.

On the other hand, rabbit young can already be weaned from 14 days off if an adapted milkreplacer is fed (PRUD'HON and BEL, 1968; MC NITT and MOODY, 1992; FERGUSON *et al.*, 1997) or from 18 days off based on an exclusively pellet feeding (SCHLOLAUT and LANGE, 1971; PIATTONI and MAERTENS, 1999). In a system of twice-daily suckling, mothers from early weaned litters have still a potential as milk producer. However, data concerning their milk production or the required attributes for substitute does are not available.

The purpose of our experiments was to study if pseudopregnant or early weaned does could serve as second mother. The implications on the milk production of both does and the milk intake of the young were measured. The results relating to the development of the young are reported in paper 2 (SZENDRŐ *et al.*, 2000).

## MATERIAL AND METHOD

Pannon White rabbits were housed in single-tier cages, in a closed building heated in winter but without temperature control in summer. The doe cages were divided into two parts (for 2 does) with a grating. The does could enter the nest box to nurse the litter via separate hatches, which could be closed. Does were fed a commercially available rabbit diet with the following calculated composition: 10.3 DE MJ/kg, 16.8 % CP, 2.9 % Cfat and 14.1 %CF. Drinking water was available *ad libitum* using weight-valve self-drinkers.

**Experiment 1/a:** Fifteen does which had not yet produced litters (aged 18.5 weeks) were treated with 1.5 µg GnRH analogue (Ovurelin, REANAL). Subsequently, on the 16<sup>th</sup> day of the pseudopregnancy, half of the does were treated with 1 mg prostaglandin (Enzaprost). Half of the treated and half of the untreated does were injected, from the 18<sup>th</sup> day off and before they had nursed the young, with 5 IU oxytocin; in addition, within each group the teats of half of the does were smeared with a perfume characteristic of suckling does (Chanel No. 5). The young were nursed by their own mother at 8 a.m. and by the pseudopregnant doe at 5 p.m. each day. Milk production was measured using the weigh(doe)-suckle-weigh(doe) procedure.

**Experiment 1/b:** Nulliparous does (n=15) were injected with 1.5 µg GnRH at the age of 16.5 weeks, while multiparous does (n=20) were submitted to the same treatment 11 days subsequent to parturition. Determination of their milk production started 31 days after the treatment. In this procedure, each litter was daily nursed by its own mother at 8 a.m. and by the pseudopregnant doe at 5 p.m. Both does had only access to the nest box during the controlled suckling time. The same weigh-suckle-weigh procedure was followed to measure the milk production. The mean individual milk intake of the young rabbits was calculated based on the quantity of milk produced and the number of young in the litter.

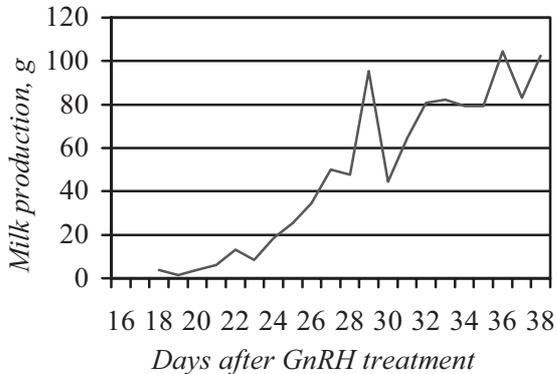
**Experiment 2:** Females were inseminated following a 42d reproduction rhythm and a 2 batch management system with an interval of 21 days. Thus when a doe kindled, another doe was available on the 21st day of lactation. This was the pair system on which the experiment was based. The original does were allowed to nurse daily her young (n=44) at 8 a.m. while the second doe, whose litter had been weaned at the age of 21 days, nursed the same litter at 4 p.m. Half of the substitute does (n=21) were inseminated and became pregnant on the 11<sup>th</sup> day after parturition, while the other half (n=23) were not inseminated, and remained empty. The young rabbits were weaned at the age of 21 days, after which their mother was transferred to another litter to act as a secondary suckling doe. An additional control group (S, n=45) were allowed to suckle their young in the traditional manner, once a day, and their progeny were weaned at the age of 35 days.

**Experiment 3:** The same “pair” management system was used as in exp. 2 but instead of weaning at 21 days, the secondary does were weaned at 24-25 days. The natural mothers (n=49) nursed their litters also at 8 a.m. each day and the additional does at 4 p.m. Half of the does (n=24) were treated post partum with 1.5 µg GnRH to induce pseudopregnancy, while the other half (n=25) were left untreated. In this experiment the does first nursed their own progeny, and subsequently, after their young had been weaned, were introduced into other litters to suckle them as substitute does. In the control group (S, n=30) the does were allowed to suckle their progeny once a day, and the young were weaned at the age of 35 days. In experiments 2 and 3, milk production of all does was measured every 2 to 3 days (three times a week).

Single-variable analysis of variance was performed in order to compare the milk intake of the young. SPSS 7.5 software was used for the statistical processing of the data.

## RESULTS AND DISCUSSION

**Experiment 1/a:** Figure 1 reveals that milk production in the pseudopregnant does did not start at the end of the pseudopregnancy (day 18 after the administration of GnRH), but on the 25<sup>th</sup>-28<sup>th</sup> day after the treatment. This corresponds with the end of what would be a normal gestation period.

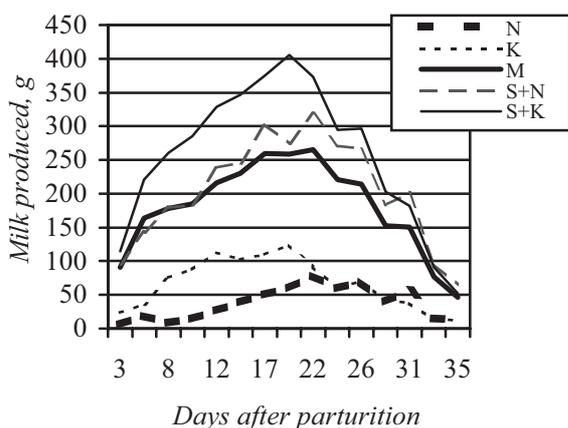


**Figure 1. Milk production in pseudopregnant, nulliparous does**

The milk production of the pseudopregnant, nulliparous does was lower than of the corresponding does which produced young. The applied prostaglandin treatment, increased daily milk production with 14 %, while oxytocin resulted in a 46 % rise. The perfume, which was intended to help the young to find the teats, had no effect on milk production. It is probable that prostaglandin exerted a direct effect on milk production, while oxytocin, which was administered prior to suckling, facilitated the delivery of the milk.

This experiment provides evidence that, in similarity with other animal species (e.g., the dog: DUMON *et al.*, 1993; ZÖLDÁG *et al.*, 1993), does in which pseudopregnancy has been induced are also capable of producing milk. Thus, attempted use of such does as secondary nursing does in experiments involving double suckling could be considered.

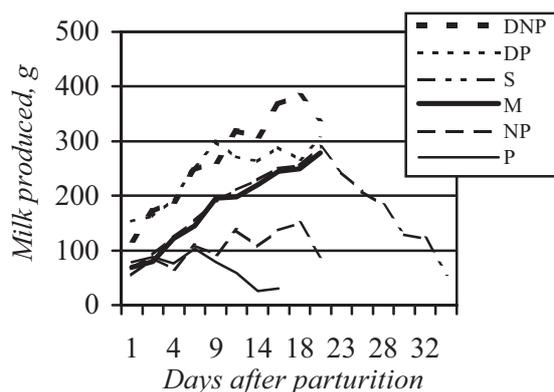
**Experiment 1/b:** The milk production of the different categories of does is presented in Figure 2. Milk production of pseudopregnant, nulliparous does (N) reached only 21 % compared with does of group M during the 5 weeks lactation. If they produced previously litters (K), then milk production reached 35 % of the controls.



**Figure 2. Daily milk production in does rearing their own litter (M), pseudopregnant nulliparous does (N) and pseudopregnant does which had previously produced litters (K): shown separately and as totals for the natural mother and the substitute doe (M+N and M+K)**

In the 3 weeks following parturition, which is the most important period from the aspect of suckling, the corresponding values were 15 and 39 %. In theory, if a pseudopregnant doe is introduced to suckle a litter as a secondary doe to their own mother, the young have access to the additional quantities of milk given above. However, pseudopregnant does were not willing to suckle the young. The data recorded were attained by means of shutting these does together with the young in the nestboxes.

**Experiment 2:** In this experiment, does whose litter had been weaned on the 21<sup>st</sup> day of lactation, served for the double suckling. Half of these does were inseminated 11 days after parturition (P), while the other half were not inseminated and remained empty (NP). In the morning the original mother (M) nursed the young.



**Figure 3. Milk production of does in the 2<sup>nd</sup> experiment**

Figure 3 demonstrates that in the first three weeks the lactation curve for the does of group M was comparable with the controls (S). The does which nursed the young in the afternoon produced less milk than the natural mothers. In the first week the lactation curves obtained with NP and P does were still similar. Afterwards, in contrast with the slightly increasing milk production of the NP does, that of pregnant does (P) declined, and after the 14th day these does dried up. The combined milk production of the two does (M+NP/P) amounted to 70 to 100 g more day than controls (S) during first week.

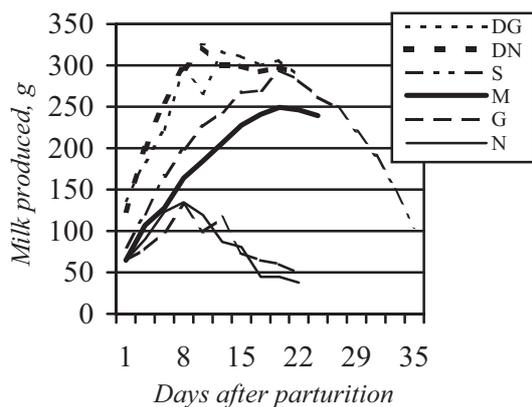
The combined milk production of the M and NP does remained at a high level while the difference in milk production between controls (S) and M+P became minimal at day 21. Table 1 shows the milk consumption of the young. In group DP the quantity of milk suckled from the M doe was slightly behind that observed in the young of group S, while in group DNP the difference was more substantial. The more milk was derived from the substitute doe, the less the M doe gave. The quantities of milk suckled in the afternoon in the first 3 weeks from does of groups P and NP amounted 60 and 24 %, respectively of the quantities recorded for their own mother (M). In the first, second and third week, double suckling leads to 69, 28 and 4 % more milk, respectively (group DP), while for DNP young this amounted to 61, 35 and 29 % respectively.

**Table 1. Effect of double suckling on daily milk intake of young (in g) (Experiment 2)**

Lactation week	Experimental groups										s.e.
	Normal suckling (S)		Double suckling (D)								
			Non-pregnant does (DNP)				Pregnant does (DP)				
	n	mean	First (M)		Second (NP)	Total (M+NP)	First (M)		Second (P)	Total (M+P)	
1st	403	13.3	190	12.1	9.4	21.4	197	12.4	10.1	22.5	0.46
2nd	360	26.5	179	22.3	13.5	35.8	192	27.2	6.6	33.8	0.92
3rd	348	33.9	162	28.6	15.0	43.6	185	34.2	1.2	35.4	1.29
4th	343	20.4	-	-	-	-	-	-	-	-	-
1st-3rd	-	24.6	-	21.0	12.6	33.6	-	24.6	6.0	30.6	-

*First* denotes the mother of the litter, and *second* the pregnant or non-pregnant does whose litters had been weaned at the age of 21 days.

**Experiment 3:** The secondary does (G and N) used were weaned after a lactation period of 25 days. Half of the does were treated with GnRH injection immediately subsequent to parturition (G), the other half remaining untreated (N).



**Figure 4. Milk production of the first and second mother and total.**

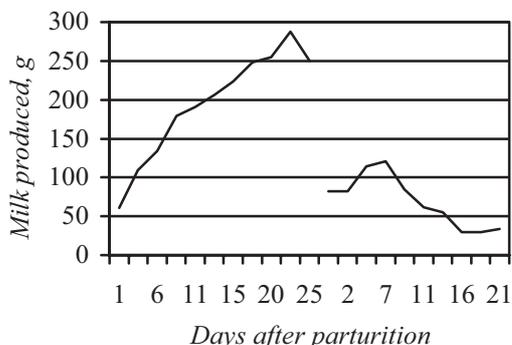
Figure 4 reveals that daily milk production increased more slowly in the does of group M than in those of controls (S). The lactation curves of the additional does (G and N) were very similar and both declined during the 2nd week in a similar way. In fact does nursing their litter in the morning (M) produced 15 to 18% less milk than controls (Table 2). During the first 3 weeks the quantity of milk consumed by the young from their second mother (G and N) amounted to 63 to 65 % of the quantity suckled from their original mother (M).

In the first 3 weeks the young had access to 34 to 35 % more milk if two mothers were used (M+G/N) compared with those of group S.

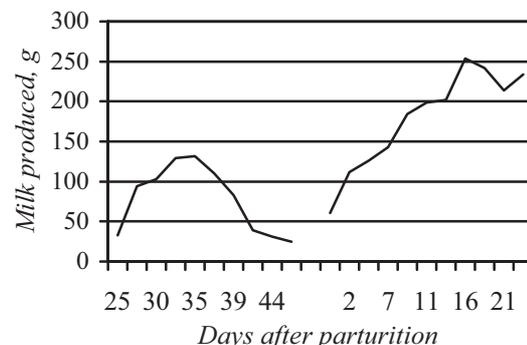
*Table 2. Effect of double suckling on daily milk intake of young (in g) (Experiment 3)*

Lactation week	Experimental groups										s.e.
	Normal suckling (S)		Double suckling								
			Treated does (DG)				Untreated does (DN)				
			First (M)		Second (G)	Total (M+G)	First (M)		Second (N)	Total (M+N)	
n	mean	n	mean	mean	mean	n	mean	mean	mean		
1st	257	15.9	216	13.3	10.4	23.7	205	12.3	11.3	23.6	0.46
2nd	244	28.2	203	22.4	15.9	38.3	202	23.1	16.3	39.3	0.77
3rd	241	32.8	136	29.3	15.8	45.1	138	27.5	12.5	40.0	0.98
4th	240	26.1	-	-	-	-	-	-	-	-	-
1st-3rd	-	25.6	-	21.7	14.0	35.7	-	21.0	13.3	34.3	-

Figure 5 shows the lactation curve of the does which suckled their litter as M doe up to the 25<sup>th</sup> day, after which they continued suckling as G or N does, i.e., as secondary does. After the peak in lactation, daily milk production decreased from 250 g to 80 g, due to the lower level of milk intake of the newborn rabbits of the following litter. Afterwards milk production increased for a few days, followed by a continuous decline in consequence of the does till they dried up. If the second peak of the lactation is joined with first curve, theoretical a normal lactation curve is obtained.



**Figure 5. Milk production in does serving as M does up to the 25<sup>th</sup> day and G or N does subsequently**



**Figure 6. Milk production before and after parturition in does inseminated on the 18<sup>th</sup> day**

In Fig.6, milk yield of does inseminated on the 18<sup>th</sup> day of lactation is presented. The first curve represents their milk production as secondary nursing doe. The amount exceeded that of does presented in figure 5. The subsequent lactation does not deviate substantially from that from M does (figure 5). This provides some evidence that the milk production of does previously used as second mother at the end of their pregnancy does not exert a pronounced negative effect on their next lactation.

## Conclusions

The data obtained in this study verify that does in which pseudopregnancy has been induced by means of treatment with GnRH also produce milk. The milk production of the nulliparous does proved low, while that of those which had already produced litters was more substantial. However, the experience of the authors was that in conditions of controlled suckling pseudopregnant does were not willing to suckle free the young.

The does whose litters had been weaned on the 21<sup>st</sup> or 25<sup>th</sup> day subsequent to parturition proved suitable as secondary suckling does. While, in an experiment by GYARMATI *et al.* (2000), double-suckling young had access to a total of 89 % more milk in the first three weeks (does which had produced litters at the same time), in experiment 2 of the present study the intake of young increased with 63 to 65 % due to the double suckling system. Thus, rearing with two does proved possible in a management system with re-insemination on the 18<sup>th</sup> day after parturition and weaning at the age of 25 days. Although it is worthy of note that in experiment 2 it was also viable to use two does for nursing with insemination on the 11<sup>th</sup> day and weaning at 21 days, this arrangement resulted in the young rabbits having access to less milk than in the other experiments. However, the use of this method is also questionable in view of anticipated EU regulations relating to weaning at 21 days.

## REFERENCES

- DUMON C., DUMOULIN P. Y., COLLET J. P., 1993. The suppression of lactation during canine pseudopregnancy using cabergoline. *Pratique Medicale and Chirurgicale de l'Animal de Compagnie*. 28:5, 573-577.
- GYARMATI T., SZENDRŐ ZS., BIRÓ-NÉMETH E., RADNAI I., PAPP GY., MILISITS G., 1999. Effect of double suckling on the production of kits. 11. Arbeitstagung über Pelztier-, Kaninchen- und Heimtierproduktion und Krankheiten, Celle, Ed. Deutsche Vet. Med. Gesellschaft e.V., Giessen, 18-24.
- GYARMATI T., SZENDRŐ ZS., MAERTENS L., BIRÓ-NÉMETH E., RADNAI I., MILISITS G., MATICS ZS., 2000. Effect of suckling twice a day on the performance of suckling and growing rabbits. 7th World Rabbit Congress, Valencia. (in press).
- FERGUSON F.A., LUKEFAHR S.D., MC NITT J.L., 1997. A technical note on artificial milk feeding on rabbit kids weaned at 14 days. *World Rabbit Sci.* (2), 65-70.
- MCNITT J., MOODY G. L. JR., 1988. Milk intake and growth rates of suckling rabbits. *J. Appl. Rabbit Res.* 11:117.
- Mc NITT J.I., MOODY G.L., 1992. A method for weaning rabbit kits at 14 days. *J. Appl. Rabbit Res.*, 15, 661-665.
- PIATTONI F., MAERTENS L., 1999. Effect of weaning age and solid feed distribution before weaning on the caecal fermentation pattern of young rabbits. 11. Arbeitstagung über Pelztier-, Kaninchen- und Heimtierproduktion und Krankheiten, Celle, Ed. Deutsche Vet. Med. Gesellschaft e.V., Giessen, 97-105.
- PROUD'HON M., BEL L., 1968. Le sevrage précoce des lapereaux et la reproduction des lapines. *Ann. Zootech.*, 17, 1, 23-30.
- SCHLOLAUT W., LANGE L., 1971. Untersuchungen über das frühzeitige Absetzen beim Kaninchen. *Züchtungskunde* 43, 136-143.
- SZENDRŐ ZS., GYARMATI T., MAERTENS L., RADNAI I., BIRÓ-NÉMETH E., MATICS ZS., 2000. Production of rabbits nursed by two does. 2. Weight gain, body weight and mortality of weaned rabbits. 7th World Rabbit Congress, Valencia. (in press).
- SZENDRŐ ZS., MILISITS G., PAPP GY., GYARMATI T., LÉVAI A., RADNAI I., BIRÓ-NÉMETH E., 1998. Milk intake and weight gain of rabbits suckled twice a day (*in Hung.*) 10 Nyúltenyésztési Tudományos Nap, Kaposvár, 35-41.
- ZÖLDÁG L., BENEDEK D., KECSKEMÉTHY S., 1993. Prevention of puerperal lactation and lactation caused by pseudopregnancy in the dog. (*in Hung.*) *Magyar Állatorvosok Lapja*. 48:6, 360-364.