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Pannon University of Agriculture, Faculty of Animal Science, Kaposvár

Comparison of once-daily, free and combined forms of suckling in rabbits

Zs. Szendrő, T. Gyarmati, A. Lévai, I. Radnai, E. Biró-Németh
Pannon University of Agriculture, Faculty of Animal Science, Kaposvár, H-7400 Guba S. u. 40. Hungary

ABSTRACT

These three experiments involved the investigation of various forms of suckling: free (F, n=71 litters, 576 young), once daily (O, n=68 litters, 543 young) and, in two experiments, combined suckling. In group F the does had free access to the litter throughout the entire day; in group O the does were allowed to suckle their young between 8.00 and 8.30 a.m. each day, but at all other times were separated from the litter; in group K, in the week following parturition free suckling was allowed for 7 days (expt. 2) or 4 days (expt. 3), subsequent to which the does were able to suckle their young only once daily until the 18th day. In experiments 1 and 2, in the week after kindling significantly lower mortality was observed in the young rabbits of group F (F=3.8 and 4.8%, O=6.0 and 9.2%, for expts. 1 and 2 respectively); between the 7th and the 21st day the young of group O showed more favourable mortality figures (F=3.6 and 5.4%, O=0.6 and 0.6%, for expts. 1 and 2 respectively). Mortality between days 0 and 21 proved lowest where the two forms of suckling were combined, in group K (expt. 2: F=10.2%, O=9.8%, K=5.3%). Experiment 3 produced no clear-cut result (F=7.5%, O=9.6%, K=7.5%). Contradictory results were obtained within the groups with respect to primiparous (P) and multiparous (M) does. The highest mortality with P does was observed in group F, that with M does in group O (P does: F=12.2%, O=6.4%, K=8.3%; M does: F=6.3%, O=11.4%, K=7.3%). Litter size at 21 days proved the highest in group K in experiment 2, but in the other experiments no difference attributable to form of suckling was ascertained. With respect to litter and individual weight at 21 days there emerged no difference of such a nature as to form the basis for the conclusion that the form of suckling used had influenced milk production in the does or the quantity of milk available per young rabbit. Although the majority of the results obtained confirm the advantages of combined suckling, due to divergent data in the literature and differences between younger and older does observed in experiments performed by the authors, it is not possible to offer a definitive recommendation with respect to the most favourable form of suckling.
(Keywords: suckling forms, rabbit)

ZUSAMMENFASSUNG

Vergleich von Säugemethoden - täglich einmal, frei, kombiniert - bei Kaninchen
Zs. Szendrő, T. Gyarmati, A. Lévai, I. Radnai, E. Biró-Németh
Pannon Agrarwissenschaftliche Universität, Fakultät für Tierproduktion, Kaposvár, H-7400 Guba S. u 40. Ungarn

In drei Versuchen wurde das freie Säugen (F, n=72 Würfe, 576 Tiere), täglich einmal (O, n=68 Würfe, 543 Tiere) und in zwei Versuchen das kombinierte Säugen (K, n=50 Würfe,

424 Tiere) untersucht. In der F-Gruppe hatten die Mutterkaninchen den ganzen Tag freien Zugang zur Wurfbox, in der O-Gruppe nur morgens zwischen 8 und 8.30 Uhr und im 2. und 3. Versuch in der K-Gruppe in der ersten Woche nach dem Werfen konnte 7 bzw. 4 Tage frei, danach bis zum 18. Tag täglich einmal gesäugt werden. Im 1. und 2. Versuch war der Ausfall in der ersten Lebenswoche in der F-Gruppe signifikant niedriger (F=3,8 und 4,8%; O=6,0 und 9,2%), zwischen dem 7. und 21. Tag erreichte die O-Gruppe das bessere Ergebnis (F=3,6 und 5,4%, O=0,6 und 0,6%). Der Ausfall zwischen dem 0-21. Tag war in der kombiniert säugenden K-Gruppe am niedrigsten (2. Versuch: F=10,2%, O=9,8%, K=5,3%). Der 3. Versuch brachte kein eindeutiges Ergebnis =F=7,5%, O=9,6 =, K=7,5%). Widersprüchlich war das Ergebnis bei den erstwerfenden (P) und den bereits mehrmals geworfenen (M) Muttertieren. Bei den P-Müttern trat in der F-Gruppe, bei den M-Müttern in der O-Gruppe die höchste Mortalität auf (P-Mütter: F=12,1%, O=6,4%, K=8,3%; M-Mütter: F=6,3%, O=11,4%, K=7,3%). Die 21-Tage-Wurfzahl war in der K-Gruppe im 2. Versuch am höchsten, in den anderen Versuchen erhielten wir keine auf die Säugemethode zurückzuführende Abweichung. Im 21-Tage-Wurfgewicht und im individuellen Gewicht gab es keine solche Abweichungen, die einen Zusammenhang die Säugemethode mit der Milchproduktion der Mütter oder mit der zur Verfügung stehenden Milchmenge pro Saugakt vermuten ließen. Obwohl die meisten unserer Ergebnisse das kombinierte Säugen bestätigen, können wir keinen eindeutigen Vorschlag für die beste Säugemethode machen, da die diesbezüglichen Daten in der Fachliteratur und in unseren eigenen Versuchen zwischen den jungen und älteren Mutterkaninchen zu differenziert sind.
(Schlüsselwörter: Säugemethoden, Hase, Kaninchen)

INTRODUCTION

Suckling rabbits remain in very close relation with their mother until weaning. Their successful rearing is dependent almost solely on their mother, and rabbit breeders have only limited chance of reducing mortality. Newborn rabbits spend their first 15-18 days in the nest box and their survival and growth depend on the milk production and nursing ability of mother does.

Rabbits – similarly to wild rabbits – suckle only once a day (*Lebas*, 1969). However, after parturition some does go into the nest box two or three times a day and may patiently wait as long as ten minutes to feed their young. This can be explained by the finding that in the early stages neither the doe nor the young has established sufficient routine, and both have to learn how to suckle (*Szendrő et al.*, 1991). The time required for suckling during the subsequent days decreases from 4-6 minutes to 2.5-3 minutes when milk production is increased. This indicates that kits are capable of suckling increasingly large of milk per minute (*Mohamed et al.*, 1992).

During the first 12 days of their lives young rabbits only suckle and sleep. Does may disturb sleeping, resting kits when not suckling. A frightened doe jumping into the nest may scatter or even trample her offspring, causing considerable harm. For the purpose of avoiding this problem, many authors suggest that does should go to the nest box only once a day, in the morning hours, and should be excluded for the remainder of the day, in contrast to the traditional, free mode of suckling. However, so far experimental results have not unambiguously supported this method. *Pizzi* and *Crimella* (1985) showed no significant difference in mortality or in weight increment between traditional (free) methods of suckling and that in which does were allowed to spend only 15 minutes per day in nest boxes. There was a higher rate of kit mortality on the 2nd,

16th, 17th and 28th days when nursing was allowed only once a day than was recorded in the free suckling group in the experiments of *Constantini et al.* (1986). According to results reported by French authors, the method of once-a-day nursing is more favourable during the first days after parturition, while free suckling is of advantage later on (*Coureaud et al.*, 1998).

In the light of these divergent findings experiments were performed to compare once-a-day nursing, free suckling, and the combined methods of these for rabbits.

MATERIALS AND METHODS

The experiments were conducted at the Pannon University of Agricultural Science, Faculty of Animal Science in Kaposvár. Rabbits of the New Zealand White and Pannon White varieties were used in the first experiment, and in the second and third experiments, respectively.

The rabbits were kept in closed welded flat-decks heated in winter (to a minimum of 15°C) but not maintained at a moderate temperature in summer (maximum 26°C). Wood shavings were put in the plastic nest boxes hung outside the cages 2-3 days preceding parturition, the placing of these being estimated such that their entrances were at the same level as the floors of the cages.

In the traditional nursing groups the does were able to the nest boxes freely. In the once-a-day nursing groups the entrances to the nest boxes were open only between 8 and 8:30 in the morning and does were separated from the litter during the rest of the day. Both does and kits could leave the nest boxes freely from the time the kits were 18 days of age. In the combined nursing group in experiment 2 the does could nurse freely for 1 week after parturition, and in experiment 3 for 4 days, following once-a-day nursing as above.

The kits were weaned at 6, 4 and 5 weeks of age in experiments 1, 2 and 3, respectively. The numbers of individuals involved in the respective experiments are shown in *Table 1*.

The experimental data were analysed using analyses of variance and the Chi^2 test.

Table 1

Number of litters and kits in the experimental groups

		EXPERIMENTAL GROUP (1)		
Experiment (5)	n	Free (2)	Once a day (3)	Combined (4)
1	Number of litters (6)	21	21	-
	Number of kits (7)	167	168	-
2	Number of litters	19	19	19
	Number of kits	166	160	171
3	Number of litters	31	28	31
	Number of kits	254	215	253

1. Tabelle: Für die einzelnen Versuchsgruppen charakteristische Daten

Versuchsgruppen(1), Freies Säugen(2), Täglich einmaliges Säugen(3), Kombiniertes Säugen(4), Versuch(5), Anzahl der Würfe(6), Anzahl der Jungkaninchen(7)

RESULTS AND DISCUSSION

Litter size

No significant difference was found between experiments 1 and 2 in the litter size of the experimental groups at birth, whereas in experiment 3 there were significantly fewer kits recorded even at parturition in the once-a-day nursing group (*Table 2*). Therefore, comparisons of litter number recorded at different dates after parturition may not be completely realistic. More reliable results can be achieved by determining decrease in litter number, but no definite difference was observed in this respect either. Changes in litter number could be explained by the mortality data.

Table 2

Effect of suckling method on litter size

Age (5) (weeks)	***EXPERIMENTAL GROUP (1)***								
	FREE (2)			***ONCE A DAY (3)***			***COMBINED (4)***		
	n	mean	SD	n	mean	SD	N	mean	SD
1st experiment (6)									
Kindling (7)	21	7.95	0.84	21	8.00	0.81			
1	21	7.71	1.08	21	7.52	0.85			
2	21	7.43	1.14	21	7.48	0.85			
3	21	7.29	1.20	21	7.48	0.85			
4	21	7.24	1.19	21	7.48	0.85			
5	21	7.19	1.22	21	7.48	0.85			
6	21	7.05	1.29	21	7.48	0.85			
Difference between 0 and 3 weeks (8)		0.66			0.52				
2nd experiment									
Kindling	19	8.74		19	8.58		19	9.00	
1	19	8.32		19	7.79		19	8.79	
2	19	7.95		19	7.74		19	8.53	
3	19	7.84		19	7.74		19	8.53	
4	19	7.84		19	7.74		19	8.53	
Difference between 0 and 3 weeks		0.90			0.84			0.47	
3rd experiment									
Kindling	31	8.19[a]	1.01	28	7.82[b]	1.02	31	8.16[a]	0.97
1	31	7.84[a]	1.19	28	7.25[b]	1.00	31	7.77[a]	1.15
2	31	7.65[a]	1.43	28	7.11[b]	1.07	31	7.65[a]	1.14
3	31	7.61[a]	1.45	28	7.04[b]	1.17	31	7.55[a]	1.18
4	31	7.42[a]	1.61	28	6.96[b]	1.14	31	7.42[a]	1.09
5	31	7.29[a]	1.60	28	6.93[b]	1.18	31	7.32[a]	1.25
Difference between 0 and 3 weeks		0.58			0.78			0.61	

Means with different letters are significantly different (P<0.05). *(Innerhalb der Spalten bezeichnen die verschiedenen Buchstaben eine Signifikanz von P<0,05.)*

2. Tabelle: Herausbildung der Wurfgrösse in Abhängigkeit von der Säugungsart

Versuchsgruppen(1), Freies Säugen(2), Täglich einmaliges Säugen(3), Kombiniertes Säugen(4), Alt(5), Erste Versuch(6), Werfen(7), Differenz zwischen den Wochen 0-3.(8)

Table 3

Effect of suckling method on mortality (%)

		EXPERIMENTAL GROUP (1)		
Weeks (5)		***FREE (2)***	***ONCE A DAY (3)***	***COMBINED (4)***
1st experiment (6)				
n		167	168	
1		3.0[a]	6.0[b]	
2		3.6[a]	0.6[b]	
3		1.8	-	
4		0.6	-	
5		0.6	-	
6		1.8	-	
0-3		6.6	6.6	
2nd experiment				
n		166	163	171
1		4.8[a]	9.2[b]	2.3[a]
2		4.2[a]	0.6[b]	2.9[ab]
3		1.2	-	-
4		-	-	-
0-3		10.2[a]	9.8[a]	5.3[b]
3rd experiment				
n		254	219	253
1		4.7	6.9	4.7
2		2.4	1.8	1.6
3		0.4	0.9	1.2
4		1.9	1.0	0.8
5		2.0	0.4	2.0
0-3		7.5	9.6	7.5
1	Primiparous (7)	6.1	3.9	4.2
	Multiparous (8)	4.4	8.6	4.9
2	Primiparous	6.1	2.1	2.1
	Multiparous	1.4	2.1	1.4
3	Primiparous	0.0	1.3	2.0
	Multiparous	0.5	0.7	1.0
4	Primiparous	2.1	2.6	0.0
	Multiparous	1.4	0.6	1.0
5	Primiparous	4.1	0.6	6.3
	Multiparous	1.0	0.7	0.0
0-3	Primiparous	12.2	6.4	8.3
	Multiparous	6.3	11.4	7.3

Means with different letters are significantly different (P< 0.05). *(Innerhalb der Spalten bezeichnen die verschiedenen Buchstaben eine Signifikanz von P<0,05.)*

3. Tabelle: Wöchentlicher Abgang (%) der Nachkommenschaft in Abhängigkeit von der Säugungsart

Versuchsgruppen(1), Freies Säugen(2), Täglich einmaliges Säugen(3), Kombiniertes Säugen(4), Woche(5), Erster Versuch(6), Erstmals geworfen(7), Mehrmals geworfen(8)

Mortality

As is summarised in *Table 3*, significantly fewer kits were lost during the week after parturition in the group where kits suckled freely in experiments 1 and 2. However, just the opposite trend was observed in the following week, does of the once-a-day nursing group having better results. Combined nursing (free nursing in the first week and once-a-day nursing afterwards) combined the advantage of both methods (experiment 2). Mortality in this group (5.3%) was just half that recorded in the other two groups (10.2 and 9.8% respectively).

There was no definite difference in the once-a-day nursing group in the first week. Combined nursing proved to be a little (but not significantly) superior to the once-a-day nursing group during the first 3 weeks, having lower mortality (at 7.5%) than the other two groups (9.6 and 7.5%, respectively). Considerable differences for this parameter were revealed between the groups of different ages when does were divided into two distinct groups of primiparous individuals. Free nursing among young does resulted in high mortality in the first and second week, in the first 3 weeks reaching 12.2 per cent for this group compared with 6.4 and 8.3 per cent for the once-a-day nursing group and for the combined nursing group respectively. Exactly the opposite result was observed in the group of older does: those in the once-a-day nursing group showed higher mortality (at 8.65%), particularly in the first week. Mortality rates of 6.3, 7.3 and 11.4 per cent among the kits of older does were determined for the free, combined and once-a-day nursing groups respectively.

Based on the above results the following conclusions can be drawn: free nursing may be more favourable in the first days after parturition while once-a-day nursing is of greater advantage until pelleted feed is introduced. This finding holds true for non-primiparous does. Contradictory results of previous experiments reported by other authors make conclusions more difficult to draw. *Constantini et al.* (1986) found free nursing to be more favourable for multiparous does, whereas *Pizzi* and *Crimella* (1984) considered once-a-day nursing more beneficial. They determined nearly a twofold mortality rate (11.4%) for kits in a once-a-day nursing group of older does compared to those in a free nursing group (6.3%). According to *Coureaud et al*. (1998), in the case of primiparous does once-a-day nursing in the 3-5 days after parturition following free nursing proved to give much better results than traditional (free) nursing. Once-a-day nursing seems to have been advantageous for young does during the 4 days after parturition in the experiments reported here, while this method or combined nursing resulted in lower mortality rates for kits compared to free nursing. Therefore, definite conclusions for practical application are rather difficult to make.

Individual and litter weight

In the group nursed freely individual and litter weight, characterising the milk production of does and also the milk consumption of kits, surpassed slightly but not significantly that measured in the group nursed once a day on the 21st day in experiment 1. In experiment 2, however, kits suckled by the combined method showed the highest litter weights while those suckled once a day achieved the greatest individual weights. In experiment 3 the highest litter weights was recorded in the case of combined nursing by young does and free nursing by older ones. Individual weights were the highest in the once-a-day nursing group at both ages (*Tables 4 and 5*). However, differences among the groups were not significant and the rankings were influenced by litter number; thus, it can be concluded that neither the milk production of does nor the milk consumption of

kits was determined by the nursing methods applied. No significant difference was found between the weights of kits nursing freely or once a day on the 28th day after parturition, as was also observed by *Constantini et al.* (1986).

Table 4

Effect of suckling method on litter weight (g)

	METHOD OF SUCKLING (1)									
AGE (5)	***FREE (2)***				***ONCE A DAY (3)***			***COMBINED (4)***		
	n		mean	SD	n	mean	SD	n	mean	SD
1st experiment (6)										
At birth (7)	21		452	99	21	478	74	-		
1 week	21		1116	160	21	1078	171	-		
2 weeks	21		1871	293	21	1882	242	-		
3 weeks	21		2530	379	21	2519	287	-		
4 weeks	21		4174	596	21	3893	497	-		
2nd experiment										
4 weeks	19		4767	1369	19	5053	1130	19	5127	1114
3rd experiment										
1 week	31		1162	214	28	1087	263	31	1174	264
2 weeks	31		1972	448	28	1922	450	31	2104	418
3 weeks	31		2857	577	28	2626	609	31	2841	575
4 weeks	31		4775	1103	28	4394	988	31	4705	939
1 week	Primiparous (8)	6	1047	242	10	1002	176	6	987	186
	Multiparous (9)	25	1189	203	18	1134	294	25	1219	263
2 weeks	Primiparous	6	1640	614	10	1808	266	6	1795	225
	Multiparous	25	2052	372	18	1986	522	25	2178	423
3 weeks	Primiparous	6	2370	779	10	2428	347	6	2445	160
	Multiparous	25	2973	465	18	2736	700	25	2936	600
4 weeks	Primiparous	6	4153	1113	10	4053	781	6	4273	260
	Multiparous	25	4924	1069	18	4584	1057	25	4809	1015

4. Tabelle: Herausbildung (g) des Wurfgewichts in Abhängigkeit von der Säugungsart

Abhängigkeit von der Säugungsart(1), Freies Säugen(2), Täglich einmaliges Säugen(3), Kombiniertes Säugen(4), Alter(5), Erster Versuch(6), Zur Geburt(7), Erstmals geworfen(8), Mehrmals geworfen(9)

Table 5

Effect of suckling method on individual weight (g)

	METHOD OF SUCKLING (1)					
AGE (5)	***FREE (2)***		***ONCE A DAY (3)***		***COMBINED (4)***	
	n	mean*	n	mean*	N	mean*
1st experiment (6)						
At birth (7)	167	60.2	168	59.8		
1 week	162	146	158	144		
2 weeks	156	256	157	253		
3 weeks	153	354	157	340		
4 weeks	152	587	157	530		
2nd experiment						
4 weeks	149	571	147	600	162	581
3rd experiment						
1 week	243	149	203	150	241	151
2 weeks	237	259	199	271	237	275
3 weeks	236	381	197	376	234	376
4 weeks	231	644	195	631	232	628
1 week	Primiparous (8)	45	135	75	134	46	128
	Multiparous (9)	197	153	128	159	195	156
2 weeks	Primiparous	43	223	74	247	45	239
	Multiparous	194	268	125	284	195	284
3 weeks	Primiparous	43	327	73	339	44	334
	Multiparous	193	394	124	396	190	386
4 weeks	Primiparous	42	590	73	574	44	584
	Multiparous	188	660	124	663	190	645

*Litter weight/litter size *(Wurfgewichts/ Wurfgrösse)*

5. Tabelle: Herausbildung (g) Des individuellen Gewichtes in Abhängigkeit von der Säugungsart

Abhängigkeit von der Säugungsart(1), Freies Säugen(2), Täglich einmaliges Säugen(3), Kombiniertes Säugen(4), Alter(5), Erster Versuch(6), Zur Geburt(7), Erstmals geworfen(8), Mehrmals geworfen(9)

CONCLUSIONS

The results of the above experiments show that free nursing proved better in the first week after parturition but once-a-day nursing gave better results subsequently until the kits were weaned onto pelleted feed. Mortality in the group fed according to this combination was lower in most cases compared to that in the groups nursing freely or once a day throughout the experimental period. Reared litter number was affected favourably by the differences observed in mortality, but it seems that neither the milk

production of the does nor the quantity of milk available per kit was affected by the nursing methods applied, based on individual and litter weights.

Although the majority of the results obtained confirm the advantages of combined suckling, due to divergent data in the literature and differences between younger and older does observed in experiments performed by the authors, it is not possible to offer a definitive recommendation with respect to the most favourable form of suckling.

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Corresponding author *(Adresse)*:

Zsolt Szendrő
Pannon University of Agriculture, Faculty of Animal Science
H-7401 Kaposvár, P.O. Box 16. Hungary
Pannon Agrarwissenschaftliche Universität, Fakultät für Tierproduktion
H-7401 Kaposvár, P.O.Box 16. Ungarn
Tel.: 36-82/314-155, Fax: 36-82/320-175
e-mail: pohnl@atk.kaposvar.pate.hu