EFFECT OF LIGHTING PROGRAM ON THE NURSING BEHAVIOUR OF RABBIT DOES

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ABSTRACT

The objective of the present study was to analyse the effect of the lighting regime on the nursing behaviour of rabbit does. The experiment was carried out at the University of Kaposvár using Pannon White rabbit does. Prior to the experiment does were kept using a lighting program of 16L/8D and each doe already had 2-3 parturitions. The does were randomly housed in two identical rooms which differed only in the lighting regime. In the first room a 16L/8D lighting regime was used throughout the experiment (16-16L group). In the other room a lighting system of 8L/16D was used during the days after parturition and the photoperiod was increased to 16 hours per day for 8 days prior to insemination. Insemination was performed on the 11th day after parturition in both rooms. After insemination the light period was modified to 8 hours per day (8-16L group). Luminous intensity measured in the cages at the height of rabbit does ranged between 40 and 70 lux. From kindling till 14 days postpartum 24-hour video recordings were taken with infra-red cameras (16-16L group: 16 does, 8-16L group: 18 does). The distribution of the once-a-day nursing was 62.4% and 60.4% in the 16-16L and 8-16L groups, respectively, while the twice-a-day nursing was 31.7% and 35.6% in 16-16L and the 8-16L groups during the whole period (day 1-14). Time, daily frequency of nursing and the length of stay in the nest-box were recorded for every doe. Changing the lighting (from 6:00 am-2:00 pm to 6:00 am–10:00 pm) affected the does' nursing behaviour: the daily frequency of the nursing events (nursing twice and three times a day: 37-40%) and number of nursing events per day were stable in the 16-16L group. In the 8-16L group the multiple nursing frequency increased from the 4th day postpartum (from 25.6 to 43.6%, days 1-3 and 12-14, respectively). Length of nursing was significantly different between the groups (16-16L: 202±60 sec., 8-16L: 184±38 sec., mean±SD, $P<0.05$). Similar differences could be observed comparing the does performing once-a-day nursing (16-16L: 195±42 sec. vs. 8-16L: 180±35 sec., $P=0.001$) and twice-a-day nursing, (first nursing: 16-16L: 214±80 sec. vs. 8-16L: 193±44 sec.; second nursing: 16-16L: 215±81 sec. vs. 8-16L: 189±62 sec., $P<0.05$). It was concluded that changing the lighting program affected the does' nursing behaviour. The frequency of multiple nursing and the number of nursing events per day increased if the dark period was shorter (8 h instead of 16 h). The lighting period modified the duration of nursing events but the difference was not relevant.

Key words: Rabbit does, Lighting program, Nursing behaviour.

INTRODUCTION

The European wild rabbit performs nursing generally at dusk (Kraft, 1979). According to Lloyd and McCowan (1968) and Broekhuizen and Mulder (1983), during the first two weeks of lactation the European wild rabbit does nurse their kits after sunset or at dawn. The domesticated rabbit does usually nurse her kits during the early morning hours (Venge, 1963; Schley, 1985). Seitz (1997) observed that the daily rhythm depend on the time of nightfall. Hudson and Distel (1989) noted that the nursing events of the does follow a 24 hour rhythm and the nursing events occur most frequently between midnight and 4:00 am. Light-dark change influences the time of nursing in both wild and domestic rabbits (Hoy and Selzer, 2002). In former studies twice a day nursing was observed by Mykytowycz and Rowley (1958) in European wild rabbits. For the domesticated rabbit's nursing behaviour authors observed discordant results. Cross (1951) noted that the domesticated rabbit does

were not able to nurse their kits more than once-a-day. On the contrary Davis (1957) and Venge (1963), and Lebas (1975) observed that during the first 2-3 days postpartum the does nursed their kits twice or three times a day, then only once-a-day. Dorn (1973) also observed twice a day nursing – during the night and early morning – in the case of closing the nest-box during the day. Jilge (1995) described a circadian nursing rhythm having an average period length of 23:48 between two nursing events in the case of continuous light. In a light-dark cycle of 12:12 a regular once-a-day but in a few case the nursing rhythm split into two nursing visit per day occurred (Jilge, 1993). Bringing the litter to the doe earlier than usual promoted maternal behaviour expression twice in 24 hours (González-Mariscal, 2007). Recent studies – using infrared cameras and 24-hour video recordings – observed multiple nursing per day for part of the does (Hoy, 1997; Seitz *et al*., 1997; Selzer, 2000; Matics *et al*., 2004). Keeping two does in an area of 150 m^2 under natural day length Hoy and Selzer (2002) found that multiple nursing occurred for 28% and 18% of cases for the European wild and domesticated rabbits, respectively. Seitz *et al*. (1997) found that in a cage system 40% of the New Zealand and Zika does performed twice or multiple nursing per day (under 12-12 light-dark period and natural day length, respectively). Selzer *et al*. (2001) monitored the does' nursing behaviour in different keeping systems under natural day length. They found that without environmental enrichment the number of daily nursing events and nest-box visits increased.

As the does generally nurse their kits during the dark period and according to Hoy and Selzer (2002) the nursing is induced by the changing period (from light to dark) it can be presumed that the length of the dark period and modification its length may affect nursing behaviour (eg. number of daily nursing events). For the purpose of biostimulation the effects of lengthening the light period from 8 to 16 hours 7-8 days prior to insemination is analyzed (Theau-Clement, 2007; Gerencsér *et al*., 2008), therefore in the present study it was examined how these modifications affect the nursing behaviour of rabbit does.

MATERIALS AND METHODS

The experiment was carried out at the University of Kaposvár using Pannon White rabbit does. The cages had a basic area of 580 x 385 mm, the size of the nest-box was 260 x 385mm. The rabbits were fed a commercial diet *ad libitum*. Drinking water was available from nipple drinkers. Prior to the experiment does were kept using a lighting program of 16L/8D and each doe already had 2-3 parturitions.

The does were randomly housed in two identical rooms with a temperature of 18 to 23°C throughout the year. Rooms differed only in the lighting regime. In the first room a 16L lighting (from 6.00 am to 10.00 pm) was used throughout the experiment (16-16L group). In the other room a lighting of 8 hours (from 6:00 am to 2:00 pm) was used during 3 days after parturition and the photoperiod was increased to 16 hours (from 6:00 am to 10:00 pm) starting at 8 days prior to insemination (i.e., on postpartum day 3; see below). After insemination (i.e., on postpartum day 11; see below) the photoperiod was switched back to 8L/16D (8-16L group). Luminous intensity measured in the cages at the height of rabbit does ranged between 40-70 lux.
Using a 42 day reproductive rhythm the does were inseminated 11 days after parturition. Cross fostering was applied (equalizing litter size to 8-9 kits/litter). The does could freely nurse their kits. From kindling till 14 days postpartum 24-hour video recordings were taken with infra red cameras (16-16L group: 16 does, 8-16L group: 18 does). Time and daily frequency of nursing and the length of stay in the nest-box were recorded for every doe. An event was considered nursing if the doe took the nursing characterising position and stayed in the nest box for at least a minute and after leaving the nest-box the activity of the kits was detectable. Performance of does that nursed their kits more than four times a day was not evaluated.

Length of nursing events and number of daily nursing were evaluated by means of multiple and one factor analysis of variance, respectively (factors: lighting program, days after parturition, number of nursing events), nursing distribution were analyzed by Chi^2-test using SPSS 11.5 software package.

RESULTS AND DISCUSSION

Contrary to several authors (Zarrow *et al*., 1965; Hudson and Distel, 1982; Schley, 1985; Wullschleger, 1985; Bigler, 1986; Stauffacher, 1988; Schlolaut *et al*., 1995) in the present study we found 35.6% and 31.3% twice a day and 4.1% and 5.8% three times a day nursing in the 8-16L and 16-16L groups, respectively. Selzer *et al*. (1999) reported similar results. Matics *et al*. (2004) found 22.8% twice a day nursing and 0.9% three times a day nursing, respectively.

The proportion of once a day and multiple nursing per day was similar in the 16-16L group during the experiment (Figure 1). Compared to the low value of multiple nursing measured on days 1-3 postpartum, the frequency of daily multiple nursing increased significantly (P=0.048) to 43.6% on day 12-14 in the 8-16L group. Average number of daily nursing in the 16-16L and 8-16L groups were 1.41 and 1.26 (P=0.146), between days 1-3, 1.43 and 1.48 (P=0.504) between days 4-11 and 1.47 and 1.46 (P=0.896) between days 12-14, respectively.

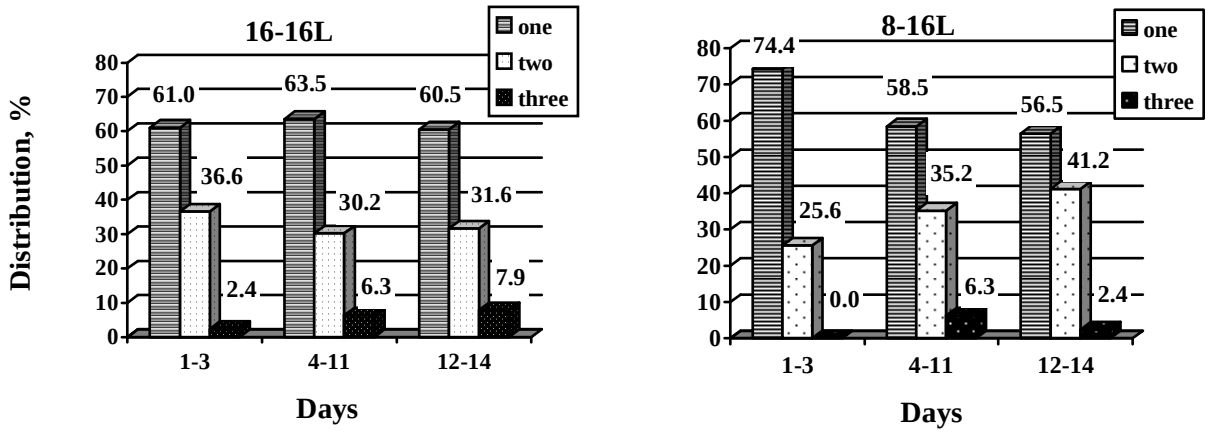

Figure 1: Daily nursing events in groups of 16-16L and 8-16L

The length of nursing was significantly longer in the first two days after parturition (P<0.001) but no substantial alterations were found from the second week (Figure 2). On the day of parturition does spend a longer time interacting with their litter (González-Mariscal *et al*., 1994) so this event was excluded from the evaluation.

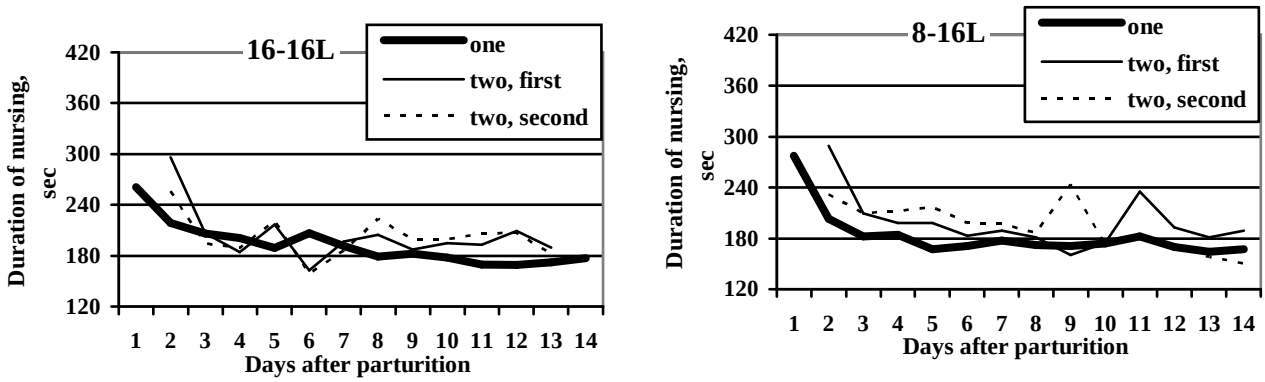

Figure 2: Duration of nursing in groups of 16-16L and 8-16L depending on the daily nursing events

From Table 1 it can be seen that the length of the nursing events decreased significantly after the first few days of lactation. Significantly longer nursing events were found in the 16-16L group compared to the 8-16L group. It seems this difference is not determinant because it was not associated with the does' milk production which was equal in the two groups (Gerencsér *et al*., 2008).

Table 1: Effect of lighting schedule on the length of nursing (in sec)

Group	Days after parturition						Total		P
	1-3		4-11		12-14				
	n	mean (±SD)	n	mean (±SD)	n	mean (±SD)	n	mean (±SD)	
16-16 L	59	249±112^{b}	216	194±33^{a}	62	188±34^{a}	337	202±60^{B}	<0.001
8-16 L	53	220±51^{c}	214	182±35^{b}	127	171±25^{a}	394	184±38^{A}	<0.001

n= number of nursing events; a, b, c within a row, A, B within a column (pooled) shows significant difference (P<0.05)

In case of once-a-day nursing the does spent significantly less time in the nest-box compared to does performed multiple nursing per day (Table 2). This finding was in accordance with Matics *et al*. (2004).

Table 2: Effect of lighting schedule on length of nursing events (in sec)

Daily nursing events		Lighting				P
		16-16 L		8-16 L		
		n	mean (±SD)	n	mean (±SD)	
One		132	195±42	159	180±35	0.001
Two	first	62	214±80	96	193±44	0.038
	second	62	215±81	96	189±62	0.026

CONCLUSIONS

Changing the lighting program affected the does' nursing behaviour. The frequency of multiple nursing and the number of nursing events per day increased if the dark period was shorter (8 h instead of 16 h). The lighting period modified the duration of nursing events but the difference was not relevant.

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