Proceedings of the

7th World Rabbit Congress

4-7 july **2000** – Valencia Spain

These proceedings were printed as a special issue of WORLD RABBIT SCIENCE, the journal of the World Rabbit Science Association, Volume 8, supplement 1

ISSN reference of this on line version is 2308-1910
(ISSN for all the on-line versions of the proceedings of the successive World Rabbit Congresses)

VIRÁG GY., PAPP Z., RAFAI P., JAKAB L., KENESSEY Á.

EFFECTS OF AN INTERMITTENT LIGHTING SCHEDULE ON DOE AND SUCKLING RABBIT'S PERFORMANCE.

Volume B, pages 477-481

EFFECTS OF AN INTERMITTENT LIGHTING SCHEDULE ON DOE AND SUCKLING RABBIT'S PERFORMANCE.

VIRÁG GY.*§, PAPP Z.**, RAFAI P.**, JAKAB L.**, KENESSEY Á.*

*Institute for Small Animal Research, Gödöllő, Hungary
**Department of Animal Hygiene, University of Veterinary Sciences, Budapest, Hungary

ABSTRACT

Length of light and dark phase by 24 hours or repeated light : dark intervals within a given period of the day are proven to influence reproduction and performance traits of domestic species. However far less research has been published considering rabbit breeding. In this experiment 12 - 12 NZW primiparous pregnant does equalized by body weight were introduced into chambers operated under different lighting schedule, continuous 12L : 12D (C) or intermittent 1,5L : 4D : 1,5L : 4D : 1L : 12D (I), respectively. The pregnancy development was not disturbed by the intermittent lighting even newborns weight was slightly lower (56,8 *vs* 61,1 g) at C group despite similar litter size (8,8 *vs* 8,7 suckling born alive). Following a within group litter equalization on the first day after kindling the average milk production of the does was higher (P=0,1) in group I (4675 *vs* 3796 g) consequently the average daily gain of suckling rabbits also (12 vs 9,7 g/day). Food consumption of the does throughout the whole duration of the experiment was similar however females of group I consumed less food for the production of one unit of milk (1,36 *vs* 1,77 g/g; P<0,05).

INTRODUCTION

Light is the main external zeitgeber for rabbit, in 12L : 12D a strong synchronization of physiological functions, such as food and water intake, excretion, locomotor activity, was reported by JILGE AND STÄHLE (1984). The minima of all functions being recorded during the light period providing evidence for the predominant nocturnality of this species. Accordingly to this MCNITT AND LUKEFAHR (1993) suggested that daylength may be an important factor in postweaning fryer performance when lowest gain was found in the summer. Light entrained circardian rhytm on the other hand could be artificially manipulated by using different lighting regimes to improve proliferation and growth performance. Artificial long days (18L :6D) reduced food consumption and body weight gain of the rabbits (EL-BOGDADY et al., 1992). With free access to the nest-box and intermittent lighting UZCATEGUI AND JOHNSTON (1990) found better growth rate of suckling rabbits what they attributed to the higher milk production of the does. In that study the beneficial effect of intermittent lighting on fertility rate and litter size at birth have been shown also.

A possible beneficial effect of controlled lactation has been confirmed (COUREAUD et al., 1998) currently and this method became widely accepted. That is however assumed as another environmental effect which might be conflicting circardian rhythm of the nursing (SCHULTE and HOY, 1997).

The aim of the study presented here was to investigate the effects of intermittent lighting on the doe in the 2nd half of pregnancy and during lactation moreover on the performance of suckling kits when nest boxes are open only for a limited period of the day.

MATERIAL AND METHODS

Primiparous New Zealand White rabbit does of the same batch, kept within farm conditions, were inseminated on day 10 post partum with pooled heterosperm. From them 24 having

§ To whom correspondence should be adressed, e-mail: virag@sunserv.katki.hu

positive palpation result on day 10 after AI were chosen out and equally divided according to their body weight into environmentally controlled rooms: C (3955 ± 149,9) and I (4020 ± 276,4). At that point they were separated from their actual litter and kits were divided between other litters on the farm.
After 3 days of adaptation 12L : 12D continuous photoperiod has started in one room (group C) and 1,5L : 4D : 1,5L : 4D : 1L : 12D intermittent lighting (adapted with minor modifications from UZCATEGUI AND JOHNSTON, 1992), resulting 12 hours of equivalent light period (BACON AND NESTOR, 1975) in the another one (group I). Temperature and light intensity of each room were held at 18°C and 40 lux, respectively. Does were fed *ad libitum* with a commercial pellet with a chemical composition as follows: 17,1 % crude protein, 16,25 % crude fibre, 3,3 % ether extract and 7,7 % ash, 49 % NNE (percent of dry matter).
On the day next to birth litters were checked and equalized to 8-9 by within group adoption, attempting creation of litters with similar weight. To prevent free nursing nest boxes were closed. Nursing was allowed for 20 minutes by opening the nest boxes when the first light period of the day had started.
Food consumption for each of pregnant (from day 16^{th} to delivery) and suckling does were determined daily. Litter size born total and alive were recorded and newborn rabbits individually weighted. Afterwards kit's body weight was controlled weekly. Daily milk production of the does was measured by the weight (doe) – suckle – weight (doe) method. Amount of food consumed by does for production of 1g of milk as well as litter weight gain (for 1 to 23 days of age) and milk consumed for 1 g of litter weight gain has been calculated individually.
Data were statistically evaluated using T-test for paired samples with equal variances (SNEDECOR AND COCHRAN, 1976).

RESULTS AND DISCUSSION

Average daily food intake of pregnant and lactating does are presented in Table 1. Basically no significant effect of intermittent lighting was detected in the second part of pregnancy and during lactation. The result is different from that which was published by UZCATEGUI AND JOHNSTON (1990) who found significantly higher food consumption during lactation under intermittent lighting. SZENDRŐ et al. (1988) however similarly did not observe higher consumption when the eating time for broiler rabbits was restricted to the dark period of the day. On the other part intermittent lighting influenced lactation performance of the does. Average amount of milk produced per doe per lactation was higher in the group I compared to that by group C (P< 0,1). This could be contributed to the better food conversion (P < 0,05) in the group I, so that smaller amount a food was consumed for production of unit of milk (1,36 g/g) than in the group C (1,77 g/g).

Table 1 Food intake of pregnant and lactating does, milk production and food efficiency (average ± SD) according to the photoperiod

Trait	PHOTOPERIOD	
	12 L : 12 S	INTERMITTENT
Food intake of pregnant does between day 16 to 32 of pregnancy (g)	2110 ± 413	2235 ± 378
Food intake of lactating does between day 1-21 of lactation (g)	6312 ± 1299	6366 ± 934
Total lactation milk production (g)	3796 ± 816	4675 ± 1080, P=0,1
Food consumption/milk production (g/g)	1,77 ± 0,45	1,36 ± 0,09, P<0,05

Since body weigh loss was observed at the group I does (Figure 1) the more intensive utilization of their body reserves might contribute to the better food conversion ratio, although differences between doe body weight in the I and C groups were not significant. Increased milk production in the group I could confirm the proposition by UZCATEGUI AND JOHNSTON (1990) against EL-BOGDADY et al. (1992) who found higher milk yield during long day photoperiod.

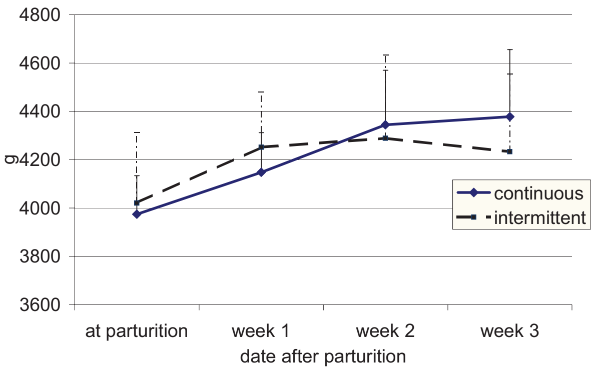


Figure 1. Development of doe body weight (average ± SD) during the lactation (1-21 days after parturition)

Litter traits at birth are presented in Table 2. Does in the group C and I delivered same litters although stillbirth rate was slightly different, 6,38 and 8,42 %, respectively. Newborn's birth weight was also heavier (+ 4,3 g) in the group I than in the group C. Differences were not statistically significant. All parameters observed in either group were within normal ranges established for NZW rabbits under field conditions (LEBAS, 1975). These results certify that intermittent lighting has no adverse effect on the embryo development and delivery.

Table 2 Total litter size at birth, number born alive, newborn weight*, survival index, litter weight gain and feed efficiency (average ± SD) according to the photoperiod

Trait	PHOTOPERIOD	
	12 L : 12 S	INTERMITTENT
Total litter size at birth (n)	9,4 ± 2,3	9,5 ± 2,6
Litter size born alive (n)	8,8 ± 3,3	8,7 ± 2,2
Newborns weight at birth (g)*	56,8 ± 14,7	61,1 ± 10,5
Survival index §	0,8 ± 0,88	0,86 ± 0,21
Total litter gain from birth to 21 days age (g)	1428 ± 589	1784 ± 660
Milk efficiency (g/g)	2,76 ± 0,41	3,89 ± 3,31

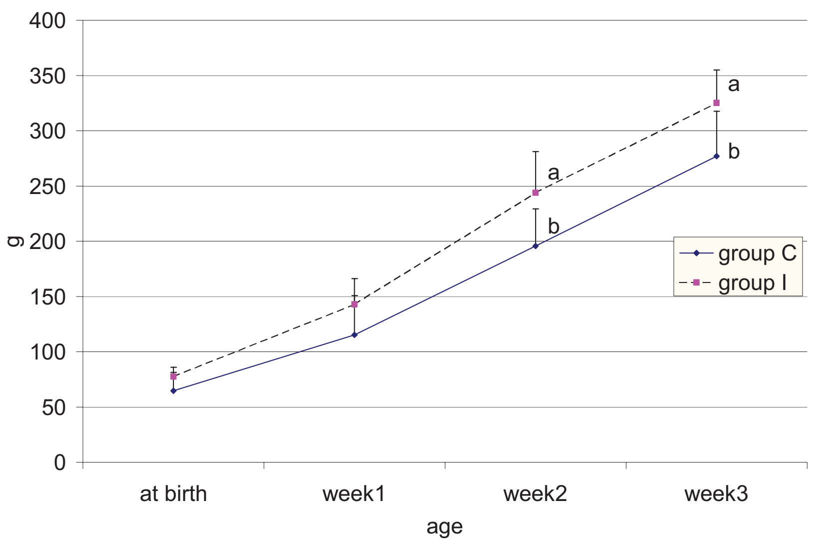
*including stillbirths
§ as number of kits per litter at 21 days/no. of kits after litter equalization

Survival index during 21 days of suckling was similar in the two groups. Survival index on the first week, characteristics for the adequacy of milk supply at controlled lactation, was a little lower in the group C while it was constant at the group I through the whole period. Average total litter gain between birth and 21 days of age was slightly higher in the group I, what was correlated with the higher body weight of the kits in this group at 1, 2 ($P < 0,05$), 3 ($P < 0,05$) weeks age, Figure 2. But the difference of the total litter gain was only near significant what could be regarded to the differences in survival pattern between the two groups. Unfortunately the kits were not individually labeled, so despite individual weighing the body gain can be estimated based on the average body weights of littermates. In this way the estimated body weight gain between birth and 21 days age was 12 and 9,7 g/day in the group I and C, respectively. This is consistent with what was found in the experiment of UZCATEGUI AND JOHNSTON (1990) who reported 13,5 and 10,0 g/day for 12 hours intermittent and 12 hour continuous lighting, respectively. Milk was utilized by similar efficiency in the two groups what could be expected, as external photoperiod does not influence the nest-box inside.

According to the results presented here, the effect of intermittent lighting is not important at most of the studied parameters when controlled lactation is performed although the general lack of significance could be considered rather as a result of the differences between does within each group. Only milk yield and food efficiency of the does as well as kits body weight at 2 and 3 weeks age was different at a significant level. Values however was better at every trait considered in the group I compared to the group C, except doe's body weight change. Latter could be harmful for the reproductive performance and health of the doe, if were statistically proven.

Since work on rabbit farms are more and more automated and the number of working hours considerably decreased in the last years more different photoperiod should be studied within field conditions, with larger number of animals to get clearer explanations of its effects.

Figure 2 Average body weight of kits in group C and I at birth, 1, 2 and 3 weeks of age (g ± SD)



a and b at same age denotes significant difference at P<0,05 level

REFERENCES

BACON W.L. AND NESTOR K.E. 1975: Reproductive response to intermittent light regimens in Coturnix coturnix japonica. *Poult Sci* **54**:6 1918-26

COUREAUD G., SCHAAL B., ORGEUR P., COUDERT P. 1998 Controlled access to the nestbox in rabbit: effects on pups mortality. 7th French Rabbit Days, *WRS* 1998. Vol **6**, Special Issue

EL-BOGDADY,-AH; ABD-EL-MOTY,-AKI; ABD-ELHAKEAM,-AA; HASSANEIN,-HH 1992: Effect of lighting systems and breed on productive and reproductive performance of female rabbits. *Egyptian-Journal-of-Rabbit-Science*. **2**: 1, 23-36

JILGE B, STÄHLE H 1984 The internal synchronization of five circadian functions of the rabbit. *Chronobiol Int* **1**:3 195-204
LEBAS F., COUDERT P., ROUVIER R., ROCHAMBEAU H. DE, 1984 Le Lapin. Elevage et pathologie. *F.A.O., Rome, Italy*.
MCNITT JI, LUKEFAHR SD 1993 Breed and environmental effects on postweaning growth of rabbits. *J Anim Sci* **71**:8 1996-2005
SNEDECOR G.W. AND COCHRAN W.G. 1976 Statistical Methods, *The Iowa State University Press, Ames, Iowa, U.S.A.*
UZCATEGUI, M.E. AND JOHNSTON, N. P. , 1990 Effect of continuous and intermittent photoperiods on the reproductive performance and growth of rabbits. *J. Appl. Rabbit Res*. **13**:215-219
UZCATEGUI, M.E. AND JOHNSTON, N. P, 1992. The effect of 10, 12 and 14 hour continuous and intermittent photoperiods on the reproductive performance of female rabbits. *5th Congress of World Rabbit Science Association*, July 25-30, 1992, Corvallis, USA., vol. **A**, 553-559.
SCHULTE I, HOY S 1997 [Nursing and suckling behavior and mother-child contacts in domestic rabbits] *Berl Munch Tierarztl Wochenschr* **110**:4 134-8
SZENDRŐ ZS., SZABÓ S., HULLÁR I. 1988 : Effect of reduction of eating time on production of growing rabbits. *4th WRC* Vol. **3**, 104-114