GNAWING BLOCKS IN RABBIT CAGES: IMPACT ON THE BEHAVIOUR AND PERFORMANCE OF DOES AND FATTENING RABBITS

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ABSTRACT

Welfare is of increasing importance to consumers and an enriched environment may be beneficial to farm animals. When overexpressed, gnawing is considered as a stereotypic response to an unsuitable environment. Cage enrichment with a gnawing element could thus alleviate this problem, but may also lead to increased hygiene problems. The aim of this study was to investigate the effect of adding a nutritional block in the cages of fattening rabbits (on restricted or non-restricted diets) and does. For does, two groups of 40 animals (including 10 nullipartum) were individually housed from seven days prior to birth until weaning 36 days later with or without a block containing pharmaceutical quality wood fibre and trace elements. For fattening rabbits, four groups of 15 cages with seven rabbits in each were compared. Two groups (30 cages) were fed *ad libitum* whilst the other two received restricted diet at 80% of the *ad libitum* level. Half of the cages received nutritional blocks from 36 to 64 days of age. Under all conditions two cages per group (8 cages) were observed using scan sampling for oral behaviours. The total weight of young rabbits, block and feed consumption were measured once a week for each cage. Mortality was recorded daily. Twenty litters per group of does were weighed at three different ages, before and after suckling, to measure milk consumption. Block availability did not significantly impact doe milk production or significantly modify female and young rabbit behaviour (except for the time young rabbits spent grooming). Mortality of fattening rabbits was not affected. Feed restricted rabbits showed significantly lower body weight and higher nutritional block intake. Over the whole period, rabbit body weight and average daily gain were higher for cages with blocks ($p<0.10$). In conclusion, nutritional blocks appear to enhance the rabbit environment. However, these preliminary results need further investigation to balance the improved growth performance with the increased cost of adding nutritional blocks.

Key words: Doe, fattening rabbits, gnawing element, nutritional blocks, behaviour.

INTRODUCTION

Welfare is of increasing importance to consumers and an enriched environment may be beneficial to farm animals. When overexpressed, gnawing is considered as a stereotypic behaviour symptomatic of an unsuitable environment. Princz *et al.* (2008) showed that adding a wooden stick in fattening rabbit cages fed *ad libitum* could reduce aggressiveness without decreasing rabbit performance. Rizzi and Chiericato (2008) even showed growth improvement with such enrichment. However, Mirabito *et al.* (2000) observed significantly higher mortality in fattening rabbit cages with a wooden stick compared to those without or provided with rough materials (22.7%, 14.4% and 15.9% respectively). It is therefore important to find a solution which allows rabbits to express their natural gnawing behaviour without impairing hygiene.

The purpose of this study was to investigate the effect of adding nutritional blocks in cages on performance and behaviour of does and fattening rabbits which were feed restricted or not (to study the potential effect of feed restriction on block consumption).

MATERIALS AND METHODS

Animals and experimental design

Two groups of 40 females (including 10 nullipartum) were individually housed with (B+) or without (B-) a block of 200g containing pharmaceutical quality wood fibre and trace elements (*Blocks: Instinct Sauvage, INZO*) from seven days prior to birth until weaning 36 days later. In order to limit hygiene problems and to avoid block contamination with droppings, gnawing blocks were hung on the cage wall to allow firstly doe and secondly young rabbit access. This block contained 10% humidity, 15% calcium, 1.5% phosphorus and 2% sodium. Feed nutrients were balanced according to Lebas (2004). Feed calcium level was calculated in order to meet rabbit requirements (1 to 1.1%). Twenty litters per group were weighed at 3, 8 and 15 days of age, before and after suckling, to evaluate milk production. Total weight of litter per cage, block and feed consumption were measured each week. Mortality was recorded daily. Four cages per group (8 cages) were observed using scan sampling for feeding, gnawing the block, gnawing the environment, and grooming behaviour at 11 and 23 days post-partum. Observations were carried out three times per day, at 9:00, 13:00 and 17:00 h with five replicates at each time.

Four groups of 15 cages containing seven fattening rabbits were sampled. Two groups (30 cages) were fed *ad libitum* (AL), whereas the other two groups were restricted to 80% of the *ad libitum* level until 64 days (R). Restricted rabbits were fed every day at 8:00 am. In both cases, half of the cages contained blocks from 36 to 64 days of age (B+ or B-). Total weight of rabbits per cage, block and feed consumption were measured each week. The feed conversion ratio was calculated excluding the block consumption. Feed nutrients were balanced according to Lebas (2004). Feed calcium level was calculated in order to meet rabbit requirements (0.95 to 1%). Mortality was recorded daily. Two cages per group (8 cages) were observed using scan sampling as described above, at 45, 56 and 66 days of age. There were five periods of sampling on each day at 9:00, 11:00, 13:00, 15:00 and 17:00h with three replicates at each time.

Statistical Analysis

Data from the doe trial were analysed by ANOVA using the repeated measures procedure in Statview®.

Data from the fattening rabbit trial were analysed using an ANOVA including feed (AL or R) and block (B+ or B-) as the main factors and their interaction in the linear model. Mortality results were tested using a non-parametric test (Chi2).

Behavioural data were pooled and analysed using the Kruskal Wallis non-parametric test.

RESULTS AND DISCUSSION

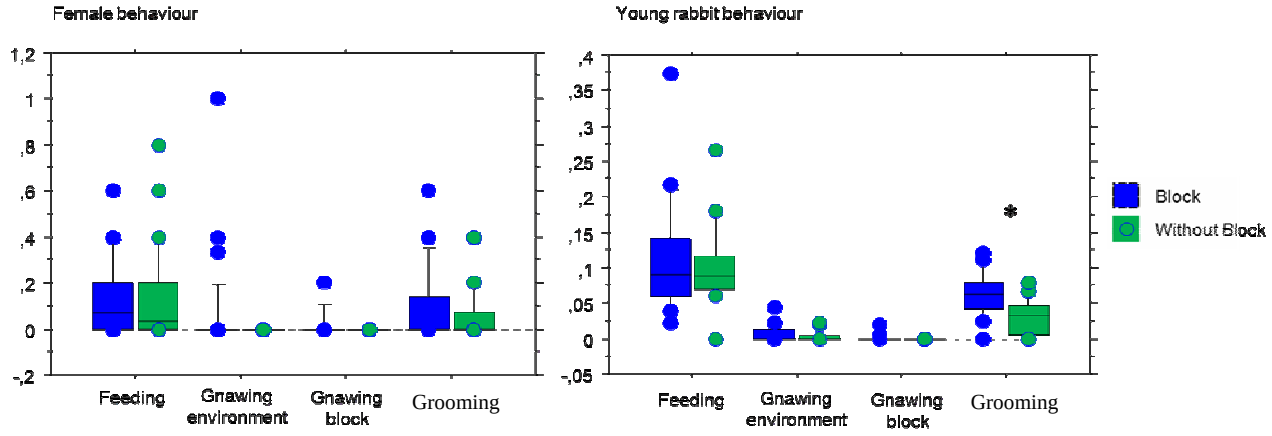
Doe trial

Blocks did not significantly affect the maternal performance of does. Nest mortality between 0 and 35 days was not significantly different (B+ = 4.7% ± 10.5 vs B- = 2.2% ± 4.2; p=0.41). Milk production, at 3, 8 and 15 days after birth, was not significantly different between groups (Table 1). This result was reflected in the similar body weight of the young rabbits. Young rabbits weighed on average 982g±81 at 35 days of age. No interaction was observed between the age of rabbits and the block addition (p=0.98). No difference was observed on feed consumption from 7 days prior to and 35 days after birth (B+: 504.0g/d±70.0 vs B-: 518.7g/d±60.3; p=0.32). Block consumption ranged from 7g/d/doe (±4g/d) before birth to 28g/d/doe (±15g/d) in the last week before weaning. This considerable increase in block consumption was explained by the intake of young rabbits contributing to the total intake per cage. A large amount of the blocks was eaten even if animals were fed *ad libitum*.

Table 1: Does performance with or without blocks (B+, B- respectively).

		B+	B-	**P-value**
Milk produced per female (g/d)	Birth + 3d	145.1±41.9	148.2±38.8	**0.56**
	Birth + 8d	195.6±42.5	224.4±55.1	
	Birth + 15d	217.5±34.9	208.8±78.3	
Mean individual weigh of young rabbits (g)	8d	163.0±23.8	174.1±22.4	**0.27**
	15d	281.6±33.5	296.3±40.6	
	21d	383.9±41.9	394.8±50.2	
	28d	600.3±59.1	610.2±72.3	
	35d	974.0±81.1	989.7±101.5	
Feed consumption per cage (g/d)	Birth-7d – Birth+35d	504.0±70.0	518.7±60.3	**0.32**

Total block consumption during the whole experimental period (42d, female and young rabbit consumption) reached 13.18g/d±6.01. Blocks had no effect on female behaviour. Young rabbits spent significantly more time grooming when a block was installed in the cage (6.4% ± 3.4 vs 3.2% ± 2.9). The reason for this effect remains unclear (figure 1).



***** showed a significant difference at 5%

Figure 1: Female (N=24) and young rabbit behaviour (N=12) with and without a block

Fattening rabbit trial

Neither the presence of a block nor the feeding programme affected the mortality rate (1.7±4.6% on average). This result differs from those of Mirabito *et al.* (2000) using a wooden stick. This can be explained by the fact that gnawing blocks were hung on the cage wall in our trial and were not on the cage floor.

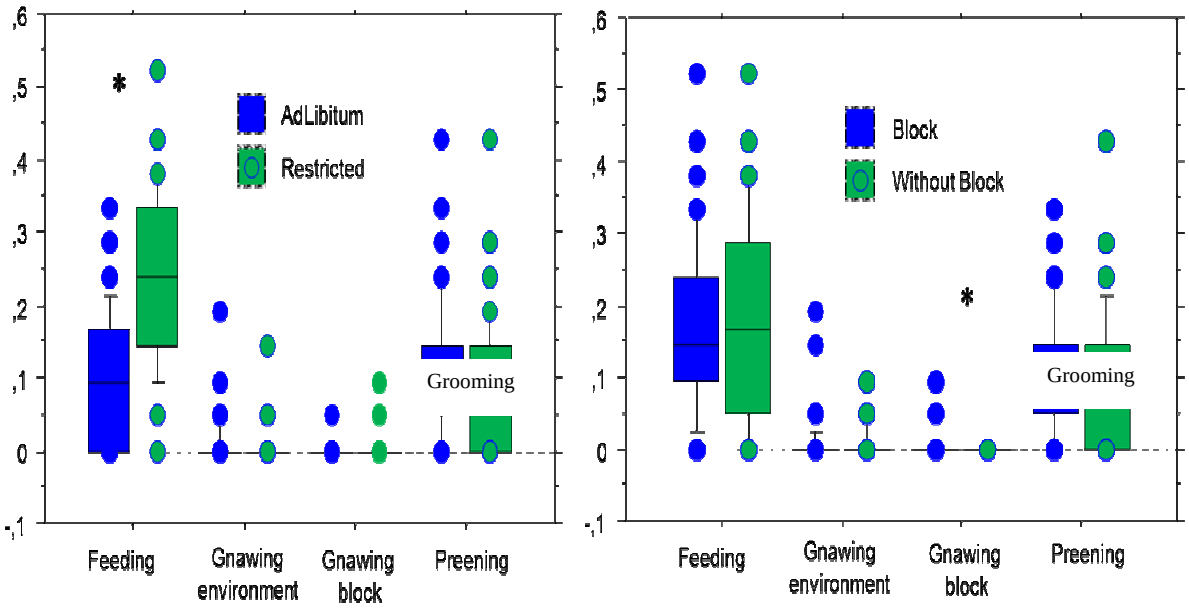
For the parameters mentioned below, no interaction between the presence of blocks and feeding method was revealed except for ADG49-64d. For this observation, addition of a block had no significant effect on *ad libitum* fed rabbits (45.9±2.5g/d), whereas it had a significant impact on restricted rabbits (31.0±1.8 with block vs 28.9 ±2.2g/d without block). The results for feed consumption, average daily gain (ADG) and feed conversion ratio (FCR) are shown in table 2. Considering the whole period, for the feed restricted group compared to the *ad libitum* group, ADG decreased by 7.2% (45.4±1.6 vs 48.9±2.1 g/d) and FCR decreased by 17.3% (3.00±0.23 vs 3.52±0.32). Mean body weights at 70d were 2734±76g and 2623±61g ($p<0.0001$), respectively for *ad libitum* and restricted rabbits and 2694±85g and 2663±90g ($p=0.09$) with or without an added block. From 36 days to 64 days, block consumption by rabbits was 3.1±1.4g/d when they were fed *ad libitum* and 6.9±1.2g/d when restricted ($p<0.0001$). Block consumption was higher in restricted rabbits. Although feed consumption was not modified by block addition when considering the whole period (150.4 vs 149.4g), ADG tended to be greater in the groups with blocks than in those without for the periods

Table 2: Productive performances of fattening rabbits according to presence or not of block (B-, B+) and feeding method (AL, R); block consumption according to feed.

		N	36-49d	49-64d	64-70d	36-64d	36-70d
Feed intake (g/d)	**Mean±Sd**						
	B-	30	125.0±15.6	146.7±16.6	180.9±12.9	136.8±15.9	150.4±17.9
	B+	30	125.5±15.4	145.6±14.9	178.4±13.3	136.2±15.0	149.4±17.1
	AL	30	139.7±5.7	160.4±6.8	170.5±4.4	150.8±5.6	167.4±4.4
	R	30	110.3±0.0	130.9±9.7	188.8±9.7	121.3±0.0	133.2±2.3
	P value						
	Block		**0.98**	**0.39**	**0.30**	**0.57**	**0.62**
	Feed		**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**
	Feed x Block		**0.98**	**0.39**	**0.95**	**0.57**	**0.46**
ADG (g/d)	**Mean±Sd**						
	B-	30	56.0±2.6	37.9±9.1	46.9±14.6	46.1±5.1	46.7±2.5
	B+	30	57.0±3.2	38.3±7.7	50.9±13.9	47.0±5.2	47.7±2.5
	AL	30	57.8±3.0	45.9±2.5	37.2±4.5	51.3±2.2	48.9±2.1
	R	30	55.2±2.2	30.0±2.2	60.6±10.7	41.8±1.5	45.4±1.6
	P value						
	Block		**0.18**	**0.28**	**0.06**	**0.09**	**0.06**
	Feed		**<0.001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**
	Feed x Block		**0.16**	**<0.05**	**0.28**	**0.72**	**0.58**
Feed conversion ratio	**Mean±Sd**						
	B-	30	2.23±0.24	4.01±0.58	3.99±0.91	2.95±0.10	3.23±0.25
	B+	30	2.19±0.22	3.87±0.42	3.68±0.83	2.89±0.10	3.28±0.47
	AL	30	2.42±0.09	3.51±0.15	4.65±0.47	2.94±0.10	3.52±0.32
	R	30	2.00±0.08	4.36±0.35	3.07±0.26	2.90±0.10	3.00±0.23
	P value						
	Block		**0.06**	**0.06**	**<0.05**	**<0.05**	**0.50**
	Feed		**<0.0001**	**<0.0001**	**<0.0001**	**0.10**	**<0.0001**
	Feed x Block		**0.11**	**0.06**	**0.66**	**0.79**	**0.28**
Block intake (g/d/rabbit)	**Mean±Sd**						
	AL	15	2.20±1.53	3.95±1.63	-	3.14±1.38	
	R	15	5.20±1.58	8.44±1.26	-	6.94±1.22	
	P value		**<0.0001**	**<0.0001**		**<0.0001**	

64-70d, 36-64d and 36-70d (47.7 vs 46.7g/d for the whole period; p=0.06). Thus, feed efficiency appears to be improved by block consumption (not taken into account in the calculation of FCR). Live weight at 70 days tended to be greater with blocks (2744±88 with block vs 2723±65g without; p=0.09). Thus, a supplemental mineral block appears to fulfil behavioural requirements and to improve ADG (+1.3% for ad libitum and + 2.4% for feed restricted). This effect could be due to supplementary mineral intake (Ca, P) (Zerrouki *et al.*, 2008) or to a decrease in stress through gnawing behaviour.

During the diurnal period, restricted rabbits spent significantly more time eating (figure 2; 24±12 vs 10±10%). This result can be explained by the fact that *ad libitum* fed rabbits ate during the night and that feed restricted rabbits were fed at 8:00 in the morning. No difference was observed between groups for any other behaviour. Stereotypic behaviours like excessive grooming and/or gnawing the environment were very rarely observed (grooming 9.6±9.4% and gnawing environment 0.8±2.7%; figure 2). Thus, our study cannot confirm whether blocks induce a decrease in certain stereotypic behaviours.



* showed a significant difference at 5%

Figure 2: Young rabbit behaviour fed *ad libitum* or restricted (N=60) and with or without a block (N=60).

CONCLUSIONS

Addition of mineral blocks in rabbit cages for both female and fattening rabbits can be considered as a way to enrich the environment. Indeed their addition did not increase the mortality rate and allowed rabbits to gnaw something specific for this purpose. This enrichment appeared to be more beneficial for fattening rabbits than for breeders to the extent that it increased their performance. This effect could be linked to either the extra supply of calcium contained in the block or the reduction in the stress level of rabbits resulting from the enrichment. Moreover, the behaviour of fattening rabbits towards blocks changed according to the quantity of feed available. A further study comparing the addition of a block or a wooden stick would be interesting. In our study, the consumption of the block by feed restricted rabbits was excessive in relation to the improvement in body weight. These first results therefore need to be investigated further to establish cost effectiveness and to understand the mechanisms involved in this improved body weight.

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