EFFECT OF PRE-WEANING DIET ON RABBIT PERFORMANCE

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ABSTRACT

This study aimed to ascertain the effect of different solid feed composition during suckling on productive performance and caecal content characteristics of rabbits at weaning (28 days). From day 16, fifteen litters housed in separate cages from their mothers were administered a weaning commercial feed (Diet A) while fifteen other litters were given the same mothers' feed (Diet B). Litters were equalized at partum at eight pups and dead pups were replaced by pups of the same age from nursing does. After weaning, the rabbits received *ad libitum* diet A for 3 weeks, then a finisher diet (Diet C). From 20 to 28 days of lactation, no significant difference was observed between the two groups in milk intake (average 175 g/d/litter), solid feed intake (average 96 g/d/litter) or growth rate (average 31.7 g/rabbit). In post-weaning, significant differences were noted only during the first week, while in the whole period (28-70 d) the differences were very slight apart from the lower mortality observed in group A (3.0 vs 8.0%). During the first week, group A rabbits consumed more concentrate (66.0 vs 57.5 g/d) and showed a higher daily weight gain (39.0 vs 36.2 g) than group B. The characteristics of the caecum and caecal content in the rabbits slaughtered at weaning were similar in both groups. The obtained results indicate that administration prior to weaning of a specific concentrate for young rabbits, even if it does not greatly affect caecal fermentation and productive performance, facilitate the transition from liquid to solid nutrition, thereby reducing health risks.

Key words*:* rabbits, pre-weaning diet, caecal fermentation, performance.

INTRODUCTION

One of the problems in rabbit nutrition is to meet the nutritional requirements of the animals, without creating digestive troubles that can lead to mortality (GIDENNE, 1997). For this last aspect, the more critical period is around weaning (20-40 days of age) due to the transition from milk to solid nutrition and the development of caecal microbial activity that starts to stabilize only after 7 weeks of age. Caecal microbial activity has a key role in rabbit digestive physiology and health. Around three weeks of age when solid feed intake starts, caecal fermentative activity develops, becoming more important as soon as the intake of solid feed increases and some of the enzymatic digestive activities show important changes (MAROUNEK *et al*., 1995). According to MAERTENS and DE GROOTE (1990) and SCAPINELLO *et al*., (1999) an earlier intake of solid feed could improve the maturation of digestive enzymes and reduce the post-weaning risk of

digestive disorders. Research on this (PADILHA *et al*., 1995; DOIANA *et al*., 1998; PINHEIRO *et al*., 2001; NIZZA *et al*., 2001), also attributing a key role to solid feed intake in the development of caecal fermentative activity, does not always give indications on the influence on health. This work aimed to study the effect of different chemical composition of diets administered before weaning on caecal content characteristics and on performance and health of growing rabbits.

MATERIAL AND METHODS

Thirty litters were equalised at partum at eight pups. Dead pups were replaced during lactation by pups with the same age from nursing does. Litters were obtained from multiparous New Zealand White females, inseminated 12 days after partum and remaining pregnant.

At partum, the litters were housed in separate cages from their mothers and then subjected to programmed lactation. Milk yield of does during lactation and solid feed intake of litters during the last week of lactation were controlled. From day 16, fifteen litters were fed a commercial weaning feed (Diet A) while fifteen other litters were fed the same mothers' feed (Diet B). Milk yield was measured by weighing the litters before and after suckling; does were placed with their litters to suckle for about 10 min once daily in the morning. Until the 18th day of lactation, measurements were made at 4-day intervals; from day 21 measurements were recorded on a daily basis. Solid feed intake was monitored daily from day 20 to 28. At weaning (28 days) and before suckling, one rabbit per litter was slaughtered to obtain data regarding caecal characteristics and content. Rabbits were stunned by neck hit and bled. After slaughter, the caecum was isolated and caecal content, after pH measurement, was frozen at 18° C until ammonia was determined (Boehringer UV urea/ammonia kit method) as well as volatile fatty acids (VFA) (Perkin Elmer 841 Gaschromatograph with column 80/120 Carbopack B-DA/4% Carbowax 20M-2m 2mm id). At weaning 100 Group A rabbits and 100 Group B were raised for six weeks to ascertain post-weaning performance and health. The animals were housed in bi-cellular cages, kept in an experimental room with artificial ventilation and a 12h light –12h dark schedule. The rabbits were given Diet A *ad libitum* for 3 weeks; then a finisher feed was distributed (Diet C). Individually conducted weight controls were recorded weekly. Feed intake was recorded daily during the first week, then weekly. If a rabbit died, half of feed intake registered in the cage up to the rabbit's death was attributed to the live rabbit. Chemical analysis of diets (Table 1) followed the method of AOAC (1984) for dry matter (DM), ash, ether extract (EE), crude protein (CP) and crude fibre (CF), and VAN SOEST *et al*. (1991) for acid detergent fibre (ADF) with a thermostable amylase pre-treatment. Gross energy was determined by adiabatic bomb calorimetry. Statistical analysis was carried out using *t* test.

Table 1: Chemical composition of diets (%)

	Diet A	Diet B	Diet C
Dry matter	91.0	90.8	90.3
Crude protein	15.8	16.2	15.5
Ether extract	2.8	3.2	3.0
Ash	8.2	8.0	7.8
Starch	11.8	18.9	17.1
Neutral detergent fibre	32.0	30.2	28.4
Acid detergent fibre	20.5	18.4	17.3
Acid detergent lignin	5.1	4.4	4.0
Gross energy (MJ/kg)	15.9	16.0	16.3

RESULTS AND DISCUSSION

Pre-weaning performance

During pre-weaning (Table 2), similar mortality rates (1.8 and 2.7%, respectively for groups A and B) were observed. In this period (20-28 days) milk intake (175 g/d) and feed intake (96 g/d) were average and there were no differences between groups. Milk yield reflected the findings of other authors (FRAGA *et al.*, 1989; FORTUN-LAMOTHE *et al.*, 2001), as did solid feed intake (FORTUN-LAMOTHE *et al.*, 2001; NIZZA *et al.*, 2002). The lack of difference in solid feed intake between the groups could mean that young rabbits regulate intake according to milk availability, irrespective of the chemical characteristics of the administered solid diet. In this regard, higher intake of solid feed in rabbit that consumed less milk is reported by FORTUN-LAMOTHE and GIDENNE (2000), PASCUAL *et al.* (2001) and DI MEO *et al.* (2003). Hence, the similar quantity of milk and solid feed intake resulted in similar growth rates (average 31.8 g/d) and live weight at 28 days (average 558 g) between groups.

Table 2: Performance of rabbits pre-weaning (20-28 days)

		Groups		
		A	**B**	**t value**
Litters	n	15	15	
Milk intake	g/d/litter	176.4	174.6	0.27
Feed intake	g/d/litter	97.5	94.6	0.64
Daily weight gain	g/rabbit	32.0	31.5	0.58
Live weight at 28 days	g	562.0	554.2	0.70
Mortality	%	1.79	2.68	

Post-weaning performance

For the first week after weaning (Table 3), young group A rabbits intake about 13% more solid feed than those of group B (66.0 vs 57.5 g/d; $P<0.01$).

Table 3 - Performance of rabbits after-weaning

		Groups		
		A	B	t value
Rabbits	n	100	100	
Initial weight	g	560	552	0.47
Final weight	g	2244	2190	1.06
Feed intake (28-35d)	g/d	66.0^{A}	57.5^{B}	3.15
Feed intake (28-70d)	g/d	124.1	125.2	1.13
Feed conversion ratio (28-35d)		1.69	1.68	0.62
Feed conversion ratio (28-70d)		3.09	3.21	1.33
Daily weight gain (28-35d)	g/rabbit	39.0^{a}	36.2^{b}	0.76
Daily weight gain (28-70d)	g/rabbit	40.1	38.0	1.22
Mortality (28-70d)	%	3.0^{b}	8.0^{a}	4.29*

^{A,B}: P<0.01; ^{a,b}: P < 0.05; (*) chi square value

The pre-weaning administration of a specific concentrate that the young rabbits also used in post-weaning probably reduced the stress during this delicate period of the young rabbit's life and allowed more regular feed intake (Figure 1).

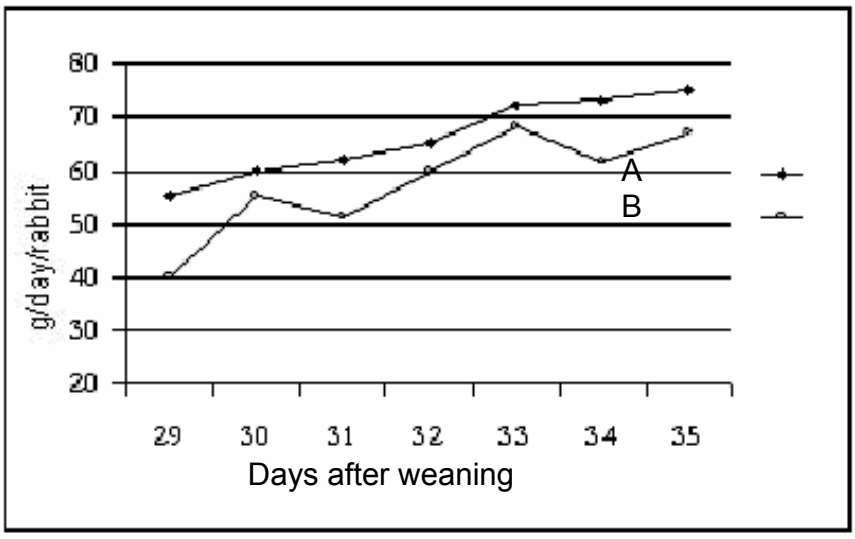

Figure 1: Per capita daily feed intake during the 1st week post-weaning

It has also been shown (LEBAS and MAITRE, 1989; BLAS *et al.*, 1994; MAERTENS and LUZI, 1995) that the normally starch-rich diet administered to lactating females cannot satisfy the nutritional requirements of young rabbits and may induce modifications in caecal fermentation. An appropriate diet administered around the 20th day of lactation and unchanged at weaning can contribute to keep feed intake regular and caecal fermentation under control. Indeed, during the whole experimental period (28-70 days) there were no significant differences in solid feed intake in the two groups (average

124.6 g/*d*). This albeit predictable result confirms that the rabbit, after the first period of weaning, is well adapted to diets and modulates the feed intake according to nutritive requirements. Also, during the first week a different daily gain in group A (39.0 *vs* 36.2; P< 0.05) was recorded. The different treatment before weaning had no effect on other post-weaning performance. The mortality, observed only during the first two weeks of the trial and due to digestive troubles, was higher (8.0 *vs* 3.0; P < 0.05) in the animals that changed diet at weaning (group B). These animals also showed during the whole period a health risk index (defined as the sum of mortality and morbidity; criteria used to identify illness were detection of digestive troubles - signs of diarrhoea) higher (7.0 *vs* 16.0%).

Caecum characteristics and caecal content

The characteristics of the caecum and caecal content observed in the rabbits slaughtered at weaning are reported in Table 3. Caecal content (average 30.5 g) and empty caecum weight (average 8.9 g) were similar in both groups. The observed values are similar to those reported in the literature (GIDENNE 1996; NIZZA *et al.*, 2002). Also the dry matter of caecal content (average 25.6 %) showed values in line with those reported in the literature (DI MEO *et al.*, 2003) The differences observed on the other parameters (pH, Ammonia, VFA, C_2, C_3, C_4) were slight and in any case statistically significant. It is the authors' opinion that the absence of the substantial differences of caecal content according to different chemical composition of the concentrates, is due to the high quantity of milk intake that allowed the composition of diet of the two groups to be kept similar.

Table 4: Characteristics of caecum and caecal content at weaning

		Groups		
		A	**B**	**t value**
Rabbits	n	15	15	
Body weight (BW)	g	565	550	
Caecal content	% BW	5.55	5.29	0.79
Empty caecum	% BW	1.56	1.63	1.17
Dry matter caecal content	%	25.3	26.0	1.13
pH		6.05	6.26	1.92
Ammonia	mmol/l	8.5	8.7	0.55
Total VFA	mmol/l	47.4	46.8	1.22
C_2	molar %	70.1	67.7	1.85
C_3	molar %	7.8	6.9	1.35
C_4	molar %	22.1	25.4	1.87

CONCLUSIONS

The results obtained in this survey, though based on a limited number of cases, show that use of a concentrate with little starch and high structural carbohydrate contents does not improve the performance of rabbits at weaning. Nor did concentrate formulated for young rabbits induce major changes in caecal content characteristics. During the first post-weaning week, group A rabbits showed a more regular intake of concentrate in respect of group B animals. This observation suggests that during suckling the effect of administration of a specific concentrate for young rabbits was confused by milk. Thus, in consideration of the results in the post-weaning period and the lower mortality of the rabbits, administration of a specific concentrate for young rabbits before weaning would appear advisable.

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