EFFECT OF PROTEIN LEVEL AND RABBIT ORIGIN ON PERFORMANCES AND MORTALITY OF GROWING RABBIT

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Abstract - 39 Hyplus rabbits issued from 2 different maternities (Group 1 and 2) were fed from 45 days to 70 days at two levels of protein : 17% (HP treatment) and 16% (LP treatment) keeping the same amount of essential amino acids. Rabbits from primiparous does weaned at 33 days (group 1) were lighter (832 g) than those from multiparous does weaned at 35 days (974 g; group 2). Growth performances between HP and LP treatment were similar: ADG and FC 40.7 g/d and 3.81 for HP, 41.3 g/d and 3.72 for LP treatment respectively. Mortality, mainly due to caecal impaction was high in rabbits from group 1 (13.3%) and was not existant for rabbits from group 2. This study demonstrates that a small difference in protein level (1 %) does not by itself affect the incidence of caecal impaction. A predisposition coming from the weaning conditions of the rabbits at 33-35 days may induce development of a caecal impaction syndrome. Maternal influence or environmental condition before weaning seems important in the occurrence of caecal impaction before 70 days of age.

INTRODUCTION

Caecal impaction (CI) is a specific syndrome of rabbit pathology. It consists in the blocking and dehydration of the caecal content. This syndrome appears most often in growing rabbits at the age of 55-70 days, (MORISSE 1986). Most of the time, affected rabbits are heavy rabbits, with a normal or good growth rate, the economical impact of this syndrome is important due to its potentially high level of mortality. This kind of pathology is often considered as a form of mucoid enteropathy due to enterotoxemia (MARCATO et ROSMINI 1986; LLEONART 1980; CHEEKE, 1987; BRUGERE-PICOUX 1989; LECERF 1984).
Various causes of enterotoxemia or CI have been evoked : feed quality (LEBAS 1991; PEETERS et al 1994), feed consumption (BATLLORI 1992), pathological environment, clostridia and colibacilli (PEETERS 1988), coccidiosis (LEBAS 1990, environmentt (DI MODUGNO et CARMARDA 1993 ; LECERF 1984).
But the CI syndrome appears to be a multifactorial one and no single cause seems in grade to provoc alone an experimental development of this syndrome.
The purpose of this study was to determine the degree of correlation between feed composition (protein level), rabbits origin and CI in a farm where the syndrome occured frequently.

MATERIAL AND METHODS

Farm

As it is impossible to provoke CI experimentally, we decided to work in a farm where this syndrom is frequently observed. The farm consists of 2 structures : a closed building with completly controled environement and a semi-open-air building.
Two years ago CI was the dominant factor causing mortality in fattening rabbits in all buildings. This lead to a mortality as high as 30 %.At present in the closed buildings mortality due to CI has totally disappeared probably in association with a change in the regulation of the ventilation system. This appears to confirm the relationship between environment and toxemia problems (DI MODUGNO et CARMARDA 1993 ; LECERF 1984). Only in the semi-open-air buiding does CI continue to be a major cause of mortality. The experiment was conduced in this building.

Animals

A factorial arrangement with 2 feed treatments and 2 animal origins was used.
439 HYPLUS rabbits weaned at 33 or at 35 days were divided into 2 groups receiving 2 different feeds.The 439 rabbits were the offspring of 2 groups of does raised in 2 separated buildings. The first group of 278 originated

from 33 kindlings of primiparous does and weaned at 33 days and the second group of 161 originated from 17 kindlings of multiparous does weaned at 35 days. (table 1).The rabbits were raised in cages of 7 to 10 animals. In each cage only rabbits belonging to the same maternity were placed.The building was a typical west-France semi open-air system.

Table 1 : Rabbit origin and feed treatment

Origin	Group 1	Group 2	Group 1	Group 2
Feed treatment	HP	HP	LP	LP
Building	Building 1	Building 2	Building 1	Building 2
Does	Primiparous	Multiparous	Primiparous	Multiparous
Weaning age	33	35	33	35
Number of rabbit at weaning	134	85	151	69

Feeding program

The experimental trial started on the 7 th of October 95 and finished on the 15 th of November 95. Feeding was as follow :
from d 33 to d 44 : weaning feed. (table 2)
from d 44 to d 70 : finishing feed. (table 2).
The finishing feeds were calculated at 2 different protein levels. Half of animals were fed a 17 % protein feed (HP treatment) and the other half a 16 % protein feed (LP treatment).
From d 57 to d 62 Oxytetracycline (1000 mg/l) and Dimetridazol (500 mg/l) was applied through the drinking water to control mortality which appears at this period and was caused by CI.

Table 2 : Feed nutrional characteristics (as is)

	Weaned feed	Group HP	Group LP
Proteine %	16.50	16.80	15.81
Fat %	3.21	4.66	4.71
Fiber %	16.00	13.89	13.99
Ash %	8.19	7.47	7.40
Lysin %	0.72	0.72	0.72
Sulfur amino acids %	0.65	0.65	0.65
Digestible energy Kcal/kg	2500	2775	2775
Medication	Oxytetracyclin 200 ppm	Flavophospholipol 4 ppm	Flavophospholipol 4 ppm

Measurements

Weight changes were measured by weigthing cages at the beginning and at the end of the experiment.
Weekly mortality per cages was recorded. Mortality causes was appreciated by necropsy for some animals. CI was diagnosed by palpation of a tough caecal mass in the abdomen and confirm by autopsy.
Ookyste excretion count was carried out in both maternities.

RESULTS AND DISCUSSION

Performances

Performances and feed treatment - Zootechnical performance did not differ between the 2 feeds (table 3). Average initial weights and final weights were similar for both feeds, 883 g and 885 g and 2388 g and 2411 g for initial and final weight of HP and LP treatment respectively.
ADG and global feed conversion were also very close for both group : ADG 40.7 vs 41.3 g/d; FC 3.81 vs 3.72 for HP and LP treatment respectively.
The absence of an effect of protein level on ADG and feed conversion is in accordance with other experiments, showing that for growing rabbit, a level of 15 to 16 % protein is adequate if essential amino acids are provided (MAERTENS 1992 ; LEBAS 1989).

Table 3 : Zootechnical performances.

	HP treatment Average	LP treatmenmt Average
Initial weight (g)	883	885
Final weight (g)	2388	2411
Average daily gain (g/d)	40.7	41.3
Feed conversion	3.81	3.72

Performances and rabbit origin - Rabbits born from group 2 were heavier at weaning than those born from group 1 (974 vs 832 g respectively)

(table 4).
This weight difference can be partly explained by the difference in animal age (33 days vs 35 days). At this age, ADG can be estimated at 40-45 g/d. On this basis, the average weaning weight of group 1 at 35 days could be estimated at 912-922 g.
On the other hand, primiparous litters were composed of 8.42 animals and multiparous litters of 9.47 animals (table 4). This litter size difference is due to a lower prolificity of primiparous does but also to a specific animal management factor : the equalization of litters at 8 to 9 rabbits for primiparous does and 9 to 10 animals for multiparous ones. Consequently, litter size per se did not play a role in the weight difference between parities because a higher weaning weight would have been expected from the lower litter size. This difference can be explained by the lower milk production of primiparous does.

Table 4 : Weight difference of the 2 groups.

	Weaning weight (g)		Litter
	Average	STD	size
Group 1	832	64	8.42
Group 2	974	66	9.47
Difference	P<0.001		

Mortaliy

Mortality and feed - During the first 2 weeks, mortality was low for all the treatments (3 animals in total for both treatments). Mortality level was 0.91 % for HP group, 0.45 % for LP group (table 5).

Table 5 :Mortality evolution per week.

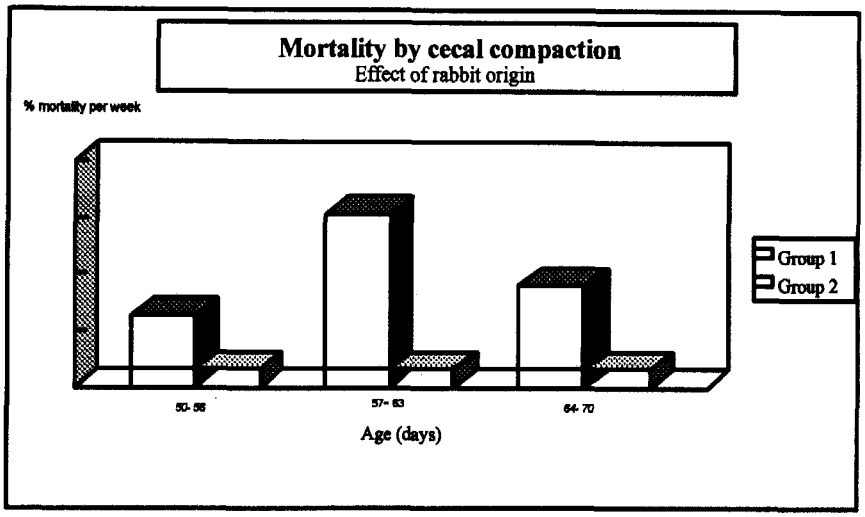
Mortality level %	HP treatment	LP treatment
2 first weeks	0.91	0.45
3 last weeks	8.68	8.18
Total period	9.59	8.64

Higher mortality started at d 56-58 and was mainly due to CI. This coincided with the age at which CI often develops (MORISSE 1986).
The level of mortality during the 3 last weeks was similar for both feeds : 8.68% and 8.18% respectively for HP and LP treatment.
Feed is often held responsible for the increase in CI. An excess of protein related to energy has been evoked by Lebas (LEBAS 1991; LEBAS 1992). Protein excess lead to a modification of caecal fermentation which may lead to increase toxin production by Colibacilli and Clostridia which affect gut motility and so the development of CI.
However, this theory recognizes that CI is not based on a single factor because attempts to induce CI by feeding on an unbalanced ration have commonly failed.
In this experiment when caecal impaction was observed, the decrease of 1% protein level (and the resulting modification of the protein/energy ratio) didn't reduce the impact or frequency of this disorder.
These findings seem to confirm that small differences in protein levels do not affect the occurrence of caecal impaction.

Mortality and animals origin - The mortality between rabbits coming from the 2 animal groups was different : 13.3 % for group 1 and 1.9 % for group 2 (fig. 1).
Mortality level per cage was different according to the group. Cages with 2 or more dead animals per cage represent 26 % of the total cages (corresponding to 65 % of the total mortality) in the group 1 versus 0 % in the group 2. This concentration of mortality per cage clearly seems to indicate clearly the litter or doe effect on mortality (fig. 2). Cages without mortality represent 44 % of the cages in group 1 versus 82 % in the group 2. This may also indicate a contamination effect.
Litters were weaned at 33 days for the group 1 and 35 days for the group 2. The latter rabbits are therefore more mature. Weaning age is a factor involved in the sanitary status and mortality of growing rabbits (LEBAS 1993).
We have also a weight difference of about 142 g. Some studies have shown that a higher weight at weaning can reduce mortality (CHMITELIN 1992).
The two maternities being separate, caecal flora may have evolved differently between the two populations.
As coccidiosis has also been evoked in CI disorder (LEBAS 1990), an analysis of oocyte concentration in the females faeces was carried out in attempt to determine if the coccidial load and infestal bacterial concentration was different . However, the average oocyte concentration was similar and low in both maternities : 1000 ookystes per g of faeces.
In our experiment we raised under similar conditions 2 origins of animals and CI was only observed in one population. LECERF 1983 raised in 2 different buildings rabbits coming from one single origin. Mortality of

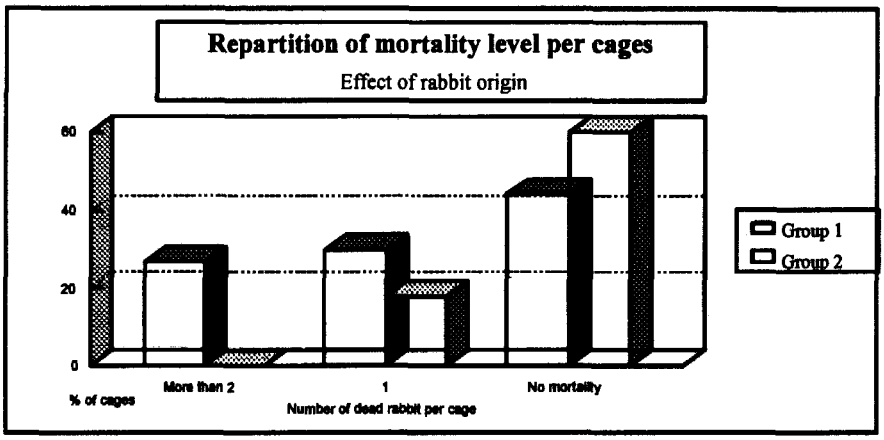
animals raised in a building with static ventilation was 0.5%, but mortality due to CI was 30 % for animals raised in a building with dynamic ventilation system. In our case rabbit origin was determinant in the occurrence of CI, in Lecerf experiment, rabbit origin was less determinant as environment as CI was developed according to the building. Although the results of modifying the ventilation system of the closed building on our farm seem to confirm Lercerf's findings, in our experiment we demonstrate that animals origin i.e. parity number and doe are equally important.

Figure 1



CONCLUSION

Figure 2



CI as a syndrome of enteropathy toxaemia is a disconcerting type of rabbit pathology with potentially large economical impact. Due to the difficulty in experimentally inducing CI, the syndrome remains a complex and poorly understood rabbit pathology.

This experiment has shown that a slight reduction of protein level of 1% did not have an effect on CI even under conditions when CI reach high levels. It should therefore be considered an inefficient means of containing CI.

We observed have seen that a predisposition of animals due to litter origin exists. Doe and especially parity, the way in which rabbits were raised prior to weaning (at 33 or 35 days) appear determinant in the development of CI at the age of 58 days.

Given the relative importance of this type of pathology and the high level of mortality that can result futher sudies on the relationship between CI and environment and management factors merrit consideration. A global analysis of all observations will help researchers to build experimental schemas in order to demonstrate the mechanism involved in the development of CI and define ways to avoid this syndrome.

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Effets du taux de protéines et de l'origine des lapins sur les performances et la mortalité des lapins en croissance - 439 lapins provenant de deux maternités différentes (groupe 1 et 2) ont été alimentés de 45 à 70 jours avec 2 niveaux de proteines : 17 % (traitement HP) et 16 % (traitement LP) en conservant le même niveau d'acides aminés essentiels. Les lapins nés de lapines primipares sevrés à 33 jours (groupe 1) étaient plus légers (832 g) que ceux nés de femelles multipares sevrés à 35 jours (974 g, groupe 2). Les performances de croissance des traitements HP et LP étaient similaires : GMQ et IC 40.7 g/j et 3.81 pour le groupe HP, 41.3 g/j et 3.72 pour le traitement LP respectivement. La mortalité principalement due à la parésie caecale était élevée pour les lapins du groupe 1 (13.3 %) et inexistante pour les lapins du groupe 2. Cette étude démontre qu'une faible différence dans le niveau de protéine (1 %) n'affecte pas en soit l'incidence des parésies caecales. Une prédisposition provenant des conditions du sevrage des lapins à 33-35 jours peut induire le développement de la parésie caecale. L'influence maternelle ou les conditions d''environnement avant le sevrage semblent déterminantes dans l'apparition de la parésie caecale à 70 jours d'âge.