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GOBY J.P., ROCHON J.J., LASBAT J.

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THE RESULTS WITH AN ALTERNATIVE DIETARY SUPPLEMENT (DIGESTON) FOR ANTIBIOTICS ON THE REPRODUCTION AND FATTENING PERFORMANCES OF RABBITS HOUSED IN OPEN AIR

J.P. GOBY*, J.J. ROCHON*, J. LASBAT**

*Technological Institute, Biological Engineering Department, Perpignan 66860

**Digestic France, St. Gaudens 31803

SUMMARY

The European decision aimed to limit the use of antibiotics in animal feed and continued consumer pressure demanding healthier foods, have forced food manufacturers to find alternative solutions. IUT in Perpignan has tested the use of a natural nutritional material (Digeston, DIG) in breeding, reproducing and fattening rabbits in Roussillon and compared with a control feed (TEM). The control fattening diet was supplemented with a coccidiostatic while the reproduction diet contained also an antibiotic. These supplements were replaced by Digeston (2kg/ton) in the test diet. Regarding fattening there was no significant difference, but with a feed conversion ratio of 3.46 for the tested feed versus 3.63 for the control feed. Digeston proved better digestive value. The significantly higher fertility levels (75.50 versus 67.40) demonstrated that Digeston is a very good substitute for antibiotic supplements. The total feed conversion ratio (maternity and fattening) obtained with the feed DIG (3.31) not only shows the technical interest for such a substitution, but also an economic interest by diminishing the feeding costs.

INTRODUCTION

Ever since the European Union's December 14th 1998 decision, the systematic use, even minimal, of antibiotics in animal feed has been severely controlled due to the increase of the number of bacteria becoming more and more resistant. The antibiotics used for growth purposes particularly help speed up development and obtain more homogeneous results. Today, food manufacturers can still substitute antibiotics with banned products as growth stimulators. But consumer and distributor pressure towards healthier food has forced manufacturers to stop using this type of additive. This is why the latter is researching and trying to discover alternative solutions that will help breeders obtain the current scientific and sanitary performance levels.

These tests, financed by l'Agence Nationale pour la Valorisation de la Recherche, used Matieres Premieres Nutritionnelles (MPN) as a substitute for antibiotics in rabbit feed. The tests were conducted at the Technical Institute (IUT) in Perpignan in cooperation with the company Digestic France. This MPN (commercialized name: Digeston) is made from lactic bacteria and naturally fermented vegetable substances (herbs and medicinal plants, one of which being horseradish root (*Cochlearia armoracia*)). Rich in peroxydase, this product reacts on the rabbit's immune defense system, notably their respiratory system.

This article presents the results of 3 years of work spent on open-air breeding at the IUT in Perpignan. Two comparative studies done in 1996-1997 based on a control group, one focused on fattening, the other on maternity, and the technical results for 1999, together allow us to test and evaluate the impact of Digeston's use in future breeding environments.

MATERIALS AND METHODS

All studies were performed in an open-air breeding environment for reproducing-fattening rabbits. The maternity and fattening cages are made of galvanized iron with wire mesh bottoms arranged in a flat-deck formation under windbreaker netting.

For the fattening studies, two groups of 13 cages with 8 young rabbits were used. The maternity performance measures were conducted on 2 groups of 24 main cages.

All data was analyzed with the help of the software STAT-ITCF.

1. Fattening studies

Animals

The animals are descendants of hybrid crossbred New Zealand/Californian females (GENIA selection born of crossbreeding lines 67 and 77 from the INRA) and purebred New Zealand males. The weaning took place at 28 days and the rabbits were divided into groups of 8 (18 rabbits per m²) and put into their specified cages for fattening up. The fattening process continued until a live weight of 2,2 kg was reached. 2,2 kg represents the weight for slaughter corresponding to consumer demand.

Feeding

The two groups were fed unlimited amounts of food throughout the entire fattening up period. The feed, supplemented with Robenidine (66g/kg of feed) for the control animals (TEM) and with Digeston (2 kg/ton of feed) for the experimental animals (DIG) contains the following nutritional information: cellulose (16% DM) minerals (9,9%), proteins (16,2%), fat content (3% DM), added vitamin AD3E.

Calculations

The calculations are based on the whole group of rabbits from one cage for group breeding does not allow us to individualize each animal. The 4 criteria studied were: average daily weight gain (calculated by weighing the animals weekly); death rate established over the entire fattening up period; quantity ingested measured weekly by weighing the food distributed to each cage, food not eaten and all residual quantities; index of consumption per cage per week.

2. Maternity study

Animals

The reproductive females used in the maternity studies are hybrid crossbred New Zealand/Californian rabbits (GENIA selection born of crossbreeding lines 66 and 77 of the INRA). 33 female rabbits were used in each study. Reproduction is led by a sole group by means of artificial insemination every 42 days. The females are 16 weeks old at the time of the 1st insemination. Ovulation is induced by gonadal-stimulative injection. An injection of PMSG is administered 48 hours before insemination. Seven series of insemination were carried out.

Feeding

The animals were fed unlimited amounts of a special medicated maternity feed (17% protein, 14,8% cellulose, 400 mg/kg oxytetracycline and 66 mg/kg robenidine) used as the control feed (TEM), and the same feed as the above was given except for the absence of oxytetracycline and robenidine which were replaced by Digeston in measures of 2kg/ton of feed (DIG).

3. Calculations

The entire technical data relative to reproduction (fertility, proliferation, rate of stillbirths, death rate at birth-weaning, weight at weaning) were recorded and saved in a technical management software "CPL micro" designed by the GIE Midi-Pyrenees and the INRA. Food consumption was analyzed by measuring the entire quantity used in each study and comparing it to the weaned rabbit's weight in kg.

4. Technical results 1999

Animals

55 females (Grimaud Hybrid) were put into reproduction at the age of 16 weeks without replacements. Reproduction was carried out as in the maternity studies. The young rabbits were weaned at 35 days. Six series of insemination were performed, that is to say 300 IA throughout the time period studied. The fattening procedure continued until 2,32 kg were attained between 70 and 75 days.

Feeding

The females and young rabbits were fed a maternity feed and a fattening-up feed to which Digeston was added in doses of 2kg/ton substituting for antibiotics.

Measurements

They were identical to the 2 tests incorporating Digeston in both fattening and maternity. The calculation of an index of total breeding consumption was done based on the entire production period. It is based on the total amount of feed (maternity and fattening) necessary to produce a live rabbit weighing 2,32 kg.

RESULTS AND DISCUSSION

1. Fattening experiment

Table 1. Analysis of the 4 zootechnical/scientific criteria throughout the entire fattening period in relation to the type of feed provided.

		Week 1	Week 2	Week 3	Week 4	Week 5	Average
Average	TEM	47.16	41.20	39	29.14	27.1	36.72
		±12.11	±7.90	±9.67	±6.02	±7.76	±11.50
Daily	DIG	48.45	39.56	32.15	29.51	29.21	35.78
		±16.71	±9.22	±5.53	±6.10	±5.07	±11.86
Gain		NS	NS	*	NS	NS	NS
Quantities	TEM	97.08	113	120.83	131.08	129.66	118.33
		±12.11	±14.85	±16.92	±13.48	±20.44	±19.79
Ingested	DIG	92.69	107.69	115.61	118.53	130.69	113.04
		±8.28	±10.15	±17.05	±9.25	±21.60	±18.73
Significance		NS	NS	NS	*	NS	NS
Feed conversion ratio	TEM	2.16	2.8	3.23	4.73	5.22	3.63
		±0.56	±0.52	±0.73	±1.35	±2.15	±1.67
Significance	DIG	2.08	2.81	3.65	4.16	4.6	3.46
		±0.59	±0.53	±0.56	±0.84	±1.08	±1.17
Mortality		NS	NS	*	NS	NS	NS
Mortality	TEM						7.29
	DIG						6.73

The weight gain performances obtained with the DIG feed in the first week can be explained by the young rabbits' rapid adaptation to Digeston that is directly linked to the development of the intestinal flora. After a period of adaptation, the presence of antibiotics brought about a more efficient use of the feed leading to faster growth. In the third week this difference became even more significant to a 5%. But, at the end of the fattening period, these benefits disappeared; Digeston had a more steady and regular effect over the total fattening up period which helped regulate growth rate due to its constant workings on the digestive flora.

The feed quantities ingested do not significantly differ throughout the total fattening up period although they remain inferior with regards to the DIG feed compared to the control feed, this difference becomes significant at 5% at week 4.

Rabbits control their food intake based on attaining a certain necessary energy level. Once this level is reached they stop eating (Fayez et al, 1994). The energy supplied by nutrients in the feed and by volatile fatty acids (VFA) result from the caecum bacteria's cellulosic activity. The two feeds being isoenergizing, the difference ingested can be explained by a greater VFA generation in rabbits fed the DIG feed. Digeston stimulates the caecum that results in a better overall use of the feed (Lebas, 1975; Brousse, 1996). To the contrary, the antibiotic added to the control feed reacted on the digestive tube's pathogenic bacteria and also on the caecum's bacteria and their actions. In the 5th week of fattening, factors of a physical order (digestive tube capacity) occurred when food was taken; thus the results are identical for the two feeds.

The weekly evolution of the index of consumption reflects the two previous parameters. The significant difference in the third week is due to a significantly higher growth rate for the control group.

The mortality rate analysis shows no significant difference between the two treatments.

Globally, the results do not much differ. Thanks to different research approaches, the animal feed reaches a degree of such perfection that it is difficult to significantly influence the rabbits' scientific production performances. The use of Digeston allows the animal to more steadily digest its feed intake thus inducing enhanced value at the end of the fattening period.

But, in the current context, economic and environmental constraints add to the technical results and breeders today have two main objectives: production and product quality. The use of Digeston helps give the final product a good image.

2. Maternity study

During the research period, 6 female rabbits fed the feed TEM died versus 9 on DIG. The addition of antibiotics helps the animals to live longer. These results support those obtained by Goby and Rochon (1994) which show a weakness among reproducing females to open-air breeding often resulting in pulmonary disorders. Oxytetracycline helps limit this risk.

Table 2: Reproduction results in an open-air maternity setting according to the type of feed given.

	TEM	DIG
	-----	-----
Female rabbits at beginning	33	33
Female rabbits at end	27	24
Number of IA	178	167
Number of births	120	126
Fertility (%)	67.4 (a)	75.5 (b)
Total born per litter	9.47	9.65
Born alive per litter	8.57	8.71
Death rate birth weaning %	17.7	21.7
Number of weaned per litter	7.81	7.53
Weight at weaning (g)	613	638
Quantity feed per rabbit weaned (kg/rabbit)	2.46	2.10
Quantity feed by Kg weaned (kg/kg we.)	4.01	3.29

Fertility levels significantly differ by 5% between the two treatments. This measure is very much tied to the rabbits' general physical condition. Due to its very wide range, the antibiotic in the feed reacts negatively on the animal's flora, notably, the digestive, and can make the female rabbits less receptive at the time of insemination.

The reproduction results tied to the birth-weaning period do not significantly differ. Actually, despite a higher proliferation rate with the DIG feed, the number of weaned per litter remains inferior when compared with the medicated fed rabbits. This is the result of a higher death rate at birth-weaning in the treatment without antibiotics. There is a critical time for young rabbits on the DIG feed between 21 and 28 days when they start eating the feed. Rich in proteins (17%) and energy the maternal feed induced digestive troubles amongst the young rabbits (Peeters 1985, Lebas 1983). This pathology is best controlled with the antibiotic supplemented feed.

A food cost analysis was done illustrating the quantity consumed in kg per treatment for each weaned rabbit. For the same food formula, the addition of Digeston reduced the reproductive females' consumption to 0,72 kg of food per kg.

This test proves the addition of Digeston in the open-air bred reproducing female's feed gave equivalent technical results to those achieved with antibiotics.

3. Technical results 1999

The results obtained in 1999 support those of the maternity study. The results based on 2,291 rabbits born alive can be carefully compared to the RENACEB results based on 5,246 groups (Guerder, 1999), for doing this allows us to conclude a certain tendency. With a lower death rate during pregnancy and during the fattening period as well as comparable development among the young rabbits, the Digeston supplemented feed perfectly meets the animals' needs as well as helps develop a good resistance to differently potentially pathological disorders. The calculation of the total index shows a very good enhanced value for the DIG feed that supports the results obtained in the two

former studies. The low value on the global index could have very important economic impact with regards to food cost.

Table 3: Study comparing reproduction performances of a breeding-fattening group fed with Digeston supplemented feed and the 1997 RENACEB results.

	DIGESTON	RENACEB 1997
Fertility (%)	76.60	74.20
Total born/births	10.52	9.99
Rate of stillbirths (%)	5.56	6.20
Mortality before weaning (born alive)	10.42	14.90
Mortality during fattening	5.44	13.90
Average live weight sold	2.32	2.39
Age at sale (days)	72.20	74.60
Global feed conversion ratio	3.31	3.79

CONCLUSION:

The results of all the work done show that it is entirely possible to produce rabbits without adding antibiotics to their feed formula just as more and more consumers demand. Digeston, rich in peroxydase, provides a good resistance to different ailments as well as adding enhanced value to their feed.

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