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EFFECT OF PROTEIN LEVEL AND DE-ODORASE ON PERFORMANCE AND CECAL FERMENTATION OF WEANLING RABBITS

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INTRODUCTION

High mortality levels in commercial rabbitries (average 15 to 20% between birth and slaughter) and the deleterious effects of disease on performance make disease control an important priority. Antibiotic therapy is often disappointing from a clinical point of view, and can become dangerous if excess medication destabilizes the intestinal flora. Often the variety of problems encounted in a commercial rabbitry result in progressive addition of as many as three or four antibiotics in routine use. Removal usually fails. Destabilization of the gastrointestinal flora leaves the animals hypersensitive to stress. A "vicious cycle" is created that can in the worst case end by a need to depopulate the house.

Use of yucca glycocompounds to reduce ammonia (NH_3) levels in confinement housing and consequently improve health and performance has been found effective for many species including pigs and chickens, lab animals and rabbits (Headon et al. 1991; Crober, 1991; Pauzenga, 1991; Suarez et al. 1991; Cheeke, 1992). These experiments have shown that ammonia levels can be reduced in a significant manner in rabbit houses and that this change is associated with an improvement in performance.

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Ammonia, because of its harmful effect on the respiratory epithelium, is one of the principal risk factors in respiratory disease caused by Pasteurella multocida (1978, Patton, 1980). Additionally, Morisse et al. (1985) have shown that diarrhea in rabbits is associated with a drop of the level of VFA in the cecum and an increase of the level of NH_3. This leads to a pH elevation and proliferation of clostridia and colibacillus bacteria.

The purpose of this study was to evaluate effects of dietary protein level and incorporation of DE-ODORASE, Alltech's glycocomponent extract from the yucca plant, on performance and fermentation parameters in the cecum of weanling rabbits.

MATERIALS AND METHODS

The trial was conducted during October/November 1991 at the Sanders research and experimentation center in Sourches. The experiment used 576 rabbits (Hyplus strain) reared from 28 to 72 days of age. The four treatments consisted of 16% or 18% crude protein diets supplemented with 0 or 120 ppm De-Odorase. Lysine levels and methionine + cystine levels were equal in the 16 and 18% diets (Table 1). The diets were offered to animals from weaning to slaughter. All diets were also supplemented with 66 ppm of robenidine to prevent coccidiosis.

Table 1. Analysis of the experimental diets

Treatment	1	3
	---------%---------	
Moisture	12.05	11.02
Crude protein	15.87	15.80
Crude fiber	14.70	14.98
Starch	14.04	13.57

The weight and feed intake of animals were recorded for each cage at 45 and 71 days of age. Mortality was noted daily, and mean results for weight, average daily gain, feed intake, feed conversion and mortality were calculated for each period 28-45 days and 45-71 days and for the total growing period between 28 and 71 days. At 45 days 20 animals (10 from the De-Odorase and 10 from the control group) receiving 16% protein diets were slaughtered. Cecal contents were sampled for determination of VFA and NH_3.

The statistical analysis was performed by analysis of variance adapted to factorial models. Means were separated by Duncan's Multiple Range test. The statistical analysis of treatment effects on mortality results was carried out with a Chi square test.

RESULTS AND DISCUSSION

1. MORTALITY

General comments. Mortality due to post-weaning enteritis was evident throughout the entire trial (14.6%). Two 4-day treatments with neomycin given to all rabbits at the rate of 1 g/l after 45 days seem to have reduced mortality.

Weaning weight effects. Groups in which the weaning weight was less than 600 g displayed a significantly higher mortality than those in which the weaning weight was higher than 600 g ($P<0.01$, Table 2). These results confirm those obtained by Morisse et al. (1985).

Table 2. Effect of weaning weight on mortality due to enteritis

Weaning weight, g	450-550	550-600	600-650	650-700
Mortality, %	16.7^{a}	12.5^{a}	4.9^{b}	3.5^{b}
28-45 days	11.8^{a}	3.5^{b}	4.2^{b}	1.4^{b}
45-71 days	28.5^{a}	16^{b}	9.0^{c}	4.98^{d}
28-71 days				

a,b,c,d means in a row with different subscripts differ, $P<0.05$

Effects on protein level. Increasing protein level from 16 to 18% had no effect on mortality during fattening, regardless of weaning weight (Table 3). This result is quite surprising as field observations indicate that high protein level has a negative effect on the incidence of diarrhea.

Table 3. Effect of weaning weight and protein level on mortality

					Weight effect	Protein effect
Weaning weight, g	450-600		600-750			
Protein, %	16	18	16	18		
Mortality, %						
28-45 days	16.0	13.2	3.5	4.9	*	NS
45-71 days	6.2	9.0	2.8	2.8	*	NS
28-71 days	22.2	22.2	6.3	7.7	*	NS

* P<0.052

De-Odorase, weaning weight and protein level. Supplementation with De-Odorase significantly reduced enteritis in growing rabbits given diets containing 16% protein (P<0.05), and caused a nonsignificant reduction in mortality in the group given 18% protein diets (Table 4). Weaning weight affected response in that regardless of dietary protein level, De-Odorase supplementation reduced mortality in rabbits weaned weighing less than 600 g (P<.01). The reduction due to De-Odorase was not significant when weaning weight exceeded 600 g. De-Odorase supplementation did not significantly reduce enteritis in the finishing phase; however, the two treatments with neomycin during this period could have masked any effect due to De-Odorase.

Table 4. Effect of weaning weight and De-Odorase on mortality in relation to feed protein content

Weaning weight,g	450-600		600-750		Block	Deo	DEOxBLK
De-Odorase, ppm	0	120	0	120			
Mortality, %	-------16 % crude protein------						
28-45 days	25.0^{aA}	6.9^{bB}	2.8^{cB}	4.2^{bc}	*	*	*
45-71 days	8.3^{a}	4.2^{ba}	2.8^{b}	2.8^{b}	NS	NS	NS
28-71 days	33.3^{aA}	11.1^{bB}	5.6^{cB}	6.9^{cB}	*	*	*
Mortality, %	-------18 % crude protein------						
28-45 days	19.4^{aA}	6.9^{bB}	1.4^{cB}	5.6^{bB}	*	NS	*
45-71 days	9.7^{a}	7.3^{a}	0.0 b	5.6^{a}	*	NS	NS
28-71	29.2^{aA}	15.3^{bB}	1.4^{cC}	11.1^{bB}	*	NS	*

* Significant difference
a,b,c: P<0.05
A,B,C: P<0.01

Cecal volatile fatty acids and NH_3 at 45 days. Two animals of the 10 sampled in each group were diarrhetic, and eight in each group were healthy. We compared the levels of VFA and NH_3 in the diarrhetic animals to those in animals showing no symptoms of diarrhea (Table 5). The animals with diarrhea demonstrated a decrease in cecal acetic and butyric acids, and an increase in propionic acid and NH_3. In general, the total VFA levels decreased, and the levels of NH_3 increased in rabbits with enteritis. This confirms the results achieved by Morisse et al. (1985) and Prohazka (1986).

Table 5. Comparison of VFAs and cecal NH_3 in animals with and without diarrhea

	Healthy animals	Animals with diarrhea
Number of animals	16	4
	mmol/l	
Total VFA	78.3	58.4
Acetic acid	64.3	47.9
Propionic acid	3.7	7.9
Butyric acid	10.3	2.6
Ammonia	16.4	53.0

Though small animal numbers and variability precluded significant differences, important trends were noted in response to De-Odorase. Ammonia tended to be lower (-10%) and butyric acid higher (+10%) in rabbits given diets containing the supplement (Table 6). While animals with diarrhea had an increase in NH_3 and lower levels of butyric acid, supplementation with De-Odorase seems to have ameliorated this effect to some extent. However, effects of De-Odorase on acetic and propionic acid were slight and conclusions about treatment effects cannot be drawn. A larger number of animal slaughtered would have been necessary to obtain conclusive information.

Table 6. Effect of De-Odorase on VFAs and cecal NH_3

	Control	De-Odorase
	mmol/l	
Number of animals	8	8
Total VFA	79.6	77.0
Acetic acid	66.0	62.5
Propionic acid	3.9	3.6
Butyric acid	9.7	10.8
Ammonia	17.3	15.6

2. RABBIT PERFORMANCE

Effect protein level and De-Odorase. No effects of either protein level or De-Odorase on growth rate were noted (Table 7). Performance of the control group was excellent (>45.5 g/d); therefore, an improvement would be difficult.

Table 7. Effect of protein level and De-Odorase on performance of growing rabbits

	Protein		De-Odorase		Protein effect	De-Odorase effect
	16%	18%	0	120 ppm		
Weight, g						
28 days	601	600	600	600	NS	NS
45 days	1323	1327	1325	1324	NS	NS
71 days	2564	2552	2562	2553	NS	NS
DWG, g/day						
28-45	42.48	42.76	42.68	42.56	NS	NS
45-71	47.71	47.12	47.55	47.27	NS	NS
28-71	45.64	45.40	45.63	45.41	NS	NS
Intake, g						
28-45	1555	1550	1545	1560	NS	NS
45-71	4559	4559	4524	4592	NS	NS
28-71	6114	6108	6069	6153	NS	NS
F:G, 28-45	2.16	2.14	2.13	2.16	NS	NS
F:G, 45-71	3.69	3.74	3.68	3.75	NS	NS
F:G, 28-71	3.12	3.13	3.10	3.15	NS	NS

CONCLUSION

Increasing crude protein from 16 to 18% did not change performance or health of the fattening rabbits.

Supplementation with De-Odorase reduced mortality post-weaning (28-45 days). Effects were marked in animals weighing less than 600 g at weaning, but not significant in animals weighing more than 600 g.

Rabbits with enteritis tended to have lower cecal, total VFAs, acetic and butyric acid concentrations with increased levels of propionic acid and ammonia. Addition of DE-ODORASE tended to reduce ammonia in rabbits with enteritis and increase butyric acid.

VFA and cecal ammonia levels at 45 days indicated a tendency toward increased butyric acid levels and a decrease in NH_3 levels with the incorporation of De-Odorase. This tendency could explain the decrease in incidence of diarrhea when rabbit feeds are supplemented with DE-ODORASE. The confirmation of these results in a further trial would allow us to validate the interest of utilization of DE-ODORASE in order to reduce the problems caused by high levels of ammonia in the gut (higher pH, development of clostridia, colibacillus, etc.).

REFERENCES

A. C. Bar A, Cheeke P.R., Nakave H.S. 1992. Effect of yucca extract DE-ODORASE on environmental ammonia levels and growth performance of rabbits, 9th Proceedings, 5th World Rabbit Congress.

Crober, D.C. 1991. Noxious gases: Hidden killers and efficiency spoilers: Their impact and control in confinement units. In: Biotechnology in the Feed Industry: Proceedings of the 7th Alltech Symposium, Alltech Technical Publications, Nicholasville, KY pp. 109-119.

Headon, D.R. 1991. Glycofractions of the yucca plant and their role in ammonia control. In: Biotechnology in the Feed Industry: Proceedings of the 7th Alltech Symposium, Alltech Technical Publications, Nicholasville, KY, pp. 95-108.

Morisse, J.P. 1979. Action of an irritant, (NH_3) on the pathogeny of a respiratory disease induced experimentally by Pasteurella multodica in the rabbit. Ann. Zootech. 28:139.

Morisse, J.P., Boilletot, Maurice, R. 1985. Alimentation et Modifications du milieu intestinal chez le lapin (AGV, NH_3, pH, Flore), Rec Med Vet. 161 (5) 443-449.

Morisse, J.P. 1986. Pathologie digestive, alimentation et zootechnie, L'éleveur de lapin. p. 51-55.

Patton, N.M., H.T. Holmes, D.D. Cavbeny, M. Matsumoto and P.R. Cheeke. 1980. Experimental inducement of snuffles in rabbits. J. Appl. Rabbit Res. 3:8-12.

Pauzenga, U. 1991. Animal production in the 90's: In harmony with nature. A case study in the Netherlands. In: Biotechnology in the feed industry. Proceedings of Alltech's 7th Annual Symposium. Alltech Technical publications, Nicholasville, KY, pp 121, 132

Prohaska, L. Antibacterial effect of volatile fatty acids in enteric E.coli infections of rabbits. Zbl Vet. Med. 1984. B 31 358-366.

Suarez, J.C., Alonso, A.N. Effects of glycocomponents derived from the yucca plant on the evolution of ammonia from laboratory animal bedding. In: Biotechnology in the feed industry. Proceedings of Alltech's 7th Annual Symposium. Alltech Technical publications, Nicholasville, KY, pp 369, 371

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