

# Practical selection of alternatives to antibiotic growth promoters.

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A wide range of alternative products proposed to feed manufacturers to replace the antibiotic growth promoters in feeds , have been tested between 2000 and 2004 .

Commercial diets supplemented with different alternatives ( acidifiers , prebiotics , probiotics , essential oils and vegetal extracts , others ) at different levels from day 1 to day 28 have been compared , alone or in combination , to a negative control and a positive control ( avilamycin 10 ppm ) in 8 experiments on broilers .

These results indicate that in the good environmental conditions of an experimental farm , the antibiotic growth promoter and its substitutes can diversely affect the performances in comparison with the negative control , the average effects being rather low .

Avilamycin being mostly active against gram-positive bacteria , these observations could be related to differences in the digestive flora of the birds in the different trials .

These data confirm that the selection of substitutes is difficult to achieve in good sanitary conditions .

The use of more discriminating experimental models can be recommended , either on the field , or by the use of specific models , eventually with microbial challenges , to worsen the sanitary conditions and simulate field conditions ; or by a combination of both.

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**Keywords** : broiler ; growth promoter ; alternatives ; selection

## Introduction

A wide range of alternative products have been proposed to feed manufacturers to replace the antibiotic growth promoters , after their complete ban in 2006 .

To select the substitutes on a scientific basis , 28 different commercial products ( acidifiers , prebiotics , essential oils and vegetal extracts , others ) have been tested alone or in combination of 2 or 3 , at different doses .

## Material and methods

Eight trials have been carried out between 2000 and 2004 by EVIALIS in its Research Center of Saint-Nolff ( France ) , on broilers fed commercial diets supplemented with different alternative solutions from day 1 to day 28 , followed by a withdrawal feed without any growth enhancer . 400 birds for each treatment on average were housed in good environmental conditions from day 1 to day 40 . Each experiment had a negative control , and avilamycin 10 ppm as a positive control . Liveweights and feed intakes were recorded on a pen basis.

## Results and discussion

The results are indexed to 100 , as the value of the negative control . The results vary deeply from an experiment to the other , with very large dispersion .

On average for avilamycin ( 8 data ) , the growth was improved by  $0.87 \pm 2.68$  , and feed conversion by  $0.16 \pm 1.44$  % .

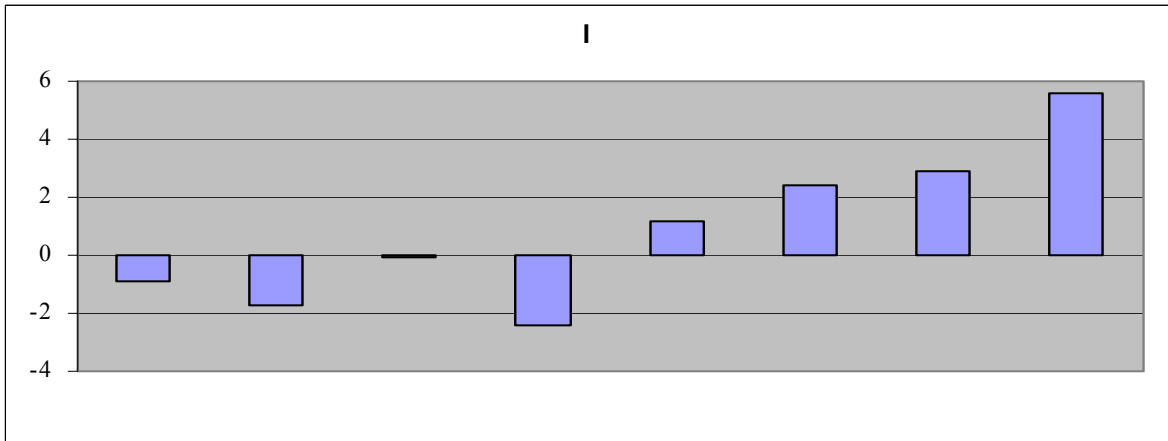


Figure 1 : Individual growth improvements with avilamycin over negative control ( 8 studies )

For the alternatives ( 72 data ) , the growth was improved by  $0.16 \pm 2.45$  % , and the feed conversion remains unchanged (  $+ 0.01 \pm 1.42$  % )

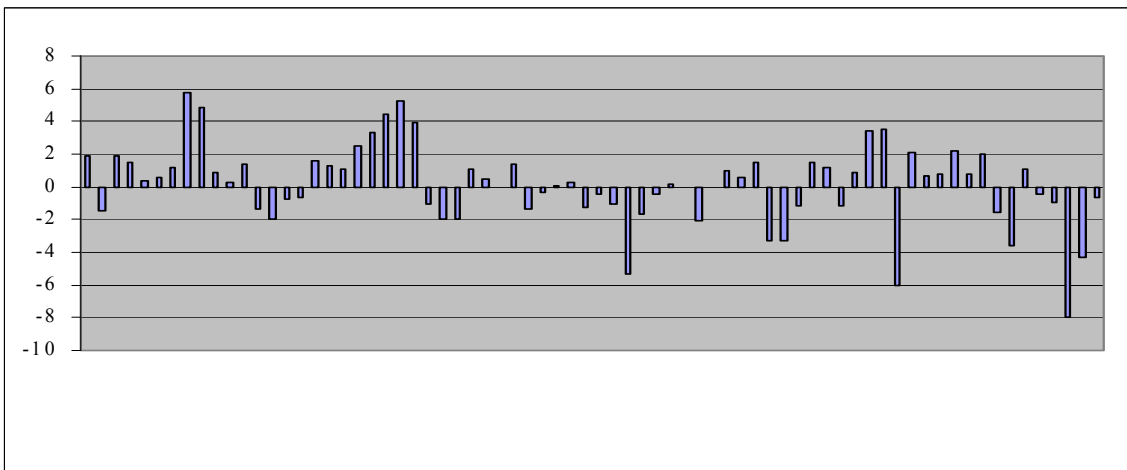


Figure 2 : Individual growth improvements with alternatives over negative control ( 8 studies )

In half of the 8 experiments , the performances of the positive control were not better than the negative one . Therefore the results are presented in Figure 3 , in 2 groups : Group 1 ( positive control better than negative control ) ; Group 2 (negative control better than positive control) .

Negative.control = 100	Growth				Feed conversion			
	Nb	Avilamycin	Nb	Alternatives	Nb	Avilamycin	Nb	Alternatives
<b>Group 1</b>	4	98.72	24	101.48	4	100.30	24	99.70
<b>Group 2</b>	4	103.03	48	99.33	4	99.45	48	99.82

Figure 3 : Overall performances of growth and feed conversion of groups 1 and 2

The differences between families of alternatives are important , as well as the heterogeneity of the effects ( Figures 4 and 5 )

Weight gain	Group 1			Group 2		
	Nb	Average	Range	Nb	Average	Range
Avilamycin 10 ppm	4	98.7	99.9 to 97.6	4	103.1	101.2 to 105.6
Acidifiers	2	100.2	98.5 to 101.9			
Protected acidifiers	4	100.9	100.4 to 101.9	5	99.1	98.0 to 101.1
Prebiotics	3	100.1	98.6 to 101.4	3	97.8	94.7 to 101.0
Probiotics				3	99.6	96.7 to 101.5
Yeast cell walls				7	99.6	97.9 to 101.0
Essential oils	5	100.4	98.0 to 101.6	2	97.8	96.7 to 98.8
Vegetal extracts	1	101.1		3	100.4	
Activated clay	3	103.6	100.9 to 105.8	7	99.8	98.6 to 101.4
Combination of 2 or 3 substitutes	6	103.9	102.5 to 105.3	10	99.0	92.0 to 103.5

Figure 4 : Weight gain

Feed conversion	Group 1			Group 2		
	Nb	Average	Range	Nb	Average	Range
Avilamycin 10 ppm	4	100.3	101.6 to 98.7	4	99.4	96.9 to 100.5
Acidifiers	2	98.9	98.8 to 99.1			
Protected acidifiers	4	99.6	97.6 to 101.9	5	99.6	97.8 to 102.4
Prebiotics	3	100.1	99.9 to 102.4	3	99.6	99.8 to 100.2
Probiotiques				3	99.3	99.8 to 101.5
Parois de levures				7	99	100.4 to 102.6
Essential oils	5	100.1	99.6 to 100.6	2	100.2	99.2 to 101.1
Vegetal extracts	1	100.2		3	99.2	97.8 to 100
Activated clay	3	99.9	97.9 to 100.8	7	100.6	99.8 to 102.4
Combination of 2 or 3 substitutes	6	98.5	98.7 to 98.3	10	99.6	97.2 to 102.6

Figure 5 : Feed conversion

These results indicate that in the good environmental conditions of an experimental research farm, the improvements in performances due to the antibiotic growth promoters are not important on average, and that the individual results are not constant between flocks. The most important effect seems to be on growth.

Similarly, the alternatives, fed alone or in combination, have various and heterogeneous effects on the performances.

Surprisingly, it seems that the average effects of the tested alternatives are opposite to avilamycin. Avilamycin being mostly active against gram-positive bacteria, these observations could relate to differences in the digestive flora of the birds in the different experiments.

## Conclusion

These data confirm that the selection of substitutes from experimental results under good sanitary conditions need special consideration, and draw the question of the adequate experimental protocol, as pointed out by Rosen (1). Well organized long-term field studies can address the reality of sanitary conditions, but can hardly establish significant differences between treatments, and therefore cannot be used for screening purposes. Microbial challenges can be used to worsen the sanitary conditions in controlled experimental stations and help to simulate field conditions.

## References

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