

Aviprox and Aviplus in feed for weaners

Report no. 772
December 8, 2006

Lisbeth Jørgensen
Danish Pig Production, DMA

Abstract

The addition of the products Aviprox and Aviplus to feed for weaners was investigated in one herd. Both products are a synergic mixture of organic acids and nature-identical flavours microencapsulated with a lipid matrix. The aim of the trial was to provide documentation for the effect of the products on the productivity of weaners. The trial comprised 38 pens of approx. seven piglets/pen (replicates) and 256 pigs per treatment group. One pen from each treatment group was allocated to successive blocks, hence there were 38 blocks in total, giving an RCB (random complete block) trial design.

The trial comprised three treatment groups:

- Group 1 (38 pens): Control
- Group 2 (38 pens): As control, but with the addition of 2 kg Aviprox per tonne feed (0.2%)
- Group 3 (38 pens): As control, but with the addition of 3 kg Aviplus per tonne feed (0.3%)

The products were delivered by the Italian company Vetagro and were added to feed that was neither heat-treated nor pelleted. Furthermore, the acid binding capacity of the feed was reduced and as a result the calcium content of the feed did not meet the Danish standard, but the level was identical in all three groups.

Analyses of the feed showed good agreement between the calculated content and the analysed content of nutrients.

On the basis of the production results obtained in the trial, the production value was calculated using the same prices in all three groups. The production value thereby expresses the total production results in one value. The pigs in groups 2 and 3 had a significantly higher production value than the control group. This was primarily due to a significantly increased daily gain and, for group 3, also a significantly improved feed conversion.

Based on the prices supplied by Vetagro, the profit of the increased productivity largely corresponded to the increased feed price arising from the addition of the products.

Background

The Italian company Vetagro required documentation of the effect of their two products Aviprox and Aviplus on the productivity of weaners. Both products are a synergic mixture of organic acids and nature-identical flavours microencapsulated with a lipid matrix.

The aim of the trial was to investigate the effect of Aviprox and Aviplus from Vetagro on the productivity of weaners. The effect was measured on the production results daily gain, feed intake and feed conversion as the primary parameters. Mortality and the frequency of treatments for diarrhoea were recorded as secondary parameters.

Materials and method

The trial was conducted in one herd. Weaners weighing approx. 7 kg were purchased for the trial on two separate occasions (weaning dates), with one week's interval between purchases.

In the herd, 124 pens were available divided between five housing sections of varying sizes. In the individual sections, the pens were evenly distributed on either side of the inspection alley. All pens had solid floor and a dung passage, and they measured 1.2 x 2.8 m including 1.1 m dung passage. The pens had covered creep areas and insulating plates on the floor. Straw and wood chips were used as bedding. Each pen had one feeder with two feeding points and one drinking bowl. The drinking bowl was placed in the dung passage.

The pigs' weight averaged 7.6 kg at the beginning of the trial and 30 kg at the end of the trial. Three treatment groups were included in the trial as shown in table 1 below.

Group	1	2	3
Company	-	Vetagro	Vetagro
Diet 1 (first two weeks post-transfer to the trial)*	Control	As control to which 2 kg Aviprox were added per tonne	As control to which 3 kg Aviplus were added per tonne
Diet 2 (remaining part of the weaner period, approx. 7-11 weeks)*	Control	As control to which 2 kg Aviprox were added per tonne	As control to which 3 kg Aviplus were added per tonne

* From day 15 to day 22, the pigs gradually switched to diet 2.

The composition of the feed and a description of the products are shown in Appendix 1. Vetagro requested that the acid binding capacity of the feed be low, and the calcium content was therefore lower than written in the Danish standards (0.9 g/FUgp lower in diet 1 and 1.3 g/FUgp lower in diet 2). All diets were produced as meal feed at the request of Vetagro, i.e. the feed was neither heat-treated nor pelleted. The feed was produced at Aarhusegnens Andel feedstuff factory and the feed for all three groups was produced on the same day to ensure that the same batches of ingredients were used for all three groups. The pigs were fed unrestrictedly, i.e. they had access to feed all day.

A pen of approx. seven pigs constituted a trial unit. Each treatment included 38 pens (corresponding to 38 blocks). Each group comprised a total of 256 pigs.

Upon transfer to the trial, the pigs were distributed according to weight, so that the average start weight was identical in each of the three pens constituting a block.

During the first 14 days after transfer to the trial, the pigs were not given additional zinc oxide at veterinary therapeutic dosages, a common practice in Denmark to prevent post-weaning diarrhoea. The criterion for initiating antibiotic treatment in case of diarrhoea was, as a point of departure, that only individual animals be treated. If two or more pigs in a pen suffered from diarrhoea, all the pigs in the pen were treated.

Recordings

The following were recorded during the trial: daily gain, feed intake, mortality and treatments for disease. Furthermore, the herd manager assessed and noted the reasons why pigs were culled/died.

All recordings were made at pen level. The pigs were weighed upon transfer to the trial, when switching from diet 1 to diet 2 two weeks post-transfer (intermediate weighing) and at the end of the trial seven weeks post-transfer. The feed consumption was calculated at intermediate weighing and at the end of the trial. Furthermore, mortality and treatments for diarrhoea and other diseases were recorded.

Production value

The production value based on an average of the weaner prices of the last five years (September 2000-September 2005) was calculated as: (kg gain x DKK per kg gain) – (number of analysed FUgp x DKK per FUgp). The production value was calculated for the entire trial period for each pen. The value of gain was calculated on the basis of the average start and finish weight and was DKK 6.16 per kg. The prices of the last five years are:

Price of a 7 kg pig: DKK 214 per pig, +/- DKK 8.52/kg
 Price of a 30 kg pig: DKK 357 per pig, + DKK 5.08/kg (15-30 kg) / -DKK5.24/kg (30-40 kg)
 Diet 1: DKK 2.74 per FUgp
 Diet 2: DKK 1.52 per FUgp

Statistics

The production value was analysed as primary parameter with weight at transfer as co-variable. The model included the following variables: block and group. Data were analysed for normal distribution and prevalence of outliers, and were subjected to an analysis of variance in SAS under the GLM procedure. Significant differences are stated at 5 per cent level adjusted for two comparisons in pairs (groups 2 and 3 with control) with a Bonferroni t-test. As a significant effect was found on the production value, the individual production traits (feed intake, daily gain and feed conversion) were also subjected to the same statistical model.

Mortality and treatments for disease were secondary recordings in this trial.

Results and discussion

Feed

The expected and the analysed content of nutrients corresponded well with each other and there were no significant differences between the three groups. The analysis results are shown in Appendix 2.

The meal feed tended to block the feeders, and all feeders were therefore inspected four times a day to ensure that the pigs had access to feed. No feeders were observed with empty troughs.

Productivity

One block was eliminated from the overall analysis as two of the pens in this block were significant outliers. Furthermore, one pen in group 2 was eliminated as the pigs had a negative feed conversion due a negative gain in the period before intermediate weighing.

The production data achieved in the trial are shown in table 2. The production results are collected in a production value that show the production data obtained with fixed prices and identical feed prices. As shown in table 3, the production value was significantly higher in groups 2 and 3 compared with the control group. This means that both products increased the pigs' productivity in the tested doses. The increased production value was caused by a significantly higher daily gain and for group 3 also a significantly better feed conversion in the entire trial period.

Table 2. Production results (weight interval: 7.6-30.0 kg)			
Group	1 - Control	2 - Aviprox	3 – Aviplus
Blocks	37	36	37
0-2 weeks post-transfer			
Daily feed intake, FUgp/pig	0.23	0.24	0.24
Daily gain, g	108 ^a	137 ^b	132 ^b
Feed conversion, FUgp/kg gain	2.28 ^{*a}	1.90 ^b	1.94 ^b
2-7 weeks post-transfer			
Daily feed intake, FUgp/pig	1.04	1.08	1.06
Daily gain, g	580	602	602
Feed conversion. FUgp/kg gain	1.79 ^a	1.79 ^a	1.75 ^b
Entire trial period			
Daily feed intake, FUgp/pig	0.79	0.83	0.81
Daily gain, g	437 ^a	463 ^b	462 ^b
Feed conversion, FUgp/kg gain	1.81 ^a	1.79 ^a	1.76 ^b
* The high feed conversion was primarily due to individual blocks with a very low gain in the period before intermediate weighing, which resulted in a very high feed conversion.			

a,b: Different letters denote significant differences (groups 2 and 3 were compared with the control group).

Table 3. Production value (weight interval: 7.6-30.0 kg)			
Group	1 - Control	2 - Aviprox	3 – Aviplus
Production value:			
DKK/pig	67.5 ^a	71.1 ^b	72.5 ^b
Index	100	105	107
a,b: Different letters denote significant differences (groups 2 and 3 were compared with the control group). Statistics have only been calculated on the production value, which reflects the production figures obtained with identical prices. There must be a minimum difference between the control group and group 2 and group 3, respectively, of DKK 3.2 per pig corresponding to 4.7 index points.			

The addition of the two products increased the feed prices by approx. DKK 10-15 per 100 kg. On the basis of the production values obtained, it was calculated that in order to reach the same end result as in the control group, the feed in group 2 can cost max. DKK 11 more per 100 kg and the feed in group 3 can cost max. DKK 14 more per 100 kg. This means that the increased productivity largely corresponds to the increased feed costs applying at the time of the trial.

Health

Mortality and the number of treatments for diarrhoea in the three groups are shown in table 4. The number of treatments for diarrhoea was fairly high compared with the normal level in this herd. This is attributed to the fact that in this trial zinc oxide at veterinary therapeutic dosages was not administered the first two weeks post-transfer at the request of Vetagro. The majority of the treatments for diarrhoea took place within the first two weeks post-transfer. Appendix 3 shows the herd manager's assessment of why pigs died or were moved to a hospital pen.

There were no significant differences in the number of treatments for diarrhoea, and there were no significant differences between the groups in mortality or in dead pigs and pigs moved to a hospital pen. Note that mortality and treatments for disease were secondary recordings in this trial, which means that the trial was not designed to test relevant differences in mortality and treatments for diarrhoea. It would only be possible to test a fairly great difference, and differences of that magnitude were not found in this trial.

Table 4. Mortality and treatments for diarrhoea			
Group	1 - Control	2 - Aviprox	3 – Aviplus
Treatments for diarrhoea, days/pigs			
0-2 weeks post-transfer	3.9	3.7	3.9
2-7 weeks post-transfer	0.2	0.1	0.1
Entire trial period	4.1	3.8	4.1
Mortality, %			
Mortality for the entire trial period (0-7 weeks post transfer)	2.6	1.3	1.2
Dead and culled in the entire trial period (0-7 weeks post-transfer)	8.4	4.6	5.9

Conclusion

Overall, the trial showed that the addition of Aviprox and Aviplus in the doses used increased the production value of weaners. The increased production value was caused by an increased daily gain when Aviprox was used and an increased daily gain and an improved feed conversion when Aviplus was used. According to the increased production value, the feed for group 2 can cost max. DKK 11 more per 100 kg and the feed for group 3 can cost max. 14 more per 100 kg to reach the same end result as in the control group. The price of the products at the time of the trial resulted in an increase in the feed price of DKK 10-15 per 100 kg feed, which means that the increased production value was largely counterbalanced by the increased feed costs.

References

Nutrient standards, 13 edition, May 2006.

Participants

Technician Jens Ove Hansen
 Statistician Verner Ruby
 Herd manager Poul Hansen

Appendix 1 - Ingredient composition of the diets, %

Diet 1

Group	1: Control	2: Aviprox	3: Aviplus
Wheat	50.56	50.36	50.33
Barley	20.00	20.00	20.00
Dehulled soybean meal, HP 300 (Hamlet Protein)	10.27	10.27	10.31
Fish meal, LT (999)	8.42	8.42	8.44
Potato protein concentrate, Protastar	3.19	3.19	3.18
Vegetable fat (Scanfedt S)	3.50	3.50	3.38
Molasses	1.00	1.00	1.00
Mono calcium phosphate	0.80	0.80	0.80
Calcium formiate	0.60	0.60	0.60
Feed salt	0.28	0.28	0.28
Lysine 98.5	0.37	0.37	0.37
Methionine 100	0.07	0.07	0.07
Threonine 98.5	0.10	0.10	0.10
Tryptophan 15	0.41	0.41	0.41
Vitamin/mineral mix	0.34	0.34	0.34
Vitamin E 25000	0.09	0.09	0.09
Aviprox	-	0.20	-
Aviplus	-	-	0.30

The following amounts of vitamins were added per kg feed: vitamin A: 9330 iU, vitamin D3: 930 IE, vitamin E (DL-alfa tocopherol): 158.4 mg, vitamin K3: 2.33 mg, vitamin B1: 2.33 mg, vitamin B2: 4.66 mg, vitamin B6: 3.50 mg, pantothenic acid: 11.66 mg, niacin: 23.31 mg, biotin: 0.23 mg, vitamin B12: 0.02 mg.
The feed included the following doses of minerals (natural content + added) per kg: 1.77 g sodium, 257.3 mg iron, 123.3 mg zinc, 73.5 mg manganese, 131.4 mg copper, 0.29 mg iodine, 0.41 mg selenium.

Diet 2

Group	1: Control	2: Aviprox	3: Aviplus
Wheat	51.05	50.85	50.55
Barley	15.00	15.00	15.00
Dehulled soybean meal, HP 300 (Hamlet Protein)	10.00	10.00	10.00
Soybean meal, toasted	10.00	10.00	10.00
Fish meal	2.02	2.02	2.02
Potato protein concentrate (Protastar)	2.99	2.99	2.99
Vegetable fat (Scanfedt S)	3.86	3.86	3.86
Molasses	1.50	1.50	1.50
Feed lime	0.50	0.50	0.50
Mono calcium phosphate	0.83	0.83	0.83
Calcium formiate	0.70	0.70	0.70
Feed salt	0.36	0.36	0.36
Lysine 98.5	0.35	0.35	0.35
Methionine 100	0.09	0.09	0.09
Threonine 98.5	0.09	0.09	0.09
Tryptophan 15	0.20	0.20	0.20
Vitamin/mineral mix, incl. phytase	0.26	0.26	0.26
Vitamin E 25000	0.20	0.20	0.20
Aviprox		0.20	
Aviplus			0.30

The following amounts of vitamins were added per kg feed: vitamin A: 5720 IU, vitamin D3: 570 IE, vitamin E (DL-alfa tocopherol): 149.5 mg, vitamin K3: 2.29 mg, vitamin B1: 2.29 mg, vitamin B2: 4.58 mg, vitamin B6: 3.43 mg, pantothenic acid: 11.44 mg, Niacin: 22.88 mg, biotin: 0.23 mg, vitamin B12: 0.02 mg.
The feed included the following doses of minerals (natural content + added) per kg: 1.72 g sodium, 251.6 mg iron, 128.8 mg zinc, 69.7 mg manganese, 141.4 mg copper, 0.23 mg iodine, 0.35 mg selenium.
Phytase was added to the feed: 780 FYT per kg feed.

Description of the products based on information provided by Vetagro

Products	Aviprox	Aviplus
Supplier	Vetagro srl Via P.Colletta,12 42100 Reggio Emilia - Italia Tel: +39 0522 927024 Fax:+39 0522 927025 www.vetagro.it	Vetagro srl Via P.Colletta,12 42100 Reggio Emilia - Italia Tel: +39 0522 927024 Fax:+39 0522 927025 www.vetagro.it
Content	The product is a synergic mixture of organic acids and nature-identical flavours microencapsulated with a lipid matrix.	The product is a synergic mixture of organic acids and nature-identical flavours microencapsulated with a lipid matrix.
Price	€ 6.50 per kg product. An inclusion of 0.2 % increases the feed price by approx. DKK 9.75 per 100 kg feed.	€ 6.50 per kg product. An inclusion of 0.3 % increases the feed price by approx. DKK 14.60 per 100 kg feed.

Appendix 2

Calculated and analysed nutrient content of diet 1

Group	1: control		2: Aviprox		3: Aviplus	
	Analysed	Guarantee	Analysed	Guarantee	Analysed	Guarantee
Crude protein, % ¹⁾	19.7	20.7	20.2	20.7	20.4	20.7
Crude fat, % ¹⁾	5.8	6.2	5.9	6.3	5.8	6.3
Ash, % ¹⁾	4.6	5.1	4.7	5.1	4.9	5.1
Water, % ¹⁾	11.6	13.2	11.5	13.2	11.5	13.2
FUgp, per 100 kg ¹⁾	119.4	117.0	119.4	117.0	118.9	117.0
Calcium, g/kg ¹⁾	7.1	7.1	7.5	7.1	7.6	7.1
Phosphorus, g/kg ¹⁾	6.4	6.6	6.6	6.6	6.5	6.6
Lysine, g/kg ²⁾	14.4	14.6	14.8	14.6	14.7	14.6
Methionine, g/kg ²⁾	4.5	4.7	4.5	4.7	4.6	4.7
Cystine, g/kg ²⁾	3.5	3.3	3.5	3.3	4.0	3.3
Met+cyst, g/kg ²⁾	8.0	8.0	8.1	8.0	8.6	8.0
Threonine, g/kg ²⁾	8.7	9.0	9.0	9.0	9.1	9.0
Zinc, mg/kg ²⁾	94	123	106	123	118	123
1) Average of ten samples. 2) Average of two analyses.						

Calculated and analysed nutrient content of diet 2

Group	1: control		2: Aviprox		3: Aviplus	
	Analysed	Guarantee	Analysed	Guarantee	Analysed	Guarantee
Crude protein, % ¹⁾	19.8	19.7	19.4	19.7	19.9	19.6
Crude fat, % ¹⁾	5.8	6.1	5.8	6.2	5.7	6.4
Ash, % ¹⁾	4.9	5.4	4.9	5.5	5.0	5.5
Water, % ¹⁾	11.9	13.3	12.0	13.3	11.9	13.3
FUgp, per 100 kg ¹⁾	117.5	115.0	117.6	115.0	117.4	116.0
Calcium, g/kg ¹⁾	7.3	7.8	7.4	7.8	7.3	7.8
Phosphorus, g/kg ¹⁾	5.6	5.8	5.7	5.8	5.7	5.8
Lysine, g/kg ²⁾	13.3	13.2	13.6	13.2	13.6	13.2
Methionine, g/kg ²⁾	3.9	4.1	4.0	4.1	4.1	4.1
Cystine, g/kg ²⁾	3.6	3.3	3.5	3.3	3.6	3.3
Met+cyst, g/kg ²⁾	7.5	7.4	7.5	7.4	7.7	7.4
Threonine, g/kg ²⁾	8.3	8.3	8.4	8.3	8.5	8.3
Zinc, mg/kg ²⁾	119	129	118	129	120	129
1) Average of ten samples. 2) Stated on the basis of one analysis.						

Appendix 3

The herd manager's assessment of why pigs died or were moved to a hospital pen:

	Number, group 1	Number, group 2	Number, group 3
Cause, hospital pen			
Runt	16	10	15
Cause, dead			
Vitamin E deficiency			1
Diarrhoea	4	2	2
Other	2	2	1