Evaluation of the use of organic acids for weaned piglets

by P. Candotti, Istituto Zooprofilattico della Lombardia e dell' Emilia Romagna, via Bianchi 9, Brescia, Italy and C. Cossettini, Eurofeed Technologies srl, Via Mulini 116/d 25039 Travagliato, Brescia, Italy.

The use of antibiotics in animal feed for treatment or prevention of infectious diseases was almost the norm in farming management strategies.

However, the potential risk to both human and animal health, concerning the emergence of antibiotic resistance, first noted in the Swann Report in 1968, has focused attention on the limitation of antibiotic usage in animal production.

This article reports on a trial that used butyric acid monoglycerides, compared to colistin and zinc oxide treatments on weaning piglets and, in so doing, evaluated the weaning piglets' health, certain blood parameters and their growth.

Materials and methods

The trial was carried out in a closed pig farm. For the trial, 273 weaning piglets aged 23 days were selected.

These animals were divided in three random treatment groups. For each group the same feed was used but different treatments were administered.

- Group A (95 piglets) received colistin (120ppm) and amoxicillin (400ppm) in their feed for the first 15 days after weaning, then colistin in the feed (120ppm) for a further 45 days.
- Group B (90 piglets) received monoglycerides of butyric acid and other acidifiers in the feed. (monoglycerides of butyric acid, formic acid, propionic acid, lactic acid, phosphoric acid and acetic acid at an inclusion level of 5kg/ton of feed) for 45 days.
- Group C (88 piglets) received zinc oxide (2400ppm) and amoxicillin (400ppm) in the feed for the first 15 days then zinc oxide (1600ppm) in the feed for 45 days.

The trial lasted for 45 days and covered the whole weaning phase. The following parameters were evaluated:

- Pig weights at T0 (weaning) T15 (plus 15 days) T30, T60, and T94.
- Feed intake for each group at T0, T15, T30 and T60.
- Mortality. Five piglets from each group were selected and identified with a tattoo. For these piglets the following parameters at T15 and T30 were also considered:
- LPS (lipopolysaccharide/enterotoxin) concentration in blood serum.
- Faecal consistency.
- Faecal coliform count and whether or not Salmonella spp were present in the faeces. Each animal had faeces evaluated with a score on each single sample. The score was as follows: 0 = normal, 1 = more viscous, 2 = not consistent, 3 = soft and 4 = liquid.

Table 1. Growth and feed conversion ratio in the treatment groups.

Time	A			B			C		
	No. pigs	Av. wt	FCR	No. pigs	Av. wt	FCR	No. pigs	Av. wt	FCR
T0	95	8.17	1.76	90	7.72	1.75	88	7.65	2.06
T15	95	11.83	1.77	90	11.11	1.74	88	10.5	1.79
T60	91	37.88	1.76	90	37.36	1.72	87	35.68	1.61
T94	91	58.28	NE	90	57.82	NE	87	56.35	NE

Table 2. Average serum LPS in the treatment groups.

	T15			T30		
	A	B	C	A	B	C
Media	0.46	0.78	1.14	0.37	0.49	0.42
Standard deviation	0.13	0.29	0.31	0.11	0.16	0.14

Results

With regards to weight, there was a statistical effect of time and treatment. Because of the available data, it was not possible to test the probable interaction between treatment and time. There was a statistical difference between group A and group C.

During the trial some animals in groups A and C died. The causes were as follows:

- Group A. Two died due to serious respiratory problems with weight loss – one from streptococcal infection and in the other the cause was not determined.

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	T15			T30		
	A	B	C	A	B	C
Media	0.50	0.20	0.04	0.47	0.20	0.27
Standard deviation	0.82	0.40	1.20	0.62	0.40	0.44

Table 3. Average visual score of faeces in the treatment groups.

	T15			T30		
	A	B	C	A	B	C
Media	10,393	35,873	2,600	5,775	53,653	113
Standard deviation	24,319	73,789	5,178	20,294	107,587	35

Table 4. Average faecal coliforms in the treatment groups.

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● Group C. One died but the cause was not determined.

Table 2 shows LPS blood serum concentrations. In Table 3 average total coliform counts and their standard deviations are reported. Statistical analysis shows that there is a relevant effect due to the treatment but not because of time.

Group A is, on average, different from group B (p=0.019) and group B is, on average, different from group C (p=0.0007).

No statistical difference has been found in treatment groups concerning faecal scores even when faecal consistency was visibly different between the three groups.

The frequency of variance for repeated analysis shows statistical differences in LPS serum concentrations and this effect varies with time. Salmonella was not detected in any of the faecal samples.

Discussion

The gut has a huge surface that is exposed to antigens, toxic compounds and bacteria. To preserve a good gut cell health and to protect these cells from damage it is necessary to maintain a constant and on-going interaction between enterocytes (gut cells), the intestinal microflora and the intestinal immune system.

The poor function of one of these elements can arise as a result of damage to this system and a consequence of this is inflammation.

Antibiotic treatment can cause an imbalance of good intestinal microflora with an upsurge in the growth of pathogenic bacteria, resulting in diarrhoea.

Bacterial degradation is the cause of LPS release into the intestinal lumen and their possible absorption into the bloodstream. So, it is important that the chosen treatment to control intestinal bacteria does not exert a negative effect that increases LPS in the bloodstream.

The results show a higher number of faecal coliforms in the group treated with organic acids in comparison to the other two treatments.

Despite this result, the faecal macroscopic aspect was always better in the animals in this group. The serum LPS concentration in this group decreased from day 15 to 30 so their level was then similar to that in the other two treatment groups.

It has already been demonstrated that butyric acid glycerides in the diet are able to improve animal growth and feed conversion in broilers. In this trial, the acidifier mix (the main ingredients are monoglycerides of butyric acids) has been shown to have the same performance as the other two treatments.

Conclusions

In the context of an ever more limited use of antibiotics for livestock, the use of an acidifier mixture, with monoglycerides of butyric acids, represents a good alternative.

This can be used for preventive treatment over the weaning period in order to control enteric disease and to improve pig performance. ■

References are available from the authors upon request