

Plasma is a good alternative to antimicrobial medication in the feeding of weaning pigs

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SUMMARY – Two experiments with weaning pigs, were conducted in order to evaluate a plasma standardised in immunoglobulins as an alternative for antimicrobial preventive medication. Trial-1 was conducted with 96 21 d-old piglets and Trial-2 was conducted with 128 pigs, of which half were 21 days of age and the other half were 31 days old. In both experiments, the effects of the use of plasma and/or colistin were studied. Four dietary treatments were used: (i) control diet; (ii) diet with plasma; (iii) diet with colistin; and (iv) diet with plasma and colistin. When included, plasma was used at 5% during the pre-starter phase (0-14 days) and at 2% during the starter phase (14 d-end of the trial). In Trial-1 both plasma and colistin resulted in improved performance. However, only the improvements in average daily gain (+23 g/d; $P = 0.1$) and feed to gain ratio (-0.031 ; $P < 0.05$) due to plasma and in feed to gain ratio (-0.043 ; $P < 0.01$) due to colistin reached statistical significance. In Trial-2, plasma improved again feed to gain ratio (-0.043 ; $P < 0.05$). The statistical significance was mainly due to the improvement experienced by the 22 d-old piglets (-0.059 ; $P < 0.05$), since the improvement in the 31 d-old piglets was smaller (-0.026 ; $P = 0.26$). It is concluded that this plasma is a good alternative to the use of antimicrobial medication.

Key words: Weaning pigs, plasma standardised in Igs, antimicrobials, colistin.

RESUME – "Le plasma est une bonne alternative aux médicaments antimicrobiens dans l'alimentation des porcelets en sevrage". Deux expériences ont été menées sur des porcelets en sevrage afin d'évaluer un plasma standardisé en immunoglobulines comme alternative à la prise préventive de médicaments antimicrobiens. L'essai 1 a été mené sur 96 porcelets âgés de 21 jours, et l'essai 2 a été mené sur 128 porcelets dont la moitié avait 21 jours d'âge et l'autre moitié 31 jours. Dans ces deux expériences, les effets de l'utilisation du plasma et/ou de la colistine ont été étudiés. Quatre régimes alimentaires ont été utilisés : (i) régime témoin, (ii) régime avec plasma, (iii) régime avec colistine et (iv) régime avec plasma et colistine. Lorsqu'il était incorporé, le plasma était utilisé à 5% pendant la phase pré-démarrage (0-14 jours) et à 2% pendant la phase de démarrage (14 jours - fin de l'expérience). Dans l'essai 1, le plasma ainsi que la colistine ont donné de meilleures performances. Cependant, uniquement les améliorations du gain moyen quotidien (+23g/j : $P = 0,1$) et du rapport aliment-gain de poids ($-0,031$; $P < 0,05$) dues au plasma, et du rapport aliment-gain de poids ($-0,043$; $P < 0,01$) dues à la colistine ont atteint une signification statistique. Dans l'essai 2, le plasma a amélioré à nouveau le rapport aliment-gain de poids ($-0,043$; $P < 0,05$). La signification statistique était principalement due à l'amélioration des porcelets de 22 jours ($-0,059$; $P = 0,05$) car l'amélioration chez les porcelets de 31 jours était moindre ($-0,026$; $P = 0,26$). La conclusion a été que ce plasma était une bonne alternative à l'utilisation de médicaments antimicrobiens.

Mots-clés : Porcelets en sevrage, plasma standardisé en Igs, antimicrobiens, colistine.

Introduction

At weaning, the immune system of the piglet is not fully developed and the passive immunity passed from the sow via milk is suddenly stopped. If at that moment, the piglet is exposed to a new social and microbiological environment, health problems are guaranteed. Until recently, antibiotics were used to prevent this, but the ban on their use as growth promoters, has created the need for the research of new alternatives. During the last decade the use of plasma in the feeding of weaning pigs has been proven as very effective, but its mode of action is not yet fully understood. One possibility is that, due to its high content in immunoglobulins, plasma offers some passive immunity to the piglet. If so, plasma would be a very interesting alternative to antibiotics in the most critical point in the rearing of pigs (weaning). The present work describes two experiments in which a plasma standardised in globulin content (Appetein[®], APC-Europe) was tested as an alternative to antimicrobials.

Material and methods

Animals

In Trial-1 ninety six 21 day-old piglets (*Landrace*) weighing 5.7 kg were used. They were housed in the weaning unit of IRTA's Department of Animal Nutrition, in 24 pens of 4 animals each.

In Trial-2, one hundred and twenty eight piglets were used. Half of the piglets were 22 days old (5.8 kg), and the other half were 32 days old (6.4 kg). A total of 32 pens with 4 animals each were used.

In both trials the animals were distributed by body weight into blocks of four pens.

Diets

Identical diets were used for both trials. Between the start and day 14 of experiment a pre-starter composition was used. Between day 14 and the end of the trial a starter composition was used. There were four experimental treatments with two levels of plasma and two levels of colistin: T-1 (no plasma, no colistin), T-2 (5-2% plasma, no colistin), T-3 (no plasma, 150 ppm colistin) and T-4 (5-2% plasma, 150 ppm colistin). The source of plasma used has a standardised globulin content (Appetein[®], APC-Europe). In the pre-starter diet 5% plasma was included in substitution of an isonitrogenous amount of fishmeal; in the starter diets 2% of plasma was used. All the diets were balanced for its amino acid and energy content.

Measurements

Feed and pigs were weighed at the start, on day 14 and at the end of the experiment. Trial-1 lasted for 35 days, Trial-2 lasted for 28 days. Average daily gain, average feed intake and feed to gain ratio were measured for each treatment and compared statistically. For the statistical analysis the effect of the block was considered. In Trial-2 the effect of age at weaning and the interaction treatment*age were also considered.

Results and discussion

The results of Trial-1 are presented in Table 1. The use of both, plasma and colistin improved performance respect to the control. Plasma improved average daily gain by 23 g ($P=0.1$), whereas colistin improved it by 18 g, but without statistical significance. Feed to gain ratio was significantly improved by both, plasma (-0.031 ; $P<0.05$) and colistin (-0.043 ; $P<0.01$). The combination of the two products appeared to have an additive effect suggesting that their mode of action is independent.

Table 1. Weight gain (ADG), feed intake (ADFI) and feed-to-gain ratio of 21 d-old weaning pigs fed on diets with or without plasma and colistin for 35 days (Trial-1). Pooled values for the treatments including or not including plasma are also presented

	T-1	T-2	T-3	T-4	Plasma	No Plasma
Colistin	–	–	+	+		
Plasma	–	+	–	+		
ADG (g/d)	358 ^A	391 ^C	381 ^{AC}	394 ^C	392 ^A	369 ^B
ADFI (g/d)	508	535	531	526	530	519
Feed:Gain	1.408 ^A	1.402 ^A	1.390 ^A	1.335 ^B	1.368 ^A	1.399 ^C

^{A,B}Values in the same row with different superscript are significantly different ($P<0.05$).

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It is worth noticing that the positive effects of plasma and colistin appeared during the first 14 days of experiment (results not shown). Between 14 and 35 days the differences achieved by those treatments were maintained. This confirms that the piglets are more susceptible during the first two weeks post-weaning.

The results of Trial-2 are presented in Table 2. As in the previous trial, both plasma and colistin improved the performance of the piglets. The effect of plasma on feed-to-gain ratio reached significance (-0.043 ; $P < 0.05$). This effect was more important in the 22 d-old pigs (-0.059 ; $P < 0.05$) than in the 32 d-old pigs (-0.026 ; $P = 0.26$), suggesting that the younger pigs are more susceptible at weaning. This is probably due to a less mature immune system. Again, the combination of the two products appeared to have an additive effect.

Table 2. Weight gain, feed intake and feed to gain ratio of 22 and 32 day-old weaning pigs fed on diets with or without plasma and colistin for 28 days (Trial-2). Pooled values for the treatments including or not including plasma are also presented

	T-1	T-2	T-3	T-4	Plasma	No Plasma
Colistin	–	–	+	+		
Plasma	–	+	–	+		
22 day-old pigs						
ADG (g/d)	277	292	281	275	284	279
ADFI (g/d)	403	402	394	377	389	399
Feed:Gain	1.457 ^A	1.373 ^B	1.404 ^{AB}	1.368 ^B	1.371 ^A	1.430 ^B
32 day-old pigs						
ADG (g/d)	395	399	409	424	411	402
ADFI (g/d)	544	549	568	564	556	556
Feed:Gain	1.380	1.375	1.385	1.330	1.353	1.383
All ages						
ADG (g/d)	336	346	345	350	341	348
ADFI (g/d)	478	475	481	470	473	480
Feed:Gain	1.415 ^A	1.374 ^{AB}	1.394 ^{AB}	1.349 ^B	1.362 ^A	1.405 ^B

^{A,B}Values in the same row with different superscript are significantly different ($P < 0.05$).

Conclusions

The use of both plasma and colistin improved the performance of weaning pigs.

This improvement tends to be higher for plasma than for colistin, especially in the young piglets.

The results suggest that the mode of action of plasma is related to their content in immunoglobulins, since its effectiveness is higher in the younger pigs (with an immature immune system) and during the first 14 days post-weaning.

It is concluded that plasma can be used as an alternative to antimicrobial preventive medication. However, further research need to be conducted to fully understand its mode of action, and to optimise its use.