

Report no. 341  
18 September 1996

**COMMERCIAL PRODUCTS IN FEED FOR FINISHERS**  
**- Salocin, Sangrovit, ToyoCerin and Acid Lac**

by PhD Anni Øyan Pedersen

National Committee for Pig Breeding, Health and Production  
The Federation of Danish Pig Producers and Slaughterhouses  
Department of Nutrition and Reproduction

**SUMMARY**

Four commercial products for finishers were tested. The products were compared with a control mix with no addition of antibiotic growth promoter. The trial included the following treatments:

- \* Control feed without growth promoter
- \* Salocin 25 ppm, from Hoechst Roussel Vet
- \* Sangrovit 30 ppm, from Hoechst Roussel Vet
- \* Sangrovit 50 ppm, from Hoechst Roussel Vet
- \* ToyoCerin 20 ppm, from LOHMANN ANIMAL HEALTH GmbH & Co. KG
- \* Acid Lac 0.3 per cent, from KEMIN

The trial was carried out in cooperation with the companies concerned, which also supplied the products tested. The companies analysed the feed mixes for their own products. The products were tested on finishers approximately weighing between 30 and 100 kg in one herd. Each treatment included 24 repeats, totalling 81 pigs per group.

The chemical analysis of the feed in general showed good concordance with the calculated nutritional content. Though, the analysed content of lysine was lower than calculated in the feed containing Sangrovit, 50 ppm, at one delivery. The company analyses of their own products showed an acceptable content in relation to the expected content.

The production value of the individual mixes has been calculated on the basis of production results

and is stated as gross margin per pen place per year at the same price for all mixes.

The production value of the feed mix with Sangrovit, 30 ppm, was significantly higher than the production value of the control mix without growth promoter. No significant difference showed between the control group and the experimental groups with 50 ppm of Sangrovit, Salocin, ToyoCerin or Acid Lac. However, the production value tended to increase when Salocin was added to the feed mix.

## **BACKGROUND**

The use of antibiotic growth promoter in feed presumably increases the risk of developing bacteria which are resistant to antibiotics used for human. Therefore, there is a desire to find alternative products which have a growth promoting effect.

The market offers an increasing number of products of presumed growth-promoting effect in finishers. Documentation for the effectiveness of the products is, however, necessary to be able to estimate the financial gain achieved from using the products in feed for finishers.

The object of testing commercial products for finishers is to provide documentation for the production value of the products. The effect of the products is measured by production results: feed intake, feed conversion, daily gain and lean meat percentage.

## **MATERIALS AND METHODS**

The trial was carried out in one finisher herd. It included four products: Salocin, Sangrovit, ToyoCerin and Acid Lac. Sangrovit was tested in two doses. The feed mix with Salocin was included in the trial as a positive control to be able to compare the effect of a well known growth promoter with the effects of alternative products. There was also a control mix without growth promoter. The distribution of groups in the trial appears from Table 1.

Group	Product	Company
1	Control without growth promoter	-
2	Salocin, 25 ppm (positive control)	Hoechst Roussel Vet
3	Sangrovit, 30 ppm	Hoechst Roussel Vet
4	Sangrovit, 50 ppm	Hoechst Roussel Vet
5	ToyoCerin, 20 ppm	LOHMANN ANIMAL HEALTH
6	Acid Lac, 0.3 per cent	KEMIN

All six feed mixes were produced by Aarhusegnens Andels Grovwareforening a.m.b.a. Appendix 1 shows the feed mix composition, and appendix 2 is a description of the tested products. The feed was produced in two rounds. Each mix was sampled for a full feedstuff analysis, including FUs<sup>1</sup> and amino acids. The companies also received a feed sample from each feed production for analysis for their own products.

MS pigs entered the trial at an average weight of 30 kg. The pigs were purchased from 4 herds. The trial comprised a total of 486 pigs, distributed into 24 repeats, totalling 81 pigs per experimental group. Each pen held three or four pigs. The repeats were divided into three blocks concerning number of pigs and distribution of sexes in the pen, resulting in nine repeats with two female pigs and two castrates per pen, eight repeats with two female pigs and one castrate per pen, and seven repeats with one female pig and two castrates per pen.

---

<sup>1</sup>FUs = 0.097 x MJ ME - 0.244

The finisher unit was divided into two sections. The pens had a solid floor and a cleaning corridor. Straw bedding was used. Each pen had one simple dry feed dispenser and one nipple drinker. The pigs were fed ad lib. and had free access to feed day and night. Feed was given manually about every second day. Feed intake, gain, medical treatments and slaughter data were recorded. The intermediate weight of the pigs was recorded about one month after the pigs entered the trial.

Data were analysed statistically by an analysis of variance in the GLM procedure in SAS. Gross margin per pen place per year was calculated based on production results measured and adjusted to the same weight at entry and at slaughter. The following class variables were included in the statistical model: Block, repeat within block and group. Five paired comparisons were made: Groups 2, 3, 4 and 5 against the control group without growth promoter. Significant differences are stated at five per cent level adjusted for more paired comparisons by a Bonferroni t-test statistic.

## RESULTS AND DISCUSSION

In general, the calculated and the analysed content of nutrients in the mixes show good concordance, cf. appendix 3. Though, the analysed content of lysine was lower than calculated in the feed containing Sangrovit, 50 ppm, at the second delivery causing a 7% undersupply of digestible lysine per FUs in relation to the standard in the last part of the finishing period.

The companies involved have tested the content of their own products in the feed mixes, as there is no known authorised analytical methods for a number of the tested products. The companies' analytical results of their own products in the feed mixes were within an acceptable area in relation to expected contents, cf. appendix 3. Though, the analysed contents of Sangrovit and Acid Lac in the mixes were lower than calculated. Concerning Sangrovit, the deviation can be due to the fact, that up til now there have not been developed a satisfactory analytical method. As Acid Lac was included in the feed mix in higher amount than the other products, no premix was made with Acid Lac as with the other products, cf. appendix 1. The lower analysed content of Acid Lac in the feed mix than calculated can therefore be due to the separate admixing when the feed was produced.

The production results are shown both before and after the intermediate weighing and totalling for the whole experimental period (Table 2). The results are given as adjusted means at the same weight at entry, intermediate weighing and delivery of the pigs. The average body weight at entry, intermediate weighing and delivery, respectively, was 30, 53, and 100 kg.

The health condition of the pigs was in general good. No pigs were treated against diarrhoea or any other digestive disorders. In the experimental period, one pig from group 1, one pig from group 4, two pigs from group 5, and one pig from group 6 were excluded from the experiment due to other reasons than digestible disorders. Moreover, there were two dead pigs in group 4 and one dead pig in group 6.

<b>Table 2. Production results corrected to the same body weight at entry, intermediate weighing, and delivery</b>						
Product	Control without growth promoter	Salocin 25 ppm	Sangrovit 30 ppm	Sangrovit 50 ppm	ToyoCerin 20 ppm	Acid Lac 0.3 per cent
Number of repeats	24	24	23	24	24	24
Number of pigs delivered	80	81	78	78	79	79
<b>30-53 kg BW:</b>						
Daily feed intake, FUs	1.77	1.75	1.75	1.79	1.75	1.75
Daily gain, g	775	785	788	786	786	777
FUs per kg of gain	2.28	2.24	2.22	2.28	2.23	2.26
<b>53-100 kg BW:</b>						
Daily feed intake, FUs	2.59	2.57	2.66	2.59	2.56	2.53
Daily gain, g	868	898	914	880	858	879
FUs per kg of gain	2.99	2.86	2.91	2.95	2.99	2.88
<b>30-100 kg BW:</b>						
Daily feed intake, FUs	2.29	2.30	2.33	2.29	2.28	2.27
Daily gain, g	831	866	868	843	834	846
FUs per kg of gain	2.76	2.66	2.69	2.73	2.74	2.68
Lean meat percentage	59.5	59.1	59.9	59.7	59.3	59.5

The production value stated as gross margin per pen place per year appears from Table 3. The production value is calculated on the basis of production results obtained (daily gain, FUs per kg of gain and lean meat percentage) at a feed price of DKK 1.33 per FUs for all groups. The price for adding the different products are thereby not included in the calculation. The average purchase price for 30 kg pigs and the sales price including bonus payment for the last year are also included in the calculation of the production value cf. Table 3.

In the statistical calculation, one pen was excluded from group 3 owing to a significantly ( $p=0.004$ ) deviating value for the gross margin, which was due to a very low lean meat percentage for the pen in question.

From the results it appears that addition of 25 ppm of Salocin to the feed mix showed no significant effect, though a tendency ( $p=0.07$ ) towards increased production value.

<b>Table 3. Production value and actual gross margin at current prices</b>						
Product	Control without growth promoter	Salocin 25 ppm	Sangrovit 30 ppm	Sangrovit 50 ppm	ToyoCerin 20 ppm	Acid Lac 0.3 per cent
<b>Production value:</b>						
Gross margin/pen place/year <sup>1</sup> , DKK at DKK 1.33 per FUs <sup>2</sup>	688	750	771	734	688	733
Index <sup>2</sup>	100	109	112*	107	100	107
<b>Actual gross margin at current prices<sup>3</sup></b>						
Index	688	742	755	710	680	702
	100	108	110	103	99	102
<sup>1</sup> ) With gain and feed consumption adjusted to same weight at entry and at slaughter. At a purchase price for 30 kg pigs at DKK 400. At sales price including bonus payment of DKK 11/kg. <sup>2</sup> ) Significant difference (at 5% level) in comparison with control group: Gross margin/pen place/year: minimum DKK 66. Index: minimum 10 index points. Index marked * differs significantly from the control group. <sup>3</sup> ) There is <b>not</b> performed statistical calculation on the differences in the gross margin at the current prices.						

The production value of the feed mix with Sangrovit, 30 ppm, significantly exceeded the production value of the control mix without growth promoter, whereas the difference in production value between the feed mix with Sangrovit, 50 ppm, and the control mix was not significant. The higher production value for the feed mix with Sangrovit, 30 ppm, compared with the control mix was especially due to higher daily gain in the period after the intermediate weighing (53-100 kg BW), but also lower feed consumption per kg of gain in the whole experimental period (30-100 kg BW). The reason for no similar positive effect of Sangrovit at the high dosage (50 ppm) as at the low dosage (30 ppm) can be explained by the undersupply of lysine in the last part of the finishing period for pigs fed the mix with 50 ppm of Sangrovit as mentioned previously.

The production value of the feed mixes with ToyoCerin and Acid Lac showed no significant difference from the production value of the control mix.

The costs of the different products are as mentioned not included in the calculation of the production value. In Table 3, apart from the production value, are also given the actual gross margins at current prices for the products, cf. appendix 2. Though, the statistical analysis is only performed with the same price for all mixes. From the actual gross margin at current prices it appears that the gross margin can be increased by DKK 67 per pen place per year by addition of Sangrovit, 30 ppm, to the feed. In comparison, the trial showed that the gross margin can be increased by DKK 54 per pen place per year by addition of Salocin, 25 ppm. By addition the other products, there was only seen small or no increase of the actual gross margin.

The conclusion of the trial is that addition of Sangrovit, 30 ppm, to finisher feed resulted in a significantly higher production value compared with the control group without growth promoter.

## Finisher mixes, ingredients, percentage

	Group 1 Control	Group 2 25 ppm Salocin	Group 3 30 ppm Sangrovit	Group 4 50 ppm Sangrovit	Group 5 20 ppm ToyoCerin	Group 6 0.3% Acid Lac
Wheat	35.60	35.50	35.50	35.50	35.50	35.45
Barley	35.60	35.50	35.50	35.50	35.50	35.45
Soy meal, toasted	21.40	21.40	21.40	21.40	21.40	21.40
Molasses, sugar beet	2.90	2.90	2.90	2.90	2.90	2.90
Animal fat	1.50	1.50	1.50	1.50	1.50	1.50
Vitamins + minerals	2.46	2.46	2.46	2.46	2.46	2.46
L-lysine	0.23	0.23	0.23	0.23	0.23	0.23
Methionine 40%	0.18	0.18	0.18	0.18	0.18	0.18
Threonine 50%	0.13	0.13	0.13	0.13	0.13	0.13
Salocin premix <sup>1)</sup>	-	0.2	-	-	-	-
Sangrovit premix 1 <sup>2)</sup>	-	-	0.2	-	-	-
Sangrovit premix 2 <sup>3)</sup>	-	-	-	0.2	-	-
ToyoCerin premix <sup>4)</sup>	-	-	-	-	0.2	-
Acid Lac	-	-	-	-	-	0.3

<sup>1)</sup> Salinomycin sodium admixed to fine wheat bran (12,500 mg/kg)

<sup>2)</sup> Sangrovit admixed to fine wheat bran (15,000 mg/kg)

<sup>3)</sup> Sangrovit admixed to fine wheat bran (25,000 mg/kg)

<sup>4)</sup> ToyoCerin admixed to fine wheat bran (10,000 mg/kg)



**PRODUCT DESCRIPTION BASED  
ON COMPANY INFORMATION**

**GROUP 2:**

**Product name:** Salocin

**Supplier:** Hoechst Roussel Vet  
Islevdalvej 110  
DK-2610 Rødovre  
Tel.: +45 44 88 82 00

**Content:** Salinomycin 120 g/kg. The carrier is calcium carbonate.

**Price:** DKK 1.12 per 100 kg of feed at admixture of Salocin 25 ppm.

**GROUPS 3 AND 4:**

**Product name:** Sangrovit

**Supplier:** Hoechst Roussel Vet

**Content:** The product is a natural feed supplement which adjusts aroma and appetite. The product is made of the root of the plant *Sanguinaria canadensis*, which grows in North-Eastern America. The active substance is Sanguinarin.

**Price:** DKK 1.83 and 3.05 per 100 kg of feed at admixture of Sangrovit 30 and 50 ppm, respectively.

**GROUP 5:**

**Product name:** ToyoCerin

**Supplier:** LOHMANN ANIMAL HEALTH GmbH & Co. KG  
Heinz-Lohmann-Str. 4  
D-27472 Cuxhaven  
Germany  
Tel.: +49 4721 7470

**Content:** The product contains bacterial spores of *Bacillus cereus* var. *toyoi* ( $10^{10}$  CFU/g).

**Price:** DKK 1.20 per 100 kg of feed at admixture of ToyoCerin 20 ppm.

**GROUP 6:**

**Product name:** Acid Lac

**Supplier:** KEMIN Scandinavia  
Gelsåvej 26  
DK-6500 Vojens  
Tel: +45 74 54 74 82

**Content:** The product consists of a mixture of five organic acids: fumaric acid, lactic acid, propionic acid, formic acid and citric acid. The acid activity is 68 per cent, the residual being a carrier. The ratio between the five acids is stated to be a balanced ratio.

**Price:** DKK 3.75 per 100 kg of feed at admixture of Acid Lac 0.3 per cent.

## Appendix 3

### Calculated and analysed nutritional content of the mixes (average of two feed deliveries)

Mix	All mixes	Control	Salocin 25 ppm	Sangrovit 30 ppm	Sangrovit 50 ppm	ToyoCerin 20 ppm	Acid Lac 0.3%
Calculated/ analysed	Calculated	Analysed	Analysed	Analysed	Analysed	Analysed	Analysed
FUs per 100 kg	108	111	110	111	110	110	110
Crude protein, %	17.0	17.9	17.1	17.4	17.4	17.6	17.3
Lysine, g/kg	10.1	10.2	10.4	10.3	9.5	10.5	10.4
Methionine, g/kg	3.2	3.1	3.2	3.2	3.1	3.2	3.0
Cystine, g/kg	3.1	3.2	3.1	3.2	3.1	3.2	3.0
Threonine, g/kg	-	7.1	6.9	6.9	6.8	7.0	6.6
Total phosphorus, g/kg	5.0	5.2	5.1	5.2	5.6	5.4	5.4

### Content of the tested products in the feed mix analysed by the companies concerned (average of two feed deliveries)

Product	Salocin	Sangrovit	Sangrovit	ToyoCerin	Acid Lac
Calculated	25 ppm	30 ppm	50 ppm	20 ppm	0.30 %
Analysed	25 ppm	26 ppm	31 ppm	22 ppm	0.23 %