

Skjoldborg test station

TestGris***

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Effect of feeding a diet containing MiaTraceZn or zinc oxide on productivity and health in weaned piglets

Test conducted on request of ATR Landhandel DK Aps

June 29, 2016

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Introduction

This study was conducted on request of ATR Landhandel DK ApS in the period March 21 to May 17 2016 on Skjoldborg test station. The piglets were fed the test diets (MiaTrace6 or ZnO6) intended 6 to 10 kg pigs from the day of insertion in the climate stable until day 14 after insertion, followed by the diets (MiaTrace10 or ZnO10) intended 10 to 16 kg pigs from day 14 after insertion until day 28. From day 28 after insertion, the pigs were fed the test diets (MiaTrace16 or ZnO16) until day 42 after insertion, i.e. the end of the test.

The objective of the present study was to evaluate effects on average daily gain (ADG) and feed utilisation (FU; kg feed per kg gain) of piglets receiving two different diets from day 0 to 14; MiaTrace6 or ZnO6, from day 14 to 28; MiaTrace10 or ZnO10 and from day 28 to 42; MiaTrace16 or ZnO16. Moreover, piglets taken out of study (PTO) because of illnesses or death, and diarrhoea related treatments (DRT) were estimated in all three periods.

Materials and methods

Animals, diets and protocol

The conventional integrated production, who conducts the study with feed for piglets, runs weekly operation in the sow unit. This means, that every week, the sows are farrowing and piglets are weaned.

A total of 2309 crossbred (Landrace/Yorkshire x Duroc) female and castrated male piglets at approximately the same proportion where weaned at 25 ± 3 days of age.

Three similar rooms of 24 pens where used. Rooms were cleaned and disinfected before insertion of piglets. The pens were traditionally structured with one dry feed dispenser at the pen partition that feeds two pens, i.e. 12 dry feed dispensers per room. The piglets were group housed in pens and allocated randomly; females and castrated males mixed on both sides of the feed dispenser. Thus, two pens around one feeder constitute one observation. Around 32 piglets were inserted in every pen after weaning. Within a week unit, it was ensured, that there were the same number of piglets on the two test diets in every room.

At the day of weaning, the pigs had an average initial body weight of 6.6 kg (SEM 1.0 kg). Piglets were allocated to one of two diets; MiaTraceZn or ZnO, i.e. six dry feed dispensers for each diet per room. The diets were balanced according to weight. Piglets were provided the diets (MiaTrace6 or ZnO6) intended 6 to 10 kg piglets from the day of insertion in the stable until day 14 after insertion. The diets (MiaTrace10 or ZnO10) intended 10 to 16 kg pigs was fed from day 14 until 28 after insertion. From day 28 to 42 the diets (MiaTrace16 or ZnO16) intended pigs with bodyweight 15 to 30 kg was fed. All diets were fed *ad libitum*. The diets were supplied when requested by a sensor in the individual feed dispenser up to several times per day when needed. When requested and delivered to the individual feed dispenser, the amount of diet fed was registered by weight at feeding. The dry feed dispensers were adjusted on a regular basis to minimise feed spillage. The pigs had permanent access to fresh water from nipple drinkers that were built into the feed dispenser. However, water and feed were separated.

The product in test MiaTraceZn was delivered by ATR Landhandel. Three premixes containing either MiaTraceZn or ZnO were mixed at Skjoldborg test station. One premix intended 6 to 10 kg pigs containing ZnO corresponding to 2400 mg Zinc Oxide per kg diet, and one containing ZnO corresponding to 130 mg Zinc oxide per kg diet intended 10 to 16 kg pigs and 16 to 30 kg pigs. The premix containing MiaTraceZn contained MiaTraceZn corresponding to 130 mg Zinc oxide per kg diet. The premix containing MiaTraceZn was intended all three diets for 6 to 10 kg pigs, 10 to 16 kg pigs and 15 to 30 kg pigs. In accordance with the wants from ATR Landhandel, the diets were mixed at Skjoldborg test station. The diets were similar in content, only differing in premix. The composition of the test diets was unknown for the personnel at the test station.

As requested by ATR Landhandel the test was conducted without the inclusion of a negative control, i.e. no group without the extra added ZnO (2400 mg zinc oxide per kg diet) was tested. Likewise, as requested by ATR Landhandel all diets contained 0.6 percent of calcium formate and 0.5 percent of benzoic acid.

Registrations

The piglets were weighed when allocated to the pens at the day of insertion day 0, at day 14 and 28 after insertion, and subsequently at day 42. All pigs in one pen were weighed as a unit. At day 14, 28 and 42 the amount of feed fed per feed dispenser was recorded, before changing to the next diet. The remainder diet in the feed disperser was weighed and removed. The product MiaTraceZn was delivered in 25 kg bags and mixed in premixes. VetZinc was prescribed by the veterinarian and mixed in premixes. Number of dead piglets, PTO and DRT were registered together with weight of pigs taken out of study.

Analysis

All analyses were done by Eurofins, see Appendix A.

Calculations and statistics

Average daily gain per piglet is calculated as the difference between weight at insertion in the study and weight at day 14 and day 28, i.e. when changing of diet and at day 42, i.e. at the end of the test period, respectively, as an average of the piglets in one double pen (around one dry feed dispenser). Moreover, ADG from day 0 to 42 was calculated. Feed utilization per piglet is the average of intake of kg feed per kg gain per double pen from day 0 to 14, day 15 to 28 and day 28 to 42. In all calculations, number and weight of piglets out of trial were deducted.

All statistical analyses were done by Danish Technological Institute, Denmark. Animal performance data were statistically analysed by the GLMM procedure of R (R Core Team, 2014). Average daily gain at day 14, 28, 42 and 0 to 42, and FU at day 14 and 28 were analysed in a gaussian mixed effect model including initial body weight, diet (MiaTraceZn6 or ZnO6, MiaTraceZn10 or ZnO10, MiaTraceZn16 or ZnO16), room number and side of the room. Pigs taken out of study and DRT day 14, 28 and 42 were analysed in a logistic mixed effect model including initial body weight, diet (MiaTraceZn6 or ZnO6, MiaTraceZn10 or ZnO10, MiaTraceZn16 or ZnO16), room number and side of the room. Statistical significance was accepted at $P < 0.05$.

Results and comments

No difference between diets was found regarding ADG at day 14 ($P=0.62$), day 28 ($P=0.88$), day 42 ($P=0.50$) or the period from day 0 to 42 ($P=0.98$), see Table 1. No significant difference was found regarding FU at day 14 ($P=0.46$), day 28 ($P=0.42$), day 42 ($P=0.36$) or the period from day 0 to 42 ($P=0.38$), see Table 1.

Table 1. Average daily gain (ADG) from day 0 to day 14, 28 and 42, and day 0 to 42, and feed utilisation (FU; kg feed/kg gain) day 0 to 14, 28 and 42, and day 0 to 42 of pigs fed diet MiaTraceZn or ZnO.^x

	Day	MiaTraceZn	ZnO	P-value
ADG, kg	14	0.24 ^a	0.26 ^a	0.62
	28	0.53 ^a	0.53 ^a	0.88
	42	0.79 ^a	0.76 ^a	0.50
	0-42	0.52 ^a	0.52 ^a	0.98
FU, kg/kg	14	1.39 ^a	1.36 ^a	0.46
	28	1.53 ^a	1.55 ^a	0.42
	42	1.52 ^a	1.65 ^a	0.36
	0-42	1.52 ^a	1.56 ^a	0.38

^x Values are least squares means. (n=12).

^a Means within rows without a common superscript differ (P≤0.05).

In general, piglets maintained good health during the experiment. No difference between PTO day 14 (P=0.22), day 28 (P=0.05) and day 42 (P=0.49), and DRT day 14 (P=0.62) was found. Due to too few observations, DRT was not analysed day 28 and 42.

Table 2. Pigs taken out of study (PTO, number of pigs) from day 0 to day 14, 28 and 42 and diarrhoea related treatments (DRT, number of pigs) day 0 to 14 of pigs fed diet MiaTraceZn or ZnO.^x

	Day	MiaTraceZn	ZnO	P-value
PTO	14	0.004 ^a	0.008 ^a	0.22
	28	0.008 ^a	0.017 ^a	0.05
	42	0.005 ^a	0.004 ^a	0.49
DRT	14	0.004 ^a	0.003 ^a	0.61

^x Values are least squares means. (n=12).

^a Means within rows without a common superscript differ (P≤0.05).

The values of least significant difference (LSD) indicate that the study was scaled to identify differences in ADG of 0.054 to 0.075 kg per day and differences in FU of 0.063 to 0.065 kg/kg.

The presented data are based on the available statistical analyses from Danish Technological Institute and analyses of diets. On that basis the diets appear similar in content.

Conclusion

In conclusion, no differences between diets were found regarding ADG or FU at day 14, 28, 42 or from day 0 to day 42. Moreover, no difference was found regarding PTO at day 14, 28 or 42, and DRT day 14.

This conclusion is valid when comparing the product MiaTraceZn with the traditional Danish use of zinc oxide, i.e. at different dose levels, sources and possibly also different solubility of zinc ions. Furthermore, all diets contained 0.6 percent of calcium formate and 0.5 pct. of benzoic acid.

Appendix A. Feed analysis^a

	6-10 kg		16-30 kg		10-16 kg	
	MiaTraceZn	ZnO	MiaTraceZn	ZnO	MiaTraceZn/ZnO	Expected
Dry matter, %	89,7	89,8	87,4	87,4	86,5	86,7
Crude protein (N*6.25), %	19,8	19,9	18,2	18,2	18,6	18,8
Crude fat, %	5,0	4,7	3,8	3,7	4,3	4,2
Crude ash, %	5,9	6,1	5,9	5,6	5,8	6,0
Ca, g/kg	11,5	14,2	11,1	9,8	10,6	7,8
P, g/kg	7,0	8,7	6,0	6,3	6,2	6,1
Na, g/kg	2,2	2,6	2,4	2,6	2,5	2,4
Zn, mg/kg	385	2750	198	200	215,0	168,0
Fe, mg/kg	261	355	360	326	181,5	188,0
Cu, mg/kg	165	239	162	173	157,1	162,0
Lys, g/kg	14,1	14,3	12,4	12,5	12,2	12,6
Val, g/kg	9,2	9,4	8,4	8,6	8,3	8,9
Thr, g/kg	8,9	9,4	7,7	7,9	7,8	7,8
Met, g/kg	4,7	4,7	3,7	3,7	3,6	4,0
Cys, g/kg	2,9	2,9	2,7	2,9	3,0	3,0

^a All analysis were done by Eurofins. All parameters are on an "as is" basis. n=1.

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