Danish Pig Production

Daka Porcine Plasma and zinc for weaners

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Abstract
The addition of Daka Porcine Plasma or 2,500 ppm zinc prescribed by the vet significantly increased the pigs' production value. The highest production value (+9%) was obtained by adding both Daka Porcine Plasma and 2,500 ppm zinc to diet 1 (the diet given the first 14 days post-weaning). A significant positive effect was obtained on daily gain and feed intake before intermediate weighing (10 days post-weaning) when blood plasma was added, regardless of whether 2,500 ppm zinc was added. After intermediate weighing, when all the pigs were given the control feed, a significant positive effect was obtained on feed intake when plasma had been added to diet 1. Regardless of the addition of Daka Porcine Plasma, the addition of 2,500 ppm zinc to the feed had a significant positive effect on daily gain, feed conversion and feed intake before intermediate weighing and a significant positive effect on feed intake and feed conversion after intermediate weighing.

The aim of the trial was to investigate the effect of adding 2,500 ppm zinc and 5% Daka Porcine Plasma to diet 1 for pigs with a weaning weight below 9 kg. The trial was designed as a two-factor trial with zinc and blood plasma as the two factors.

Group	1	2	3	4
Diet 1	Control	Control + 2,500 ppm zinc (ZnO)	Daka Porcine Plasma (5%)	Daka Porcine Plasma (5%) + 2,500 ppm zinc (ZnO)
Diet 2	Control	Control	Control	Control

The feed for this trial was produced at a commercial feedstuff factory. Daka requested that the temperature of the feed be below 77°C to ensure that blood plasma was not destroyed by the heat impact during pelleting. The temperature of the finished product before cooling averaged 70.5°C at the first production and 72.5°C at the second production.

There were no differences between the groups in the number of dead and culled pigs. Mortality averaged 0.3% and 5.7% of the pigs were transferred to a hospital pen. During the first ten days post-weaning, significantly more pigs were treated for diarrhoea in the control group than in groups 2-4. There were no differences between groups 2-4 in the number of treatments for diarrhoea.

Overall, the trial demonstrated that the addition of 2,500 ppm zinc and/or 5% Daka Porcine Plasma to diet 1 increased the production value when calculated with the same feed prices. The improved production results obtained when plasma alone was added did not correspond to the excess price of the feed.

Danish Pig Production has asked the Danish Veterinary and Food Administration whether the production method used ensures that the blood product contains no virus. The inquiry is currently being reviewed by the Veterinary and Food Administration.

Background
Plasma is a good protein source for weaners and is in particular used in countries weaning pigs a lower ages than in Denmark. Besides being easily digestible and having a good amino acid composition, it is assumed that the immunoglobulins of blood plasma may help strengthen the immune response of the pigs and thereby make them more robust against disease [1]. A previous trial found that pigs given feed containing blood plasma had a significantly higher daily gain and feed conversion compared with the control

group in the first two weeks post-weaning, which was the period when the product was added to the feed. However, this difference was set off in the following growth period until 30 kg [2], Other trials have confirmed this positive effect on daily gain [3].

One trial demonstrated that the lowest productivity among weaners given feed containing 5% blood plasma was found when the feed was pelleted at a temperature of 77°C. This trial studied pelleting temperatures of 60, 66, 71 and 77°C [3].

Due to the risk of BSE infection, the use of blood plasma in pig feed was banned in the EU as of January 1, 2001. In 2008, it became legal to use blood plasma in pig feed. Blood plasma must not be used for pigs produced for the UK market or for organic pigs. The use of pure blood products requires approval just as is the case with the use of fishmeal. This approval is free and can be obtained from the Plant Directorate.

Previous trials found that the addition of 2,500 ppm zinc increased daily gain and feed conversion and reduced mortality and treatments for diarrhoea in weaners [4],[5].

The aim of the trial was to investigate the effect of adding 2,500 ppm zinc prescribed by the vet and blood plasma, alone and combined, to diet 1 for weaners primarily on productivity and, secondarily, on the pigs' health.

In 2008, the EU lifted the ban on the use of blood products in pig feed. The EU approval includes requirements for process method, and a number of bacteria have been singled out that must be eliminated during the production process. However, it is unclear whether the process also eliminates virus. The risk of introducing virus via blood plasma is therefore unknown, and Danish Pig Production has placed an inquiry with the Danish Veterinary and Food Administration on whether the use of blood plasma in pig feed is risk-free in terms of viruses. The inquiry is currently being reviewed by the Veterinary and Food Administration.

Material and method

The trial was conducted at Experimental Station Grønhøj. The trial comprised pigs from weaning at an average weight of 7.1 kg until they weighed averagely 30.5 kg. There were 42 replicates (pens) of either 5-7 or 13 pigs depending on the pen size in the individual sections. A total of 364 pigs were included in each group. The trial was designed as a two-factor trial.

Table 1. Trial design

Group	1	2	3	4
Diet 1 (first 14 days post-weaning)	Control	Control + 2,500 ppm zinc (ZnO)	Daka Porcine Plasma (5%)	Daka Porcine Plasma (5%) + 2,500 ppm zinc (ZnO)
Diet 2	Control	Control	Control	Control

Feed

Diet 1 for all four groups was formulated to contain the same nutrients. However, it was possible for the diets containing Daka Porcine Plasma to have a slightly higher content of leucine, isoleucine, phenylalanine, tyrosine and valine, which could not be added synthetically. The trial feed for groups 3 and 4 included 5% Daka Porcine Plasma in diet 1. Plasma primarily replaced fishmeal, milk powder and, secondarily, soy protein concentrate (see table 2). Daka Porcine Plasma was included in the diets on the basis of information on the nutrient content provided by Daka Proteins (see Appendix 1), and the digestibility of energy and protein was set to 100. The formulation of the diets was based on the nutrient standards from 2007 [6].

The pigs were given diet 1 the first 14 days post-weaning. From day 10, a gradual transition from diet 1 to diet 2 was initiated. All the pigs in the trial were given diet 2 after the change of diets. The allocation of feed to each pen was recorded. The pigs were weighed when swithcing to diet 2 (intermediate weighing) and upon departure from the weaner facility. Mortality and treatments for diarrhoea were recorded as secondary parameters, which means that the differences had to be large to make definite conclusions on differences between the treatments.

Table 2. Diet 1 – composition of protein ingredients, content of FUgp, crude protein and selected amino acids.

Ingredient	Group 1	Group 2	Group 3	Group 4
Daka Porcine Plasma,%	-	-	5.0	5.0
Zinc oxide, prescribed by the vet, %	-	0.3	-	0.3
Soy protein concentrate, HP 200, %	9.1	9.1	6.5	6.6
Potato protein concentrate, %	4.0	4.0	4.0	4.0
Dehulled soybean meal, %	3.0	3.0	3.0	3.0
Milk powder, %	6.0	6.0	3.0	3.0
Fishmeal reg., %	4.0	4.0	-	-
FUgp/kg	1.19	1.19	1.19	1.19
Crude protein, g stand. dig./FUgp	155	155	155	155
Lysine, g stand. dig./FUgp	11.13	11.13	11.13	11.13
Isoleucine, g stand. dig./FUgp	6.56	6.57	6.46	6.47
Leucine, g stand. dig./FUgp	11.89	11.89	12.46	12.47
Histidine, g stand. dig./FUgp	3.68	3.68	3.89	3.89
Valine, g stand. dig./FUgp	7.65	7.65	8.29	8.30

The feed for this trial was produced at a commercial feedstuff factory. Daka requested that the temperature of the feed be below 77°C to ensure that Daka Porcine Plasma was not destroyed by the heat impact during pelleting. A lower production temperature was obtained by disconnecting the BOA compactor. The temperature was measured in feed collected in a bucket immediately after the pellet press. A thermometer was placed in the feed and the pellets were “packed” around the thermometer to reduce the heat loss as much as possible. The temperature of the finished product before cooling averaged 70.5°C at the first production and 72.5°C at the second production. Zinc oxide was added to the feed before pelleting.

Statistics and calculations

Daily gain and feed conversion for each pen were used for calculating the production value per pig using the same price per analysed FUgp for all groups. The production value thereby expresses the pig’s biological response to the diets as the diets were factored at the same price.

The production value was calculated with the following model: (kg gain × DKK per kg gain) – (analysed FUgp × DKK per FUgp). The value of daily gain was calculated partly on the basis of the average start and finish weight in the entire trial and partly on the basis of the average pig price of the last five years.

The below figures were used in the calculation of the production value:

The average pig price of the last five years (September 1, 2003, to September 1, 2008):

- 7 kg pigs: DKK 191 per pig, +/- DKK 8.75 per kg.

- 30 kg pigs: DKK 333 per pig, - DKK 4.84 (15-30 kg)/+ DKK 4.97 (30-40 kg) per kg.

- Feed price (average of the last five years): diet 1 DKK 2.84/FUgp, diet 2 DKK 1.59/FUgp.

- Various costs: DKK 20.

The current production value was calculated using an average pig prices based on the current prices and also included the current price of the diets. The calculation included the following figures:

Average price of five weeks (weeks 11-15, 2009):

- 7 kg pigs: DKK 174 per pig, +/- DKK 7.65 per kg.

- 30 kg pigs: DKK 303 per pig, +/- DKK 4.56 per kg.

- Feed price (average of prices in April 2009). Diet 1 for group 1: DKK 2.60/FUgp; group 2: DKK 2.79/FUgp; group 3: DKK 3.26/FUgp; group 4: DKK 3.45/FUgp. Diet 2, DKK 1.74/FUgp.

- The price of Daka Porcine Plasma added to diet 2 was set to DKK 25/kg incl. the profit of the feedstuff producer.

The trial was designed as a two-factor trial with zinc and blood plasma as the two factors. The production value was analysed as the primary parameter. Recordings of disease and mortality were included as secondary parameters. The continuous data were described in a generalised linear model with blood plasma and zinc as systematic effects, start weight as co-variate and start day as random effect. The discrete data (mortality and treatment) were described with logistic regression with blood plasma and zinc as explanatory variables. The current production values were not subject to statistics.

The results are shown as an adjusted average for each group. Data were tested for normal distribution, interaction and prevalence of outliers to ensure that no pens deviated significantly from the others. Significant differences are stated at 5 per cent level.

Results and discussion

Feed

The diets were formulated on the basis of the nutrient standards from 2007 [6] before the revision made in 2008 [7]. The analysed and calculated values for content of digestible amino acids and crude protein per FUgp were assessed according to the new standards [7]. Analyses of diet 1 for groups 3 and 4 to which blood plasma was added revealed good correspondence between the calculated and analysed total content of crude protein and amino acids. Analyses of the two control diets with and without zinc revealed a crude protein deficiency compared with the calculated content and compared with the standard for standardised digestible crude protein of approx. 5%. The standardised digestible content of the first four essential amino acids was 6-7% lower than the standard. It is unknown whether the differences between the nutrient content of the diets is caused by an underestimation of the amino acid content of blood plasma or by an overestimation of the amino acid content in milk powder and fishmeal.

Furthermore, the analyses demonstrated that the content of the essential amino acids that were not added (isoleucine, leucine, histidine, phenylalanine, tyrosine and valine) was as expected in the diets containing blood plasma. However, combined with a lower content of the first four essential amino acids in the control feed, the increased content of these amino acids may have played a part in the increased daily gain among the two groups of pigs given diet 1 containing blood plasma.

The calculated and analysed nutrient content corresponded for diet 2 (see Appendix 2).

Health

There were no differences between the groups in mortality and culled pigs. Mortality averaged 0.3%, and 5.7% of the pigs were transferred to a hospital pen. The majority of these were transferred after intermediate weighing. The majority of treatments for diarrhoea were also performed after intermediate weighing – probably due to an outbreak of Lawsonia. In the period before intermediate weighing, the pigs given the control feed were subject to significantly more treatments for diarrhoea than the pigs in the other groups. There were no differences between groups 2-4 (see table 3).

Table 3. Average number of days spent on treatment for diarrhoea

Group	1	2	3	4
	Control	+ 2,500 ppm zinc	Daka Porcine Plasma	Daka Porcine Plasma + 2,500 ppm zinc
Days spent on treatment for diarrhoea before intermediate weighing	0.3a	0.04b	0.04b	0.04b
Days spent on treatment for diarrhoea in the entire trial period	3.5	2.9	2.8	3.0

a,b: Values with different superscripts are significantly different.

Productivity and production value

Table 4 shows the effect of zinc and blood plasma on the productivity and on the production value.

Daka Porcine Plasma

In the entire trial period, a significant positive effect was found on the production value of adding Daka Porcine Plasma to the feed the first 14 days post-weaning. A significant positive effect was obtained on daily gain and feed intake before intermediate weighing when blood plasma was added regardless of whether 2,500 ppm zinc was added. Interaction was found between the groups for feed conversion before intermediate weighing and the results are therefore not shown in table 4. The effect on feed conversion of adding zinc was greater than the effect of adding blood plasma. Generally, the feed conversion was poor in the

control group before intermediate weighing and a very large spread was found compared with the other three groups due to a low daily gain in the control group (see table 5). After intermediate weighing, a significant positive effect was found on the feed intake when blood plasma was added from weaning until intermediate weighing.

A previous trial found an effect on productivity in the first weeks when blood plasma was added to the feed, but for the overall growth period, there were no differences between the groups. When 2.5% blood plasma (three products: two of porcine origin and one of cattle origin) was added to diet 1, the daily gain increased by approx. 30 g a day and the feed conversion improved by 0.2 FUgp per kg in the period before intermediate weighing for pigs weaned at four weeks of age [2]. In this trial, an effect was obtained on production value, daily gain and feed intake for the entire growth period. It is unknown whether this was caused by the fact that the addition of blood plasma was doubled compared with the previous trial.

Zinc
Regardless of the addition of Daka Porcine Plasma, the addition of 2,500 ppm zinc to the feed had a significant positive effect on daily feed intake and daily gain before intermediate weighing and a significant positive effect on feed intake and feed conversion after intermediate weighing. A significant positive on the production value for the entire period was also found due to a higher daily gain (and an increased feed intake) (see table 4).

In a previous trial, the combination of 2,500 ppm zinc oxide and organic acids (1% lactic acid, 1% formic acid and 0.5% benzoic acid) was compared with a control diet. It was concluded that the combination of zinc and acid significantly reduced diarrhoea and mortality and that it increased the production value by 16% compared with the control diet [5]. Another trial, which compared 2,500 ppm zinc with a control diet, demonstrated a significant reduction in mortality and an increase in the production value by 9% [4]. In this trial, the addition of 2,500 ppm zinc to diet 1 did not have such a distinct effect on productivity and health as seen in previous trials.

Daka Porcine Plasma and zinc
The effect of adding Daka Porcine Plasma and 2,500 ppm zinc was additive, ie. if both products were added, the effect on the productivity was close to the sum of the effect of the two products' effect.

Table 4. Effect of Daka Porcine Plasma regardless of addition of 2,500 ppm zinc (groups 3 & 4 vs 1 & 2) and effect of 2,500 ppm zinc regardless of addition of Daka Porcine Plasma (groups 2 & 4 vs 1 & 3) on productivity and production value.

	Daka Porcine Plasma	2,500 ppm zinc	Significant effect	
			Daka Porcine Plasma	2.500 ppm zinc
Before intermediate weighing (weaning to day 10)				
Daily gain, g/day	+44	+85	*	*
Feed intake, FUgp/day	+0.03	+0.05	*	*
Feed conversion, FUgp/kg	-	-	interaction	
After intermediate weighing				
Daily gain, g/day	+12	+9	-	-
Feed intake, FUgp/day	+0.03	+0.03	*	*
Feed conversion, FUgp/kg	0	+0.03	-	*
Total growth period				
Daily gain, g/day	+19	+28	*	*
Feed intake, FUgp/day	+0.03	+0.04	*	*
Feed conversion, FUgp/kg	-0.02	-0.02	-	-
Production value, DKK/pig	+3.0	+3.7	*	*

Table 5 shows the production results and production value calculated with prices of the last 5 years and identical feed prices, and the current production value calculated with current prices and including the current price of the diets.

Table 5. Productivity and production value based on prices of the last 5 years and the current production value.

Group	1	2	3	4
	Control	+ 2,500 ppm zinc	Daka Porcine Plasma	Daka Porcine Plasma + 2,500 ppm zinc
No. pigs	364	364	364	364
Until intermediate weighing (10 days; 7.1-9.3 kg)				
Daily gain, g/day	137	231	190	266
Feed intake, FUgp/day	0.29	0.35	0.33	0.37
Feed conversion, FUgp/kg	2,61	1.74	2.05	1.63
After intermediate weighing (9.3-30.5 kg)				
Daily gain, g/day	546	546	549	566
Feed intake, FUgp/day	0.95	0.97	0.97	1.02
Feed conversion, FUgp/kg	1.69	1.72	1.70	1.72
The entire period (7.1-30.5 kg)				
Daily gain, g/day	454	477	468	501
Feed intake, FUgp/day	0.80	0.83	0.82	0.87
Feed conversion, FUgp/kg	1.68	1.66	1.66	1.64
Production value, DKK per pig	71.8	74.6	73.9	78.6
Index	100	104	103	109
Production value, DKK per pig incl. the price plasma of DKK 25/kg	54.8	56.5	53.6	56.0
Index	100	103	98	102

With a price of blood plasma of DKK 25/kg, a 2% increase in gross margin could be achieved for the group in which both zinc and blood plasma were added compared with the control group. Compared with the control group, the addition of zinc increased the gross margin by 3% and the addition of Daka Porcine Plasma resulted in a gross margin that is 2% below that of the control group (see table 5). The positive effect of plasma on the pigs' productivity did therefore not fully pay for the product.

Conclusion

The addition of Daka Porcine Plasma or 2,500 ppm zinc prescribed by the vet significantly increased the production value. The highest production value was obtained by adding both Daka Porcine Plasma and 2,500 zinc to diet 1. A significant positive effect was obtained on daily gain and feed intake before intermediate weighing when blood plasma was added regardless of whether 2,500 ppm zinc was added. After intermediate weighing, a significant positive effect was obtained on feed intake when plasma had been added to diet 1. Regardless of the addition of Daka Porcine Plasma, the addition to the feed of 2,500 ppm zinc had a significant positive effect on daily gain and feed intake before intermediate weighing and a significant positive effect on feed intake and feed conversion after intermediate weighing. The positive effect of plasma on the pigs' productivity did not fully pay for the excess price of the feed as Daka Porcine Plasma cost DKK 25 per kg.

There were no differences between the groups in mortality and culled pigs. Mortality averaged 0.3%, and 5.7% of the pigs were transferred to a hospital pen. The addition of blood plasma, zinc or both blood plasma and zinc to the feed significantly reduced the number of treatments for diarrhoea before intermedi-

ate weighing compared with the control group. The majority of treatments for diarrhoea were administered after intermediate weighing due to an outbreak of Lawsonia.

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Appendix 1

Nutrient content in Daka Porcine Plasma, based on data sheet from Daka (crude protein and amino acids, four analyses).

Nutrient	Typical values	Guaranteed values
FUgp per 100 kg	123	
EFOS pig	99.8	
Protein, %	82	Min. 80
Fat, %	2.5	Min. 0.1
Water, %	6	Max. 8
Ashes, %	6	Max. 12
Lysine, g/100 g protein	8.7	
Methionine, g/100 g protein	0.9	
Cystine, g/100 g protein	3.6	
Threonine, g/100 g protein	6.1	
Tryptophan, g/100 g protein	1.9	
Leucine, g/100 g protein	9.7	
Isoleucine, g/100 g protein	4.0	
Histidine, g/100 g protein	3.3	
Phenylalanine, g/100 g protein	5.7	
Valine, g/100 g protein	6.6	
Calcium, %	0.06	
Total-phosphorus, %	0.09	
Zinc, mg/kg	13	

Ingredients in diet 1, %.

Ingredient	Group 1	Group 2	Group 3	Group 4
Daka Porcine Plasma	-	-	5.00	5.00
Soy protein concentrate, HP 200	8.86	8.96	6.51	6.60
Potato protein concentrate	4.00	4.00	4.00	4.00
Dehulled soybean meal	3.00	3.00	3.00	3.00
Milk powder babyfeed 18/18	6.00	6.00	3.00	3.00
Fishmeal, reg.	4.00	4.00	-	-
Wheat	46.72	46.17	50.05	49.49
Barley	20.00	20.00	20.00	20.00
Feed lime	1.04	1.04	1.31	1.30
Mono calcium phosphate	1.11	1.11	1.60	1.61
Salt	0.20	0.20	0.11	0.11
Lysine (98.5 %)	0.41	0.40	0.33	0.33

DL-Methionine (100 %)	0.09	0.09	0.15	0.15
Threonine (98.5 %)	0.11	0.11	0.03	0.03
Tryptophan (15 %)	0.30	0.30	0.11	0.11
Vitamin/mineral mix w. beta xylanase	0.35	0.35	0.35	0.35
Zinc oxide (pharma)	-	0.30	-	0.30
Vegetable fat Scanfedt S	2.75	2.90	3.39	3.55
Molasses	1.00	1.00	1.00	1.00
Porzyme	0.06	0.06	0.06	0.06
Phytase natuphos 100 %, FTU/kg	525	525	525	525
Beta xylanase, units/kg	4800	4800	4800	4800

Ingredients in diet 2, %.

Diet 2, all four groups	
Wheat	52.87
Barley	15.00
Soybean meal, dehulled	19.29
Vegetable fat Scanfedt S	3.00
Potato protein concentrate	3.00
Feed lime	1.82
Mono calcium phosphate	1.20
Salt	0.40
L-lysine 98.5 %	0.54
DL-Methionine 100 %	0.15
Threonine 98.5 %	0.16
Tryptophan 15 %	0.31
Vitamin/mineral mix w. beta xylanase and phytase	0.26
Molasses, beet	2.00
Phytase natuphos 100 %, FTU/kg	520
Beta xylanase, units/kg	4,992

Appendix 2

Calculated and analysed nutrient content, diet 1.

Group	1. Control		2. + 2,500 ppm zinc		3. Daka Porcine Plasma		4. Daka Porcine Plasma + 2,500 ppm zinc	
	Calcula-ted	Analy-sed [1]	Calcula-ted	Analy-sed [1]	Calcula-ted	Analy-sed [1]	Calcula-ted	Analy-sed [1]
FUgp per 100 kg	119	119	119	120	119	119	119	120
Crude protein, %	20.9	19,9	20.9	19.9	20.6	21.4	20.6	21.0
Lysine, g/kg	14.6	13.3	14.6	13.4	14.5	14.3	14.4	14.3
Methionine, g/kg	4.6	4.2	4.6	4.2	4.6	4.4	4.6	4.5
Meth.+cyst., g/kg	8.0	7.5	8.0	7.5	8.8	9.0	8.8	8.9
Threonine, g/ kg	9.2	8.8	9.2	8.6	9.1	9.6	9.1	9.4
Isoleucine, g/kg	8.8	8.2	8.8	8.1	8.6	8.9	8.6	8.7
Leucine, g/kg	15.9	14.8	15.9	14.8	16.6	17.1	16.6	16.5
Histidine, g/kg	5.0	4.7	5.0	4.7	5.2	5.2	5.2	5.2
Phenylalanine, g/kg	10.1	9.5	10.1	9.5	10.8	10.9	10.8	10.8
Phenyl.+Tyrosine, g/kg	17.7	16.2	17.7	16.2	19.3	19.1	19.3	18.5
Valine, g/kg	10.4	9.7	10.4	9.9	11.3	11.6	11.3	11.2
Calcium, g/kg[2]	8.5	9.4	8.5	8.5	8.5	8.6	8.5	8.8
Total-phosphorus, g/kg[2]	7.0	7.2	7.0	6.8	7.0	7.1	7.0	7.3
Zinc, mg/kg[2]	170	206	2,387	2,440	167	172	2,387	2,547

1) The analysed content is based on 6 analyses of FUgp and crude protein and 5 analyses of amino acids.

2) The analysed content is based on 3 analyses.

Calculated and analysed nutrient content, diet 2.

Group	Control	
	Calculated	**Analysed [1]**
FUgp per 100 kg	114	114
Crude protein, %	19.8	20.4
Lysine, g/kg	14.0	14.8
Methionine, g/kg	4.4	4.5
Meth.+cyst., g/kg	7.8	8.2
Threonine, g/ kg	8.7	9.4
Isoleucine, g/kg	8.1	8.6
Leucine, g/kg	14.4	15.4
Histidine, g/kg	4.7	4.8
Phenylalanine, g/kg	9.5	9.9
Phenyl.+Tyrosine, g/kg	16.5	17.1
Valine, g/kg	9.3	10.2
Calcium, g/kg[2]	10.1	12.1
Total-phosphorus, g/kg[2]	6.6	8.0
Zinc, g/kg[2]	130	150

1) The analysed content is based on 8 analyses of FUgp and crude protein and 7 analyses of amino acids.

2) The analysed content is based on 2 analyses of pooled samples from the deliveries.