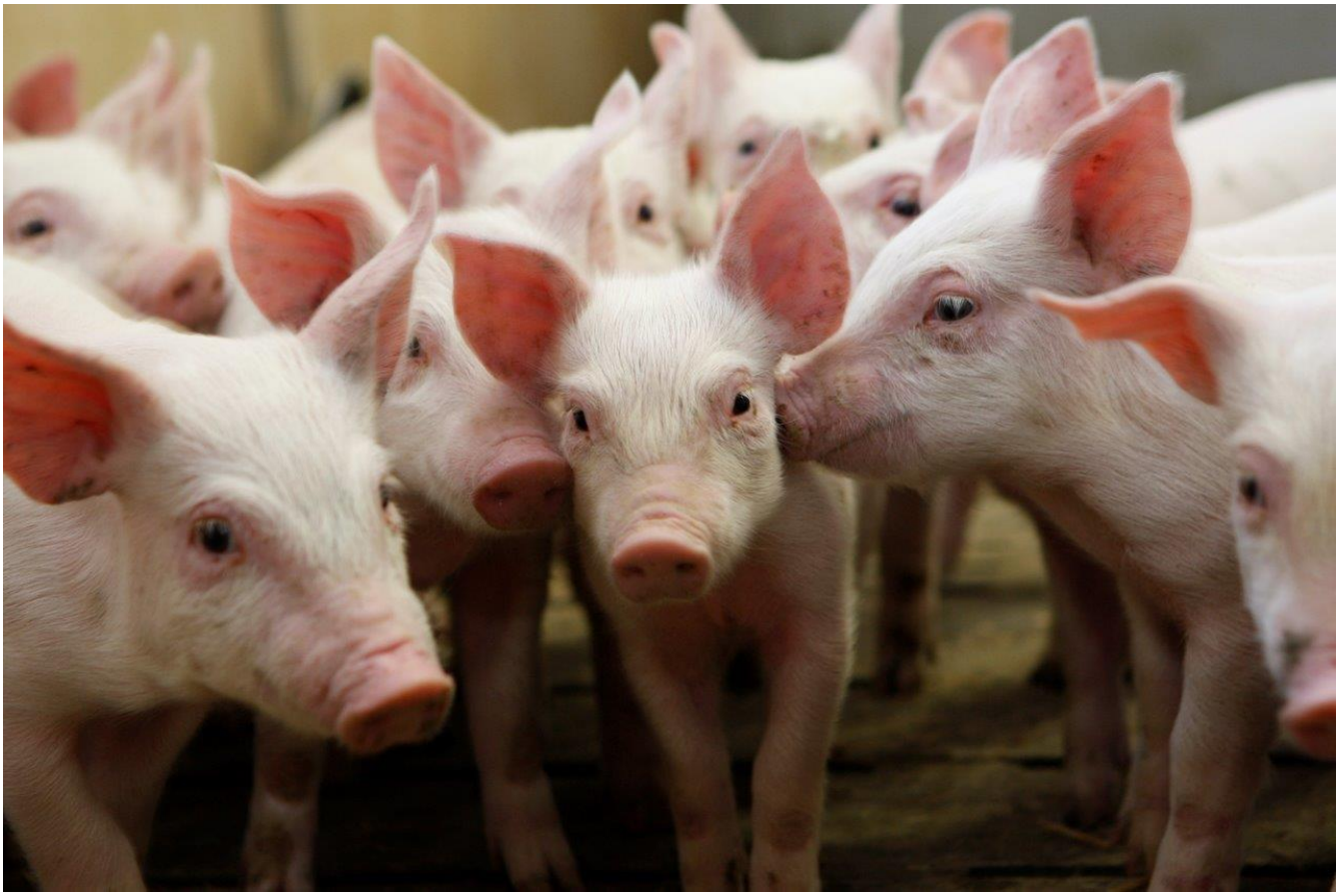
Skjoldborg test station

TestGris***

SvineRådgivningen

Birk Centerpark 24, 7400 Herning
www.svineraadgivningen.dk
CVR: 25399781



Comparison of four diets containing either fish meal and blood plasma, AX3 Digest, AX3 Advanced or AX3 Gastric as the main protein source for small piglets after weaning.

Presentation of two trials (Study 1 and Study 2)

The trials were conducted on request from Triple A

Authors: Dorthe Carlson and Niels Ove Nielsen

June 2021

Indhold

Summary

In this report two studies are presented.

The objectives of the studies were as follows:

1. compare a diet with AX3 Digest as the main protein source with a Control diet containing fish meal and plasma as the main protein source (study 1).
2. compare two diets containing either AX3 Gastric or AX3 Advanced as the main protein source (study 2).

The 4 diets are named Control, Digest, Gastric and Advanced in the following

Both trials were performed on small, weaned piglets (3.8 and 3.9 kg, respectively) and due to their low weight, these piglets were kept in “extra care” weaning rooms (BabyPig rooms) for the first two weeks after weaning. The effect of diet on production and health in the BabyPig rooms were investigated. Hereafter they were moved to standard weaning rooms where their weight was followed for another four weeks.

The results in study 1 showed that the ADG and FI for the first 2 weeks after weaning was significantly affected ($P<0.001$) by dietary treatment. The ADG was 199 and 163 g/day in the Control and Digest group, respectively and the FI was 252 and 213 g/day in the Control and Digest group, respectively. The FCR (1.27 and 1.29, respectively) was not significantly affected by diet ($P=0.36$). The differences in weight gain between the two groups continued the following four weeks where the pigs were housed in standard weaning rooms and fed the same diet.

The results in study 2 showed that the ADG for the first 2 weeks after weaning was similar ($P=0.49$) for the two dietary groups, with ADG of 197 and 200 g/day in the Gastric and Advanced group, respectively. However, the FI and the FCR was significantly affected by dietary treatment. The FI was 242 and 213 g/day in the Gastric and Advanced group, respectively ($P=0.016$) and the FCR was 1.24 and 1.06, in the Gastric and Advanced group, respectively ($P=0.003$). There were no differences in weight gain between the two dietary groups the following four weeks where the pigs were housed in standard weaning rooms and fed the same diet ($P>0.5$).

From study 1 it is concluded that the Digest diet resulted in reduced performance in terms of ADG and FI in very small piglets for the first two weeks after weaning compared with a control diet containing fish meal and porcine plasma.The FCR was similar between the two diets and the differences in ADG is therefore considered as a consequence of a lower FI. The lower feed intake may be ascribed to differences in palability and/or differences in water binding capacity (filling factor in the stomach) between the two diets. The disadvantage of the Digest group in growth continued for the rest of the experimental period in the weaning rooms where all animals received the same type of diet for 4 weeks.

From study 2 it is concluded that the pigs fed the Gastric and Advanced diet performed similar in terms of weight gain. No differences were observed on ADG in the baby pig rooms, where the piglets were fed the two diets or during the following 4 weeks in the standad weaning rooms. However, pigs fed the Advanced diet consumed less feed than pigs fed the Gastric diet resulting in a very efficient FCR for the Advanced diet.

Health parameters such as medical use, disease and mortality did not appear to be affected by the dietary treatments in any of the two studies.

Introduction

This report presents two different studies conducted on request from Triple A in the period May 18 to September 01 (2020) and in the period August 17 to November 09 (2020) at Skjoldborg test station. In the following the studies will be referred to as study 1 and study 2, respectively.

The **objective of study 1** was to compare a diet with AX3 Digest as the main protein source with a Control diet containing fish meal and plasma as the main protein sources. The two diets are designated **Digest** and **Control** in this report.

The **objective of study 2** was to compare two diets containing either AX3 Gastric or AX3 Advanced as the main protein source. The two diets are designated **Gastric** and **Advanced** in this report.

Both trials were performed on small, weaned piglets and due to their low body weight, these piglets were kept in "extra care" weaning rooms for the first two weeks after weaning before being transferred to the standard weaning rooms. The "extra care" weaning rooms and the period where piglets were housed in these rooms are in the following called "BabyPig rooms" and "BabyPig period", respectively. The effect of diets on production and health in the BabyPig rooms were investigated. Hereafter they were moved to standard weaning rooms where they were followed for another four weeks.

The test was designed to test the effect of diet on average daily gain (ADG), feed intake (FI) and Feed Conversion Ratio (FCR; kg feed per kg gain) in small, weaned piglets under practical pig production conditions.

Materials and methods

The procedure used in the two trials was very similar. In the following, it will only be mentioned when there were differences, if nothing is mentioned it means that the same procedure was used in both trials.

Animals, diets and protocol

The test station is a conventional (Health status: Blue Spf + myc + AP6 +AP12+Vac.) integrated production, which runs weekly operation in the sow unit. This means, that every week, sows farrow and piglets are weaned.

Study 1 included a total of 1078 pigs and study 2 included 1139 pigs. The pigs were Danbred crossbred (Landrace/Yorkshire x Duroc) female and castrated male piglets with approximately the same number of both genders.

The piglets were weaned at 25 ± 3 days of age. Housing conditions for piglets complied fully with EU and Danish legislation.

The test period was initiated at the day of weaning and finalised at day 42 after weaning.

All rooms used in test were cleaned and disinfected before insertion of piglets.

BabyPig period

Four similar rooms of 4 pens where used. The piglets were group housed in pens and allocated randomly according to gender. Around 26 piglets were inserted in every pen after weaning. Pens are designed as 2-climate pens with an insulated piglet nest and a slatted activity area.

At the day of weaning, all piglets were distributed in the pens according to size (Small or Large). The average body weight of piglets in the pens was in the range of 3.2 to 4.7 kg (study 1) and 3.0 to 4.8 kg (study 2). The pens were allocated to one of two diets i.e., two dry feed dispensers for each diet per room.

The average initial body weight of the piglets was 3.8 (± 0.5) and 3.8 (±0.5) kg for the Control and the Digest diets, respectively (study 1). The average initial body weight was 3.9 (± 0.5) and 3.9 (±0.5) kg for the Gastric and Advanced group, respectively (study 2).

Study 1 included 40 pens (20 pens per dietary treatment) and the total number of pigs was 539 and 539 in the Control and the Digest group, respectively.

In study 2, one pen from the Advanced group was deleted from the data set as this pen by mistake was fed the Gastric diet for a few days in the BabyPig period. Hence, in total the test included 43 pens (22 pens in the Gastric group and 21 pens in the Advanced group) and the total number of pigs was 582 and 557 in the Gastric group and the Advanced group, respectively.

The diets fed in the baby pig rooms were formulated and produced by Nutrimin (Ans By, Denmark). The composition of the diets is given in Table 1 and Table 2 in Appendix B. None of the diets contained pharmacological doses of ZnO. All diets were made as meal feed and delivered in 25 kg bags on the test station. In Table 3 (Appendix B), the main differences in terms of particle size, crude fiber and crude protein content between the three protein sources studied (Digest, Gastric and Advanced) is presented.

Bags containing the Control diet were marked with a red label and bags containing Digest diets were marked with a blue label (study 1). Bags containing the Gastric diet were marked with a blue label and bags containing the Advanced diet were marked with a yellow label (study 2). The compositions of the test diets were unknown for the personnel at the test station.

In each pen two different feeding troughs (vertical and horizontal) were used for manual feeding of dry feed and manual feeding of wet feed (dry feed + water), respectively (see picture in Appendix A).

The pigs were fed *ad libitum* with dry feed in the vertical feeders. The wet feed (dry feed mixed and soaked with water) was fed 4 times each day during the working hours (evenly distributed between 07:00 and 15:00 hours) and one time in the evening (between 20:00-23:00 hours). The pigs had permanent access to fresh water from a nipple drinker located in the pen.

Samples of the diets used in test were analysed for different nutrients (e.g. protein, fat, ash, amino acids and minerals) at Eurofins laboratory (Vejen, Denmark). The diets were also analysed for pH, Water Binding Capacity (WBC) and for Acid Binding Capacity (ABC-4) at Triple A's laboratory (Hornsyld, Denmark).

Registration in the BabyPig period

The piglets were weighed when allocated to the pens at the day of insertion and when the BabyPig period was finalised at day 14. All pigs in one pen were weighed as a unit. Whenever a pig was taken out of the study due to death or disease the date and weight was recorded.

Every time a new 25 kg bag was opened it was noted for which pen it was used. Each bag was dedicated for only one pen.

The standard procedure was followed in respect of registration of any medical treatment (including date and treatment days) against diarrhoea and other infections. Furthermore, whenever a pig was taken out of the study due to death or disease the date and the weight of the piglet was recorded.

Weaning period

At day 14 after weaning the piglets were moved into the standard weaning rooms. Eight similar rooms of 12 double-pens where used. Of the 12 double-pens per room only 2 (4 single pens) were used for this trial. The double-pens were traditionally structured sharing two dry feed dispensers integrated in the mid-pen wall partitioning the double-pen in two pens (photo of pen design in Appendix A).

In the weaning rooms the piglets were placed in pens together with their pen mates from the baby pig room.

In the weaning rooms all pigs were fed the same standard diet produced on farm (Appendix C1, Study 1 and Appendix C2, study 2).

As study 2 was made in autumn 2020 the diets changed after harvest. Hence two diets are presented in Appendix C2 (Harvest 2019 and Harvest 2020). The diets shifted from “Harvest 2019” to “Harvest 2020” in October 2020, when about half of the test was finalised. The shift between the three feeding phases was gradually according to the weight of the piglets. The gradually shift between the phases was automatically controlled (Agrisys, Denmark).

Registration in the weaning rooms

The piglets were weighed at the day of insertion, after 15 days and after 29 days. All pigs in one pen were weighed as a unit.

Whenever a pig was taken out of the study due to death or disease the weight was recorded. Any medical treatment (including treatment days) against diarrhoea and infections was registered.

Calculations and statistics

Average daily gain per piglet was calculated as the difference in weight at insertion (day 1) and exit of the BabyPig room (day 14), For the final four weeks the average daily gain was calculated as the difference in the weight at insertion in the weaning room (day 14) and weight at day 29 and as the difference between weight at day 29 and at day 43 (exit of test). The body weight used was an average of the piglets in each pen.

In the BabyPig rooms Feed Intake (FI) per pen was calculated as the total amount of feed used for this pen (number of bags x 25 kg) minus the amount of feed (kg) in the last bag opened and minus

any feed residues in the dry feed dispenser. The wet feed troughs were always emptied by the pigs before the test was finalised.

Feed intake was not registered in the standard weaning rooms.

In all calculations, data were adjusted for number and weight of piglets taken out of trial.

Pigs taken out of study (PTO) were calculated as percentage of the initial number of piglets.

All statistical analyses were done in cooperation with the Danish Technological Institute, Department of field trials, technology and analysis, Aarhus, Denmark. Animal performance data were statistically analysed by the GLMM procedure of R (R Core Team, 2014). ADG, FI and FCR in the BabyPig rooms and ADG in the weaning rooms were analysed in a Gaussion mixed effect model including initial body weight at day 0, weekly batch number and diet (Study 1: Control and Digest, Study 2: Gastric and Advanced). “Weekly batch number” was included in the model as a random parameter and “diet” was included in the model as a fixed parameter. Statistical significance was accepted at $P<0.05$.

The trials were mainly designed to analyse performance data and hence health data in terms of PTO and medical treatments are only reported in a descriptive way (no statistical analyses were performed on these data).

Results and comments

In Appendix D the results from Chemical analyses of the diets are presented together with the expected level of each nutrient (Table 1 and Table 2). The analysed content of the different nutrients confirms that the two diets were similar in terms of nutrient content in both studies. The discrepancies between the expected content and the analysed content can be ascribed to the analytical variation for all analysed nutrients.

In Table 3 (Appendix D), the analysed pH, ABC-4 and WBC results are presented. It shows as expected a relative high pH and ABC-4 value in the control diet containing fish meal and 5% plasma compared to the control diet (study 1). In study 2, the pH and ABC-4 values were very similar for the two diets but lower compared to the diets in study 1. This difference is most likely to be an effect of the inclusion of citric acid in the diets in study 2. The WBC of the 4 diets was 320, 350, 360 and 370 g/100g in the Control, Gastric, Advanced and Digest diets, respectively.

Study 1

The results showed that the ADG for the first 2 weeks after weaning was significantly affected ($P<0.001$) by the dietary treatments. The ADG was 199 g/day and 163 g/day in the Control and Digest group, respectively (Table 1).

The results suggest that the difference in weight gain is mainly ascribed to differences in FI ($P<0.001$) as the FCR did not differ between the dietary groups ($P=0.36$). The FI was 252 and 213 g/day during the first 2 weeks, in the Control and Digest group, respectively. The FCR was 1.27 and 1.29 in the Control and Digest group, respectively (Table 1).

The lower FI in the Digest group may be ascribed to differences in palatability between the two diets or it may be a consequence of the higher WBC of the Digest diets. A higher WBC may result in a higher filling factor in the stomach resulting in increased satiety feeling in the piglets.

The lead in weight gain in the control group compared to the Digest group continued in the following weeks in the weaning rooms even though all piglets received the same diet in this period. From day 15-29 the ADG was 435 and 418 g/day in the Control and the AX3 Digest group, respectively (P=0.001) and from day 30-43 the ADG was 645 and 611 g/day in the Control and AX-Digest group, respectively (P=0.006) (Table 1).

For the total test period the ADG was 426 and 398 g/day in the Control and AX3 Digest group, respectively (P<0.001) which led to a final BW 1.2 kg higher in the Control group compared with the AX3 Digest group (22.3 vs 21.1 kg) (Table 1).

The LSD values (Table 1) indicates that the test was scaled to identify differences of 10 g/d, 11 g/d and 0.06 kg feed/kg gain in ADG, FI and FCR, respectively in the BabyPig period and differences in ADG of 11 and 26 g/day in the weaning period.

Table 1. Initial Body Weight (BW) and Final BW, Average daily gain (ADG), feed intake (FI) and feed converstion ratio (FCR) in the BabyPig period (4-6 kg) and ADG in the weaning period (day 15-43) of pigs fed the two experimental diets in the BabyPig period in Study 1.

		Diet			
		Control	**AX3 Digest**	**P-value**	**LSD**
Body Weight:					
Initial BW, kg[y]	Day 1	3.8	3.8		
Final BW, kg[y]	Day 43	22.3	21.1		
BabyPig room:					
ADG, g/d[x]	Day 1-14	199[a]	163[b]	<0.001	10
FI, g/d[x]	Day 1-14	252[a]	213[b]	<0.001	11
FCR, kg feed/kg gain[x]	Day 1-14	1.27	1.29	0.36	0.06
Weaning room:					
ADG, g/d[x]	Day 15-29	435	418	0.001	11
ADG, g/d[x]	Day 30-43	645	611	0.006	26
Total test period:					
ADG, g/d[x]	Day 1-43	426	398	<0.001	11

[y] Values are means (n=20), [x] Values are LS-means (n=20).
[ab] LS-Means within rows without a common superscript differ (P<0.05).

Study 2
The results showed that the ADG for the first 2 weeks after weaning was not significantly affected (P=0.49) by the dietary treatments. The ADG was 197 g/day and 200 g/day in the Gastric and Advanced group, respectively (Table 2).

The trial revealed significant differences in FI (P=0.016) the first 2 weeks after weaning. The FI was 242 and 213 g/day in the Gastric and Advanced group, respectively.

Consequently, the FCR was significantly (P=0.003) different between the two dietary groups with values of 1.24 and 1.06 in the Gastric and Advanced group, respectively (Table 1).

From day 15-29 the ADG was 388 and 389 g/day in the Gastric and the Advanced group, respectively (P=0.81) and from day 30-43 the ADG was 701 and 695 g/day in the Gastric and Advanced group, respectively (P=0.60) (Table 1).

For the total test period the ADG was 429 and 426 g/day in the Gastric and Advanced group, respectively (P=0.51) which led to similar BW at day 43 (22.3 and 22.2 kg in the Gastric and Advanced group, respectively) (Table 1).

The LSD values (Table 1) indicates that the test was scaled to identify differences of 11 g/d, 24 g/d and 0.12 kg feed/kg gain in ADG, FI and FCR, respectively in the BabyPig period and differences in ADG of 13 and 22 g/day in the weaning period.

Table 2. Initial Body Weight (BW) and Final BW, Average daily gain (ADG), feed intake (FI) and feed converstion ratio (FCR) in the BabyPig period (4-6 kg) and ADG in the weaning period (day 15-43) of pigs fed the two experimental diets in the BabyPig period in study 2.

		Diet			
		Gastric	**Advanced**	**P-value**	**LSD**
Body weight:					
Initial BW, kg[y]	Day 1	3.9	3.9		
Final BW, kg[y]	Day 43	22.3	22.2		
BabyPig room:					
ADG, g/d[x]	Day 1-14	197	200	0.49	11
FI, g/d[x]	Day 1-14	242[a]	213[b]	0.016	24
FCR, kg feed/kg gain[x]	Day 1-14	1.24[a]	1.06[b]	0.003	0.12
Weaning room:					
ADG, g/d[x]	Day 15-29	388	389	0.81	13
ADG, g/d[x]	Day 30-43	701	695	0.60	22
Total test period:					
ADG, g/d[x]	Day 1-43	429	426	0.51	11

[y] Values are means (n=22 “Gastric” and n=21 “advanced”)), [x] Values are LS-means (n=20). [ab] LS-Means within rows without a common superscript differ (P<0.05).

In Appendix E the number of pigs taken out (PTO) of the trials is presented. The reasons, for taking the pigs out, included different kinds of veterinary observations e.g. diarrhoea, hernia, arthirits etc.

PTO in study 1 is presented in Table 1, Table 2 and Table 3 and PTO in study 2 is presented in Table 4, Table 5 and Table 6. The data does not imply a difference between the PTO in the control and Digest group (study 1) or between the Gastric and Advanced group (study 2). The mortality for the whole test period was 2.0 and 1.1 % in the Control and Digest group, respectively (study 1) and the mortality for the whole test period was 0.69 and 1.44 % in the Gastric and Advanced group, respectively (study 2).

Comparisons across the two studies
When comparing the results from the two studies (Table 1 and Table 2) it is noticed that the ADG in the baby pig period was similar between the Control, Gastric and Advanced group (approximately 200 g/d) and lower in the Digest group (163 g/d). While the FI was highest in the Control and Gastric group (242-252 g/d) and lowest in the Digest and Advanced group (213 g/d). Consequently, the FCR was similar (1.24-1.29 kg/kg) in the Control, Digest and Gastric group and considerably better in the Advanced group (1.06 kg/kg).

The exact reason for the differences between the diets is difficult to fully explain from data in these studies. However, it may be speculated that the WBC had an influence on FI as the diets with the highest WBC (360-370 g/100 g) resulted in the lowest feed intake (maybe due to a higher filling factor in the stomach). Furthermore, it may be speculated that the more efficient FCR of the Advanced diet compared to the other 3 diets was a consequence of a lower particle size of the Advanced protein source compared to the particle size of the Digest and Gastric protein sources. This in combination with a low pH and a low ABC-4 value of the advanced diet may have caused a higher digestibility of the protein resulting in improved FCR. However, more studies are required to finally conclude on these mechanisms.

Economical Considerations

When the piglets left the Baby Pig rooms 2 weeks after weaning they had gained 2.3 kg in the Digest group and 2.8 kg in Control, Gastric and Advanced group, respectively. The marked price was EUR 0.80 (DKK 5.96) per kg live weight (German marked price) (Table 3).

The marked price of the four diets used in these trials were at the time of formulation EUR 96.5 (DKK 719), EUR 83.4 (DKK 621), EUR 91.3 (DKK 680) and EUR 91.8 (DKK 684) per 100 kg for the Control, Digest, Gastric and Advanced, respectively. The total feed intake during the BabyPig period was 3.53, 2.98, 3.39 and 2.98 kg in the Control, Digest, Gastric and Advanced group, respectively. Consequently, the feed costs per pig in the BabyPig period was EUR 3.41, 2.49, 3.10 and 2.74 in the Control, Digest, Gastric and Advanced group, respectively.

Table 3. Economical balance in the baby pig period, all values are “per pig”

	Control	Digest	Gastric	Advanced
Value of weigth gain	2.8 kg x 0.8 € = 2.24 €	2,3 kg x 0.8 € = 1.84 €	2.8 kg x 0.8 € = 2.24 €	2.8 kg x 0.8 € = 2.24 €
Value of feed intake	3.53 kg x 0.965 €/kg = 3.41 €	2.98 kg x 0.834 €/kg =2.49 €	3.39 kg x 0.913 €/kg =3.10 €	2.98 kg x 0.918 €/kg= 2.74 €
Net cost	-1.17 €	-0.65 €	-0.86 €	-0.50 €

Summing up the economical balance the data indicates that the net cost per pig was reduced for all 3 diets containing AX3 products compared with the Control diet. However, it should be noted that these calculations only give a snapshot and will change with fluctuations on the feed market.

Conclusion

Study 1
It is concluded that the Digest diet resulted in reduced performance in terms of ADG and FI in very small piglets for the first two weeks after weaning compared with a control diet containing fish meal and porcine plasma.The FCR was similar between the two diets and the differences in ADG is therefore considered as a consequence of a lower FI. The lower feed intake may be ascribed to differences in palability and/or differences in water binding capacity (filling factor in the stomach) between the two diets.

The disadvantage of the Digest group in growth continued for the rest of the experimental period in the weaning rooms where all animals received the same type of diet for 4 weeks.

Study 2
It is concluded that the pigs fed the Gastric and Advanced diet performed similar in terms of weight gain. No differences were observed on ADG in the baby pig rooms, where the piglets were fed the two diets or during the following 4 weeks in the standad weaning rooms.
However, pigs fed the Advanced diet consumed less feed than pigs fed the Gastric diet resulting in a very efficient FCR for the Advanced diet.

Health parameters such as medical use, disease and mortality did not appear to be affected by the dietary treatments in any of the two studies.

Appendix A. Photo of the pens used for test

Pens in a BabyPig room

Pens in a standard weaning room

Appendix B. Feed ingredients of diets used the first 2 weeks after weaning.

Table 1. Feed ingredients of the two diets used in the baby rooms for the first two weeks after weaning (4-6 kg) – study 1.

	Control, %	**Digest, %**
Wheat	46.1	46.7
Barley	10.0	10.0
Milk powders	20.0	20.0
Soy protein concentrate (Control or AX3 Digest)	7.3	13.5
Plasma	5.0	-
Fish meal	3.0	-
Potato protein concentrate	2.5	2.5
Minerals, vitamins, amino acids etc.	3,9	5.1
Fat, spray dried	1.0	1.0
Calcium formiate	1.2	1.2

Table 2. Feed ingredients of the two diets used in the baby rooms for the first two weeks after weaning (4-6 kg) – study 2.

	Gastric, %	**Advanced, %**
Wheat, Heat treated	44.4	46.6
Barley	10.0	10.0
Milk powders	20.0	20.0
Soy protein concentrate (AX3 Gastric or AX3 Advanced)	12.2	10.5
Plasma	2,5	2.5
Potato protein concentrate	2.5	2.5
Minerals, vitamins, amino acids etc.	4.9	4.9
Fat	1.5	1.0
Calcium formiate	1.2	1.2
Citric acid	0.8	0.8

Table 3. Physical and chemical characteristics of the three different protein sources (Information provided by Triple A).

	Digest	**Gastric**	**Advanced**
Particle size (<100µm), %	33	23	60
Crude Fiber, %	5.0	7.0	3.6
Crude Protein, %	68	64	72

Appendix C1. Diets used in the standard weaning rooms (study 1)

Table 1. Feed ingredients (%) in the starter diet 6-9 kg.

	%
Wheat	62.5
ZnO premix	3.0
Fish Meal	5.0
Soy oil	2.3
Alpha Soy	11.8
Premix[1]	15.4[1]

[1]Containing potato and milk proteins, vitamins, minerals, amino acids, phytase, antioxidants, xylanase and organic acids

Table 2. Feed ingredients (%) in the transition diet (9-15 kg).

	%
Wheat	60.5
Barley	10.0
Soybean meal	10.0
Soy oil	1.5
Alpha Soy	11.2
Premix[1]	6.8

[1]Containing vitamins, minerals, amino acids, phytase, antioxidants and organic acids

Table 2. Feed ingredients (%) in the final diet (15-30 kg).

	%
Wheat	47.9
Barley	20.0
Soybean meal	26.0
Soy oil	1.2
Premix[1]	4.9

[1]Containing vitamins, minerals, amino acids, phytase, antioxidants and organic acids

Appendix C2. Diets used in the standard weaning rooms (study 2).

Table 1. Feed ingredients (%) in the starter diet 6-9 kg.

	Harvest 2019	Harvest 2020
	%	%
Wheat	66.5	65
Fish Meal	5.7	6.5
Soy oil	2.4	2.4
Premix[1]	25.4[1]	26.1

[1]Containing Soy-Bean Concentrate, potato protein and milk proteins, vitamins, minerals, amino acids, phytase, antioxidants, xylanase and organic acids

Table 2. Feed ingredients (%) in the transition diet (9-15 kg).

	Harvest 2019	Harvest 2020
	%	%
Wheat	60.5	61.1
Barley	10.0	10.0
Soybean meal	10.0	10.0
Soy oil	1.5	1.5
Alpha Soy	11.2	10.1
Premix[1]	6.8	7.3

[1]Containing vitamins, minerals, amino acids, phytase, antioxidants and organic acids

Table 2. Feed ingredients (%) in the final diet (15-30 kg).

	Harvest 2019	Harvest 2020
	%	%
Wheat	47.9	41.3
Barley	20.0	25
Soybean meal	26.0	26.9
Soy oil	1.2	2.4
Premix[1]	4.9	5.1

[1]Containing vitamins, minerals, amino acids, phytase, antioxidants and organic acids

Appendix D. Expected (E) and Analysed (A) content of nutrients in the diets.

Table 1. Expected (*E*)[1] and Analysed (**A**)[2] content of nutrients in the experimental diets (study 1).

	Control		Digest	
	E	**A**	*E*	**A**
Dry matter, %	*92.9*		*92,9*	
EFOS, %		**92.6**		**92.3**
Protein, %	*20.3*	**20.1**	*20.0*	**20.0**
Fat, %	*5.9*	**6.4**	*5.8*	**6.2**
Ash, %	*6.3*	**6.2**	*6.1*	**6.4**
Amino Acids:				
Lys, g/kg	*15.4*	**15.8**	*15.1*	**15.1**
Met, g/kg	*4.8*	**4.55**	*4.8*	**4.51**
Cys, g/kg		**4.37**		**3.64**
Thr, g/kg	*9.7*	**10.2**	*9.6*	**9.71**
Ca, g/kg	*8.2*	**10.1**	*7.8*	**10.6**
P, g/kg	*7.4*	**7.5**	*7.4*	**8.1**
Na, g/kg		**3.6**		**3.7**
K, g/kg	*8.7*	**8.6**	*7.0*	**7.1**
Mg, g/kg	*1.1*	**1.6**	*1.0*	**1.5**
Zn, ppm	*132*	**146**	*132*	**168**
Cu, ppm	*140*	**132**	*140*	**126**
Mn, ppm	*53*	**132**	*53*	**155**
Fe, ppm	*180*	**344**	*180*	**413**

[1]The values given for the Expected content of trace minerals is the amount supplemented from the mineral premix, the mineral content of the raw materials is not included, hence the analysed content is expected to higher than (>) the expected values.

[2] The values are means of two samples (batch#1 and batch#2)

Table 2. Expected (*E*)[1] and Analysed (**A**)[2] content of nutrients in the experimental diets (study 2).

	Gastric		Advanced	
	E	**A**	*E*	**A**
Dry matter, %	*92.7*	**92.7**	*92.7*	**92.8**
EFOS, %	*-*	**92.4**	*-*	**92.9**
Protein, %	*20.1*	**20.2**	*20.1*	**20.3**
Fat, %	*6.4*	**6.7**	*5.9*	**5.7**
Ash, %	*6.8*	**6.2**	*6.8*	**6.4**
Amino Acids:				
Lys, g/kg	*15.1*	**15.3**	*15.1*	**15.6**
Met, g/kg	*4.75*	**4.42**	*4.75*	**4.57**
Cys, g/kg	*3.61*	**3.68**	*3.62*	**3.62**
Thr, g/kg	*9.64*	**9.82**	*9.64*	**9.93**
Ca, g/kg	*7.4*	**10.4**	*7.9*	**10.6**
P, g/kg	*7.4*	**7.5**	*7.4*	**8.0**
Na, g/kg	*3.0*	**3.6**	*3.2*	**3.8**
K, g/kg	*6.8*	**7.4**	*7.0*	**7.7**
Mg, g/kg	*0.84*	**1.7**	*0.86*	**1.6**
Zn, ppm	*132*	**154**	*132*	**183**
Cu, ppm	*140*	**155**	*140*	**144**
Mn, ppm	*52.8*	**143**	*52.8*	**111**
Fe, ppm	*180*	**392**	*180*	**374**

[1]The values given for the Expected content of trace minerals is the amount supplemented from the mineral premix, the mineral content of the raw materials is not included, hence the analysed content is expected to higher than (>) the expected values.
[2] The values are means of two samples (batch#1 and batch#2)

Table 3. pH, Acid Binding Capacity (ABC-4) and Water Binding Capacity (WBC) of the test diets (Analyses made by Triple A)

	Study 1		Study 2	
	Control	Digest	Gastric	Advanced
pH	6.0	5.5	4.6	4.7
ABC-4, meq HCl per kg	291	236	144	150
WBC (g water/100 g)	320	370	350	360

Appendix E. Pigs Taken Out of study (PTO) and medical treatments.

Study 1

Based on veterinary diagnosis, all pigs in test received treatment with Tilmovet® (Huvepharma) in the drinking water for the first 6 days in the BabyPig rooms and Doxycyclin (Doxx-Sol®) in the drinking water for the first 5 days in the standard weaning rooms.

Apart from the group treatments 12 individual piglets (out of 1078 pigs in test) were medical treated against diarrhoea with injections of Alamycin (ScanVet) for 3 on each other following days during the first 2 weeks of test. Of these pigs, 4 were from the Control group and 8 from the Digest group, respectively.

In addition to antibiotic treatments against diarrhoea, 7 and 5 pigs from the Control and Digest group, respectively, were treated for arthritis with injections of Streptocillin® (Boehringer Ingelheim) for 3 on each other following days. There were no other treatment days against any specific diseases for pigs in test.

Table 1. Pigs taken out of study (PTO, number of pigs) in the test period (day 0-14) and the reason for taking it out and PTO in % of total number of experimental pigs in study 1.

	Control	**Digest**
PTO:		
Dead	5	3
Disease pen	0	0
Reason:		
Cerebrospinal Meningitis	1	0
Diarrhoea	0	1
Arthritis	0	1
Hernia	1	1
Un-thriving	0	0
Other	3	0
PTO as % of total number of pigs	0.93	0.53

Table 2. Pigs taken out of study (PTO, number of pigs) in the test period (day 15-29) and the reason for taking it out and PTO in % of total number of experimental pigs in study 1.

	Control	**Digest**
PTO:		
Dead	3	1
Disease pen	8	6
Reason:		
Cerebrospinal Meningitis	0	0
Diarrhoea	1	1
Arthritis	3	0
Hernia	2	1
Un-thriving	2	4
Other	3	1
PTO as % of total number of pigs	2.06	1.31

Table 3. Pigs taken out of study (PTO, number of pigs) in the test period (day 30-43) and the reason for taking it out and PTO in % of total number of experimental pigs in study 1.

	Control	**Digest**
PTO:		
Dead	3	2
Disease pen	8	10
Reason:		
Cerebrospinal Meningitis	0	1
Diarrhoea	0	0
Arthritis	5	4
Hernia	0	0
Un-thriving	5	2
Other	1	5
PTO as % of total number of pigs	2.1	2.3

Study 2

Based on veterinary diagnosis, all pigs in test received treatment with Tilmovet® (Huvepharma) in the drinking water for the first 6 days in the BabyPig rooms. In week batch number 1, group treatment (all 4 pens in the room) with Tilmovet® was repeated for the last 3 days in the BabyPig room.

Apart from the group treatments 3 individual piglets (out of 1139 pigs in test) were medical treated against diarrhoea with injections of Alamycin (ScanVet) for 3 on each other following days during the first 2 weeks of test. Of these pigs, 1 was from the Gastric group and 2 from the Advanced group, respectively.

In addition to antibiotic treatments against diarrhoea, 1 pig from the Advanced group was treated for arthritis with injections of Streptocillin® (Boehringer Ingelheim) for 3 on each other following days. There were no other treatment days against any specific diseases for pigs in test.

Table 4. Pigs taken out of study (PTO, number of pigs) in the test period (day 0-14) and the reason for taking it out and PTO in % of total number of experimental pigs in study 2.

	Gastric	**Advanced**
PTO:		
Dead	2	3
Disease pen	0	0
Reason:		
Cerebrospinal Meningitis	0	1
Diarrhoea	0	0
Arthritis	0	0
Hernia	0	0
Un-thriving	1	0
Other	1	2
PTO as % of total number of pigs	0.34	0.54

Table 5. Pigs taken out of study (PTO, number of pigs) in the test period (day 15-29) and the reason for taking it out and PTO in % of total number of experimental pigs in study 2.

	Gastric	**Advanced**
PTO:		
Dead	0	0
Disease pen	8	9
Reason:		
Cerebrospinal Meningitis	0	0
Diarrhoea	0	1
Arthritis	0	2
Hernia	0	0
Un-thriving	8	6
Other	0	0
PTO as % of total number of pigs	1.38	1.62

Table 6. Pigs taken out of study (PTO, number of pigs) in the test period (day 30-43) and the reason for taking it out and PTO in % of total number of experimental pigs in study 2.

	Gastric	**Advanced**
PTO:		
Dead	2	5
Disease pen	6	4
Reason:		
Cerebrospinal Meningitis	0	0
Diarrhoea	0	0
Arthritis	3	4
Hernia	2	1
Un-thriving	2	0
Other	1	4
PTO as % of total number of pigs	1.40	1.35