

Out of feed events and gastric ulcers in finishing pigs fed 40% pea-starch diets

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SUMMARY

Gastric ulcers in pigs are a concern for the swine industry. To enable studies on gastric ulcer formation, an experimental model is required that will consistently result in gastric ulcers in pigs. Therefore, the objectives of this pilot study were to determine if an extra stressor in the form of an out-of-feed event was needed to create gastric ulcers in pigs fed 40% pea starch in their diets. A total of 90 finisher pigs (90.6 ± 2.2 kg initial BW) were housed in a group of 5 pigs/pen and fed 40% pea starch for 14 d before a 0, 16, or 24-hr out-of-feed event. On d 28, 3 pigs/pen were sent to a commercial abattoir and their stomach tissues harvested for lesion scoring. A control group fed a commercial diet, and no out-of-feed event was used to monitor and compare performance.

Pigs fed 40% pea starch diets had good growth performance, but lower feed efficiency than control pigs fed the commercial diet. Out of a total of 36 pig stomachs scored, 8.3 % had no ulcers (0), 47.2% had less severe ulcers (1 and 2) and 44.4% had severe to very severe ulcers (3 and 4). All 12 pigs experiencing a 24-hr out-of-feed event, 11 out of 12 pigs from the 16-h out-of-feed group, and 10 out of 12 pigs from the 0-hr out-of-feed group had some form of ulcer. It can be concluded that feeding 40% pea starch resulted in gastric ulcers in pigs, or that gastric ulcers are a common occurrence, and an out-of-feed event is not necessary for future research trials looking at gastric ulcers.

INTRODUCTION

Gastric ulcers in pigs are a concern for the industry. Pigs with ulcers may show reduced growth performance and in severe cases could even cause death. The literature points to different factors causing gastric ulcers, including small particle size of diets, out of feed events, and other stressors. However, little is known about the exact mechanisms of how gastric ulcers form and what the triggers are.

Air-classified pea starch is a by-product of the pea protein industry. Due to an increase in the pea protein industry in Canada, air-classified pea starch is an animal feed ingredient of interest. However, pea starch has a very small particle size, around 10 microns. Because a small particle size is believed to cause gastric ulcers in pigs, the question is whether a high inclusion of pea starch in grower pig diets may cause ulcers.

However, gastric ulcers are not consistently observed. Prior to initiating our research program investigating the inclusion of air-classified pea starch in swine diets we wanted to ensure a model was available that resulted in gastric ulcers in pigs. The objective of this pilot study was to see if an out-of-feed event was needed to create gastric ulcers in pigs fed diets with 40% pea starch.

EXPERIMENTAL PROCEDURES

A trial utilizing 90 pigs with an initial BW of 90.6 ± 2.2 kg housed in groups of 5 pigs/pen was used to determine if an out-of-feed event will affect growth performances and stomach health (gastric ulcers) of pigs fed pea starch diets. The pigs were provided 40% pea starch diets and water ad libitum for two weeks before the feed-out event. A control group of pigs were also fed “normal production” diets and monitored to compare growth parameters measured. There were four treatments: 1) a control group that had continuous access to feed, and a 40 % pea starch diet group exposed to 2) 0 h, 3) 16 h and 4) 24 h out-of-feed events. Pigs on the 40 % pea starch diets were acclimatized to the diet one week prior to the start of the experiment. Blood was collected at the start of the experiment and at the end to measure inflammatory bio-markers which could be indicators of stress leading to gastric ulcers. Bodyweight measurements were taken on d 0, d 7, d 17 and d 28. On d 13, feed was removed from the pigs at 7 am and 3 pm and reintroduced at 7 am for the 24 h and 16 h out-of-feed groups respectively, to mimic a feed-system breakdown. Water was available to the pigs throughout this period. Video recording of pigs after feed reintroduction will be taken to study pig reactions.

After d 28, 3 pigs per pen (n = 54) from the pigs on the 40% pea starch diets were sent to a commercial abattoir and their stomach tissues harvested. Lesions in the pars oesophagea (the non-glandular part of the stomach, just at the end of the oesophagus) which is the anatomical area that usually develops ulcer were scored on a scale of 0 to 4: 0- normal stomach; 1- parakeratosis; 2- active ulcer less than 33% of the pars oesophagea; 3- active ulcer 33 to 66% of the pars oesophagea; 4- more than 66% of the pars oesophagea.

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RESULTS AND DISCUSSION

The growth performance results are presented in Table 1. Pigs on the 40% pea starch diets tended to have a higher ADG and BW compared to the control pigs on the commercial diets by d 7. However, there was no difference on any other weigh day and the overall BW. Overall average daily feed intake (ADFI) in pigs on the 40% pea starch diet was significantly higher (about 500g averagely per day) than the control pigs. The overall G:F was reduced in the 40% pea starch-fed pigs.

Out of a total of 36 pig stomachs scored, 8.3% had no ulcers (0), 47.2% had less severe ulcers (1 and 2) and 44.4% had severe to very severe ulcers (3 and 4). All 12 pigs experiencing a 24-hr out-of-feed event, 11 out of 12 pigs from the 16-h out-of-feed group, and 10 out of 12 pigs from the 0-hr out-of-feed group had some form of ulcer (Figure 1).

IMPLICATIONS

Gastric ulcers were found in 33 out of the 36 pig stomachs scored. A total of 80% of pigs fed 40% pea starch and not experiencing an out-of-feed event had gastric ulcers. While pigs experiencing an out-of-feed event had a more severe lesion score than the ones from the 0-hr out-of-feed group, we concluded that an out-of-feed event is not necessary for future research trials examining the impact of pea starch on gastric ulcer formation in growing pigs.

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Table 1. Growth performance parameters in finishing pigs fed a commercial diet without feed out event (Control) or fed 40% pea starch diets and exposed to a feed out event of 0, 16, or 24 hours¹

Item	Control	Out of feed event (hrs)			SEM	P-value
		0	16	24		
BW, kg						
Initial	90.08	90.11	90.59	90.19	1.00	0.95
d 7	97.85a	99.81b	100.81b	100.29b	0.56	0.09
d 14	107.98	109.45	110.46	109.82	1.74	0.31
d 28	122.8	124.57	124.17	124.52	2.18	0.46
ADG, kg d⁻¹						
d 1 to 7	1.12a	1.39b	1.39b	1.42b	0.12	0.04
d 8 to 14	1.43	1.38	1.46	1.38	0.21	0.85
d 15 to 28	1.00	1.08	0.99	1.05	0.07	0.77
d 0 to 28	1.14	1.23	1.20	1.23	0.05	0.20
ADFI, kg d⁻¹						
d 1 to 7	3.23a	3.63b	3.60b	3.63b	0.14	0.06
d 8 to 14	2.91a	3.65b	3.58b	3.53b	0.25	<0.01
d 15 to 28	2.83a	3.27b	3.27b	3.21b	0.25	0.08
d 0 to 28	2.98	3.52	3.48	3.46	0.14	0.01
G:F						
d 1 to 7	0.35	0.38	0.38	0.39	0.02	0.62
d 8 to 14	0.49a	0.38b	0.40b	0.40b	0.04	0.03
d 15 to 28	0.37	0.34	0.30	0.33	0.03	0.67
d 0 to 28	0.40a	0.37b	0.36b	0.37b	0.01	0.03

¹ Data are presented as least-square means of 6 replicate pens with 5 pigs per pen. ADG = Average Daily Gain, ADFI = Average Daily Feed Intake, G:F = Gain to Feed ratio. Means without a common superscript are significantly different (P < 0.05). P-Values in bold are significant.

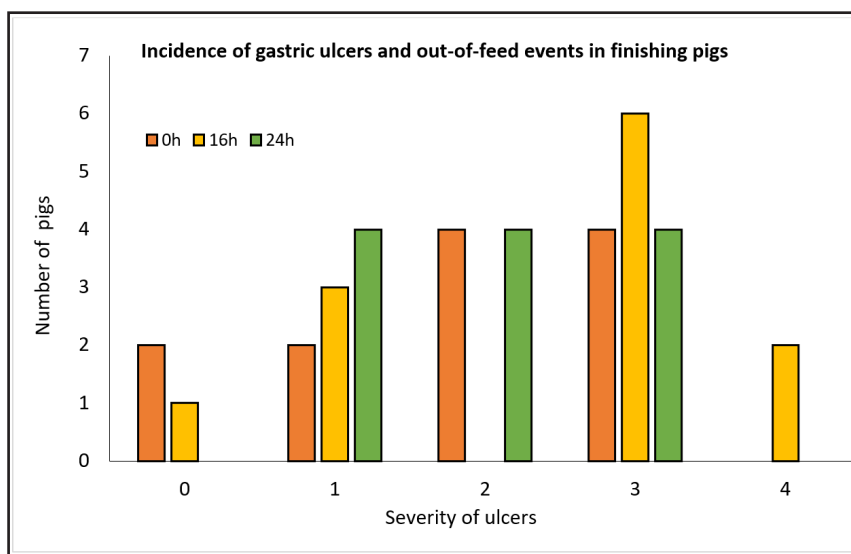


Figure 1. Incidence of gastric ulcers in finishing pigs fed 40% pea starch experiencing a 0, 16 or 24 hours long out-of-feed event