Nursery Pig Growth And Health Are Improved When Supplemented With A Microbial Fementation Prototype Feed Additive

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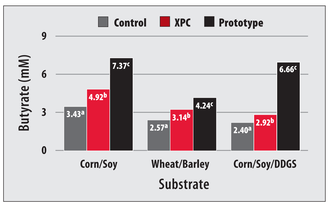
Abstract

Previous research demonstrated increased bacterial production of butyrate when a *Saccharomyces cerevisiae* fermentation product (Diamond V Original XPC) or a fermentation prototype was evaluated in an in vitro assay using fresh fecal inoculum from pigs. These results led to an in vivo trial in pigs to test these feed additives. The objective of the study was to evaluate the impact of feeding XPC and the newly developed *Lactobacillus acidophilus*-based microbial fermentation prototype (LAFP) on nursery pig growth and health. A total of 120 pigs weaned at 19 d of age and weighing 6.7 kg were use in this study. Pigs were allotted to 1 of 4 treatments and housed 2 pigs/pen with 15 replications/treatment. The treatments were Control, XPC (1 g/kg), and LAFP at 1 g/kg and 2 g/kg. The Control diet contained antibiotics and pharmacological levels of copper and zinc supplementation. The XPC and LAFP treatments were supplemented to the Control diet and treatments were fed in two dietary phases (Phase 1: d 1 to 9 and Phase 2: d 10 to 21). Pig body weight and feed intake were recorded, as well as the number of injectable medications administered to the pigs to treat health problems during Phase 1 and 2. Pigs supplemented with XPC or LAFP had significantly greater growth rate and feed intake than pigs fed the Control diet during Phase 1 ($P < 0.05$). Pig weights at the end of Phase 1 for Control, XPC, and LAFP at 1 g/kg and 2 g/kg were 7.03, 7.37, 7.67, and 7.58 kg, respectively, with the weights of LAFP fed pigs being significantly greater than Control ($P < 0.05$). Pigs supplemented with LAFP did not require any injectable antibiotics during Phase 1, while pigs fed Control and XPC required 24 and 15 injections, respectively ($P = 0.27$). During Phase 2, growth rate in pigs supplemented with LAFP at 2 g/kg was significantly greater than Control ($P < 0.05$). In addition, pigs supplemented with LAFP at both inclusion rates had significantly greater feed intake than Control during Phase 2 ($P < 0.01$). At the end of Phase 2, pigs receiving LAFP at 1 g/kg and 2 g/kg were 1.16 and 1.29 kg heavier ($P < 0.05$) than Control. The number of injectable medications administered ($P < 0.50$) to the pigs during Phase 2 for Control, XPC, LAFP at 1 g/kg, and LAFP at 2 g/kg were 14, 5, 1, and 2; respectively. The results of this research demonstrate that feeding LAFP, a *Lactobacillus acidophilus*-based microbial fermentation prototype, can improve growth performance and health of pigs. These improvements in animal health and production may be related to improved endogenous butyrate production in the gastrointestinal tract. However, additional research is required to better understand the mode of action.

Introduction

- Research in pigs evaluating the impact of feeding XPC has shown a number of beneficial affects including:
  - Improved growth rate and feed conversion (Shen et al., 2009; van der Peet-Schwering, et. al., 2007).
  - Improved gut health and immune response to challenges (Chaytor et al., 2011; Kiarie et. al. 2011; Kiarie et. al. 2012; Price et al., 2011).
- Recently, Severson et al. (2010) demonstrated increased bacterial production of butyrate when XPC or a *Lactobacillus acidophilus*-based fermentation prototype was evaluated in an *in vitro* assay using fresh fecal inoculum from pigs **(Figure 1)**.

Figure 1. *In Vito* Butyrate Production During a 12 hr Incubation.



- Further research is needed to evaluate the effects of the *Lactobacillus acidophilus*-based fermentation prototype on pig performance and health.

Objective

- To evaluate the impact of feeding *Saccharomyces cerevisiae* fermentation product (Diamond V Original XPC™) and the newly developed *Lactobacillus acidophilus*-based microbial fermentation prototype (LAFP) on nursery pig growth and health.

Materials and Methods

- A total of 120 pigs weaned at 19 d of age and weighing 6.7 kg were use in this study.
- Pigs were allotted to 1 of 4 treatments and housed 2 pigs/pen with 15 replications per treatment.
- Dietary Treatments:
  1. Control
  2. As 1 + XPC 1 g/kg
  3. As 1 + LAFP 1 g/kg
  4. As 1 + LAFP 2 g/kg
- The Control diet contained antibiotics and pharmacological levels of copper and zinc supplementation **(Table 1)**.
- The XPC and LAFP treatments were supplemented to the Control diet in place of corn (maize).
- The treatments were fed in two dietary phases (Phase 1: d 1 to 9 and Phase 2: d 10 to 21).
- Pig body weight and feed intake were recorded at the beginning of the trial and at the end of each Phase.
- The number of injectable medications administered to the pigs to treat health problems during Phase 1 and 2 were also recorded by treatment. Daily animal caretakers were blinded to the experimental treatments.

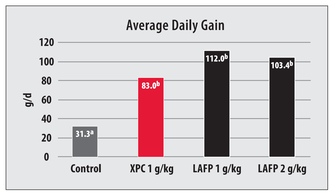
Table 1. Composition of Control Diets[1,2].

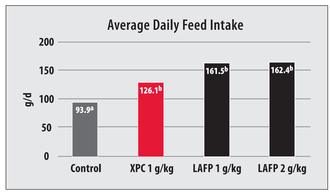
Ingredient, %	Phase 1 (d 1 to 9)	Phase 2 (d 10 to 21)
Corn (maize)	37.14	49.10
Soybean meal (48% CP)	22.61	27.64
Whey powder	25.13	12.56
Blood plasma	5.03	1.26
Blood cells	–	0.34
Fish meal	2.16	2.51
Soybean oil	4.02	–
Animal fat	–	2.01
Monocalcium phosphate	1.21	1.30
Limestone	0.87	0.80
L-lysine HC1	0.232	0.305
DL-methionine	0.127	0.145
L-threonine	–	0.022
Salt	0.187	0.519
Choline chloride (60%)	0.076	0.051
Zinc oxide (72% Zn)	0.402	0.251
Copper sulfate (25.2% Cu)	0.101	0.105
Tiamulin[3]	0.176	–
Chlortetracycline[3]	0.201	–
Tilmicosin[3]	–	0.754
Vitamin & mineral premix	0.328	0.328
Total	100	100

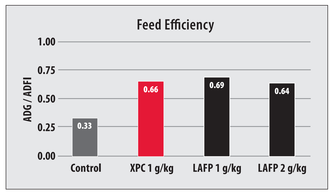
[1] All diets were formulated to meet or exceed the nutrient requirements of swine (NRC, 1998).
[2] The feed additives Diamond V Original XPC and *Lactobacillus acidophilus*-based fermentation prototype (LAFP) replaced corn (maize) at their respective treatment levels.
[3] Dietary antibiotics.

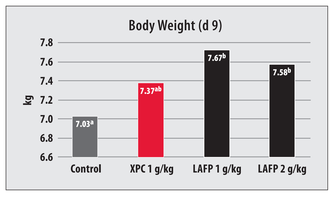
Results

PHASE 1 PERFORMANCE (d 1-9)

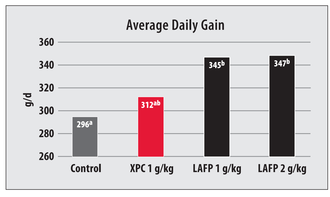


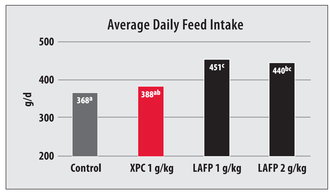


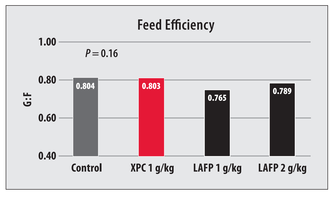


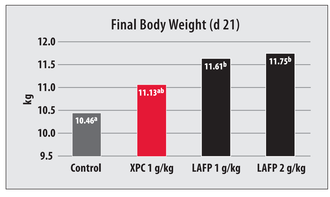


PHASE 2 PERFORMANCE (d 10-21)

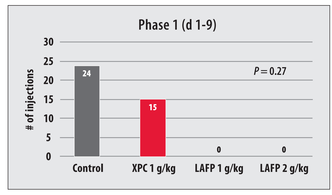


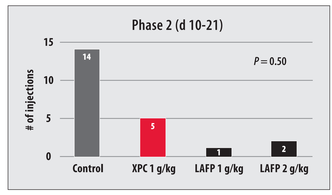






PIG MEDICATIONS





Conclusions

- The results of this research demonstrate that feeding LAFP, a *Lactobacillus acidophilus*-based microbial fermentation prototype, can significantly improve growth performance of pigs.
- Pig body weight, growth rate, and feed intake were greatest in pigs fed 2 g/kg of LAFP.
- Feeding either 1 g/kg or 2 g/kg of LAFP reduced the number of injectable medications.
- These improvements in animal health and production may be related to improved endogenous butyrate production in the gastrointestinal tract; however, additional research is required to better understand the mode of action.

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