

The effects of adding a combination of benzoic acid, a coated sodium butyrate, and phosphoric acid to nursery diets, either with or without high levels of zinc or copper, on post-weaning pig performance

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Across the globe, swine producers face increasing pressure to improve their sustainability, especially for nutrient management of manure and land use. In the US, manure application is commonly limited to prevent excess P and N, but Zn and Cu regulations like those in the EU are anticipated. Thus, the objective of this experiment was to evaluate a feeding strategy that can replace the inclination for using high levels of zinc and copper in pig starter feeds.

A subset of 480 weaned pigs (6.44 ± 0.1 kg, PIC genetics, approximately 21-d of age) were used in a 42-d trial to evaluate the effects of adding a combination of benzoic acid, a coated sodium butyrate, and phosphoric acid (**OA**) to pig diets, with or without high levels of zinc or copper, on pig performance. Upon arrival to the research nursery, the pigs were individually weighed, allotted to 10 pigs/pen, and blocked by initial BW. Pens within each of the twelve blocks were randomly assigned to one of four dietary treatments (**TRT**). The four **TRT** were: positive control (**PC**) containing 3000 ppm Zn in Phase 1 (d 0 to 7), 2000 ppm Zn in Phase 2 (d 7 to 21), and 250 ppm Cu in Phase 3 (d 21 to 42); negative control (**NC**) containing 95 ppm of Zn and 20 ppm of Cu throughout the trial; the PC + OA from a premix included at 0.9% in Phase 1 and 2 and 0.45% in Phase 3; and the NC + OA using the same premix and inclusions. Apart from **TRT**, diets within each phase were identical, with 2000 FYT/kg HiPhos in Phases 1 and 2 and 1500 FYT/kg HiPhos in Phase 3 to reduce CP and inorganic Ca and P. The OA premix supplied 0.5% benzoic acid, 0.1% sodium butyrate, and 0.05% phosphoric acid in Phases 1 & 2 and half those levels in Phase 3. Pigs were weighed, and feed disappearance was determined weekly during the experiment.

From d 0 to 21, OA improved ($P < 0.0001$) BW, ADG, ADFI, and F:G of pigs fed either the PC or NC, with pigs fed NC + OA performing similarly to pigs fed PC. In Phase 3, OA improved BW, ADG, ADFI, and F:G of pigs fed the NC diet, with pigs fed the NC + OA performing equally to those fed PC. Overall, pigs fed NC + OA performed equally to pigs fed PC or PC + OA. During the trial, no diarrhea was observed or treated. In conclusion, feeding OA was demonstrated to be an effective alternative to feeding high levels of Zn and Cu. Therefore, OA can be part of an effective strategy for improving sustainability.

Parameter	Dietary Treatment				Statistics	
	PC	NC	PC+OA	NC+OA	SEM	P - value
Body Weight, kg						
D 21	11.62 ^b	10.73 ^c	12.50 ^a	11.63 ^b	0.141	< 0.0001
D 42	23.86 ^a	21.46 ^b	24.40 ^a	23.88 ^a	0.309	< 0.0001
ADG, g/d						
Phase 1-2 (D 0-21)	245 ^b	201 ^c	285 ^a	241 ^b	6.8	< 0.0001
Overall (D 0-42)	414 ^a	358 ^b	428 ^a	413 ^a	9.1	< 0.0001
ADFI, g/d						
Phase 1-2 (D 0-21)	311 ^b	273 ^c	344 ^a	299 ^b	6.4	< 0.0001
Overall (D 0-42)	563 ^a	522 ^b	582 ^a	572 ^a	9.1	0.0002
Feed:Gain						
Phase 1-2 (D 0-21)	1.29 ^b	1.39 ^a	1.24 ^b	1.25 ^b	0.022	< 0.0001
Overall (D 0-42)	1.36 ^b	1.46 ^a	1.36 ^b	1.38 ^b	0.011	< 0.0001