PSVI-4 Effect of Phytogenic Feed Additives on Ammonia Emission in Finishing Swine.

Kory Moran[1], Sandra Chamusco[1], Tobias Aumiller[1], [1]*Delacon Biotechnik GmbH*

Abstract: Two independent studies were conducted to evaluate the effects of a commercially available phytogenic feed additive (essential oils blend and saponins) to reduce ammonia (NH_3) emission in finishing swine. In each experiment, 72 barrows and gilts (Exp. 1: 30.7±3.35kg; Exp. 2: 26.2±1.85kg) were used during 110 and 77 d, respectively. In each experiment, pigs were housed in 8 gas-tight sealed chambers under controlled climatic conditions. Each chamber had three pens with a fully slatted floor. Pigs were allotted into 24 pens (3 pigs/pen). Treatments were assigned to the chambers (4 chambers/treatment). Dietary treatments were: 1) Control, and 2) Phytogenics (100g/MT AromexPro, Delacon Biotechnik GmbH). Diets were offered ad libitum and in mash form. Ammonia emissions were measured during the last 14 d of the experimental period of each study. Ammonia emissions were calculated per chamber as the experimental unit. Air NH_3 concentration in the chambers was measured by a Photoacoustic Gas Monitor System INNOVA every 13 minutes. The ventilation rate of each chamber was used to calculate the emission rate. Data were analyzed using PROC MIXED of SAS. In Exp. 1, the phytogenics treatment significantly reduced by 19.5% the daily NH_3 produced per animal, and by 20% the NH_3 emission per kg body weight gained compared with the control treatment (12.94 vs. 16.07 g NH_3/animal/day, $P < 0.001$ and 13.73 vs. 17.23 g NH_3/kg BWG, $P = 0.011$). Similar findings were observed in Exp. 2, the phytogenic treatment significantly reduced by 19.8% the daily NH_3 produced per animal and by 21% the NH_3 emission per kg BWG compared with the control treatment (14.40 vs. 17.95 g NH_3/animal/day, $P = 0.01$ and 13.58 vs. 17.18 g NH_3/kg BWG, $P = 0.01$). In conclusion, the results suggest that the phytogenic feed additive used in the present studies can be implemented as a nutritional strategy to reduce NH_3 emissions in finishing swine.

Keywords: ammonia emission, essential oils, finishing pigs, saponins

PSVI-8 Effects of Phosphorus Level and Increasing Phytase Dose on Basal Endogenous Loss of Calcium and Balance of Phosphorus in Pigs Fed Diets Containing Phytate P at Commercial Levels.

Megan E. Nelson[1], Su A Lee[1], Yueming Dersjant-Li[2], Deepak Velayudhan[2], Janet C. Remus[3], Hans H. Stein[1], [1]*University of Illinois at Urbana-Champaign,* [2]*Danisco Animal Nutirtion (IFF),* [3]*IFF Danisco Animal Nutrition*

Abstract: The objective was to test the hypothesis that dietary P concentration and level of phytase influences basal endogenous loss of Ca in pigs. Seventy barrows (body weight: 17.66 kg) were housed in metabolism crates and allotted to 7 Ca-free diets containing corn, potato protein concentrate, and full-fat rice bran (0.27% phytate P). A positive control (PC) diet contained P at the requirement for digestible P for 11 to 25 kg pigs. Negative control (NC) diets were formulated by reducing concentration of digestible P by 0.15% and adding a novel consensus bacterial 6-phytase variant at 0, 250, 500, 1,000, 2,000, or 4,000 phytase units/kg diet. Feces and urine samples were collected separately for 4 d after 5 d of adaptation. Dried and ground fecal samples were analyzed for dry matter, Ca, and P and urine was analyzed for P. Data were analyzed using a model that included diet as fixed effect. Positive control and NC were compared using a contrast statement and linear and exponential effects of dietary phytase were tested. Results indicated that apparent total tract digestibility of dry matter was not affected by dietary P or phytase (Table 1). The basal endogenous loss of Ca was not affected by dietary P, but exponentially ($P = 0.030$) decreased as dietary phytase increased. Phosphorus retention (g/d) was greater ($P < 0.001$) in pigs fed PC compared with NC without phytase. The standardized total tract digestibility (STTD) of P exponentially ($P < 0.001$) increased as phytase increased; however, retention of P as % of absorbed P decreased (linear, $P = 0.006$) as phytase increased because the extra P absorbed as a result of phytase could not be retained due to the lack of Ca. In conclusion, increasing the phytase dose decreased basal endogenous loss of Ca and increased STTD of P.

Table 1. Basal endogenous loss of Ca and P-balance by pigs fed Ca-free diets[1]

Item, %	ATTD of DM, %	Basal endogenous loss of Ca, mg/kg DMI	STTD of P, %	P retention, g/d	P retention, % of intake	P retention, % of absorbed
PC diet						
	92.92	512	78.6	3.08	52.25	68.45
NC diet (FTU/kg)						
0	92.71	501	71.20	2.04	48.22	71.20
250	92.27	282	79.19	1.76	42.53	56.26
500	91.88	246	83.33	1.96	47.31	59.10
1,000	91.52	211	86.00	1.89	44.05	53.28
2,000	92.35	239	87.83	1.72	42.47	50.26
4,000	92.14	186	91.73	2.01	47.71	53.95
SEM	0.76	63	1.95	0.29	6.00	6.45
P-value						
PC vs. NC	0.758	0.885	0.001	< 0.001	0.338	0.552
Linear	0.832	0.002	< 0.001	0.845	0.808	0.006
Exponential	0.629	0.030	< 0.001	NA[2]	NA	0.108

[1]Least squares means represent 10 observations per diet with the exception that there were 9 observations for basal endogenous loss of Ca by pigs fed the PC diet and also by pigs fed the NC diet with 2,000 FTU/kg.

[2]The exponential analysis did not provide data that fitted the model.

Keywords: endogenous loss of Ca, phosphorus balance, phytase

PSVI-16 Performance Response of Nursery Pigs Fed Increasing Levels of Fermentable and Structural Fiber. Sabrina B. May[1], Sara Ebarb[1], Brent Frederick[1], [1]*Cargill Animal Nutrition*

Abstract: Dietary fiber can provide functional benefits to nursery pigs, thereby improving gut health and growth performance. However, effects vary depending on the type and amount of fiber supplemented. The objective of this experiment was to determine the effects of dietary fermentable fiber (FRM), structural fiber (STR), and their interaction on growth performance of nursery pigs. In total, 3,014 weanling pigs (body weight = 5.71 ± 0.11 kg, 15 replicate pens/treatment, 21 – 23 pigs/pen) were allotted by pen in a randomized complete block design to treatments in a 3 × 3 factorial arrangement with 2 factors: FRM (12, 13, or 14%) and STR (3, 4, or 5%). Diets were formulated to maintain similar dietary protein and metabolizable energy, and rice hulls or beet pulp were added to achieve different levels of STR and FRM, respectively. Fiber concentrations were estimated using in vitro fermentation methods. Phase 1 and 2 diets were fed from day 0 – 11 and 11 – 21 post-weaning, respectively. A common diet was fed from d 21 – 43. Data were analyzed by general linear model in R with random effect of location block. Orthogonal contrasts tested for linear and quadratic effects of STR and FRM, and their interaction. Overall (d 0 – 43), increasing FRM increased average daily gain (ADG; linear, $P < 0.05$). As STR increased, overall ADG increased and then decreased (quadratic, $P < 0.05$), with 4% STR resulting in the greatest ADG. Interactions between fiber type were observed ($P < 0.05$) for final body weight, overall average daily feed intake, and overall gain:feed. Pigs fed 14% FRM and 5% STR had the numerically greatest final body weight and ADG. In summary, increasing STR up to 4% improved performance, and greater levels of FRM can further improve performance when higher levels of STR are provided in the diet.

Keywords: dietary fiber, growth performance, nursery pigs