(0 vs. 2.54%; SEM = 0.008) and increased ($P < 0.05$) ADFI from d 17 to 21 (30.8 vs. 17.6 g; SEM = 4.41). There were no significant differences in suckling pig BW gain (3.21 vs. 3.25 kg; SEM = 0.107, for small and large pellet treatments, respectively) or percentage of pigs consuming creep feed (58 vs. 59%; SEM = 0.008, for small and large pellet treatments, respectively). During the nursery phase, pigs fed a large nursery pellet, regardless of creep feed treatment, had increased ($P < 0.01$) ADFI from d 0 to 7 (138 vs. 153 g; SEM = 3.6). Pigs fed the large creep feed pellet, regardless of nursery pellet diameter, had improved ($P < 0.03$) ADG (67 vs. 50 g; SEM = 5.0) and G:F (0.452 vs. 0.334; SEM = 0.0349) from d 0 to 7 post-weaning, as well as improved G:F overall (0.828 vs. 0.779; SEM = 0.0129). There were no significant differences in ADG or ADFI during the common or overall period. In summary, feeding a large creep feed pellet improved late suckling creep ADFI and nursery G:F, while feeding a large nursery pellet increased ADFI during the first week in the nursery.

Key Words: creep feed, nursery pigs, pellets

doi: 10.2527/msasas2016-213

214 Stability of commercial phytase products under increasing thermal conditioning temperatures.

J. A. De Jong*[1], J. M. DeRouchey[1], M. D. Tokach[1], R. D. Goodband[1], J. C. Woodworth[1], C. K. Jones[1], C. R. Stark[1], C. L. Bradley[2], J. A. Loughmiller[3], J. R. Bergstrom[4], *[1]Kansas State University, Manhattan, [2]AB Vista Feed Ingredients, Marlborough, United Kingdom, [3]Maverick Nutrition, Fairmont, MN, [4]DSM Nutritional Products, Parsippany, NJ.*

The objective was to determine the stability of 4 commercial phytase products exposed to increasing thermal conditioning temperatures. The 4 commercial products used were: Quantum Blue 5G (AB Vista, Marlborough, United Kingdom); Ronozyme Hi Phos GT (DSM Nutritional Products, Parsippany, NJ); Axtra Phy TPT (Dupont, Wilmington, DE), and Microtech 5000 Plus (Guangdong VTR Bio-Tech Co., Ltd., Guangdong, China). The phytase products were mixed as part of a corn-soybean meal-based swine diet at a concentration recommended by the manufacturer to provide a 0.12% aP release. Diets were exposed to each of 4 thermal conditioning temperatures (65, 75, 85, and 95°C) for approximately 40 s and the entire process was repeated on 4 consecutive days to create 4 replicates. Samples were taken while feed exited the conditioner and before entering the pellet die. Phytase activity was determined from complete feed samples before conditioning to establish a baseline diet phytase activity level for each product. Phytase stability was measured as the residual phytase activity (% of initial) at each conditioning temperature. There were no product × temperature interactions for conditioning temperature, throughput, or residual phytase activity. As expected, as the target temperature was increased, conditioning temperature increased (linear, $P < 0.001$) and conditioner throughput decreased (linear, $P < 0.001$). As target temperature increased, phytase activity decreased (linear, $P < 0.001$) for each product. There was a significant phytase product main effect which was primarily caused by Microtech 5000 Plus having decreased ($P < 0.05$) phytase activity when compared to all other products at all conditioning temperatures. In summary, increasing conditioning temperatures decreased phytase stability regardless of product. In addition, Microtech 5000 Plus had decreased residual phytase activity (% of initial) when compared to all other products.

Table 214. Effect of conditioning temperature and phytase product on residual phytase activity[1]

	Conditioning temperature, °C					Probability, $P <$	
Item	65	75	85	95	SEM	Linear temperature	Product main effect
Residual phytase activity,[2]%							
Quantum Blue 5G	99.0	78.2	37.9	21.1	8.80	0.001	0.001
Ronozyme Hi Phos GT	87.5	59.7	43.3	22.9			
Axtra Phy TPT	80.6	62.0	36.2	33.1			
Microtech 5000 Plus	37.6	21.4	3.5	3.5			

[1] Within each of 4 conditioning runs at each temperature, a composite sample consisting of 4 subsamples was used for analysis for each product.

[2] Stability was measured as the analyzed post-conditioning phytase concentration divided by phytase concentration before conditioning.

Key Words: conditioning temperature, pelleting, phytase stability

doi: 10.2527/msasas2016-214

215 Effects of grinding corn through a 2-, 3-, or 4-high roller mill on pig performance and feed preference of nursery pigs.

J. T. Gebhardt*[1], J. A. De Jong[1], M. D. Tokach[1], J. C. Woodworth[1], J. M. DeRouchey[1], R. D. Goodband[1], K. F. Coble[2], C. R. Stark[1], C. K. Jones[1], S. S. Dritz[1], *[1]Kansas State University, Manhattan, [2]New Fashion Pork, Jackson, MN.*

A total of 410 pigs were used in 2 experiments to determine the effects of grinding corn through various roller mill configurations on feed preference and performance of nursery pigs. In Exp. 1, 320 pigs (DNA 400 × 200; initial BW = 10.7 kg) were randomly allotted to 1 of 4 dietary treatments with 16 pens/treatment and 5 pigs/pen for a 21-d growth trial. The 4 dietary treatments used the same corn-soybean meal-based formulation that were mixed from the same batch of ingredients. Corn was ground through the same 4-high roller mill, but using different roller configurations including feed with corn fraction ground to 650 µm using 2 sets of rolls (2-high), feed with corn fraction ground to 495 µm using 3 sets of rolls (3-high), feed with corn fraction ground to 340 µm using 4 sets of rolls in a fine grind configuration (4-high fine), and feed with the corn fraction ground to 490 µm using 4 sets of rolls

in a coarse grind configuration (4-high coarse). In Exp. 2, 90 pigs (PIC 327 × 200; initial BW = 12.2 kg) were randomly allotted to 1 of 3 diet comparisons to determine feed preference. The 3 diets compared were the 2-high, 4-high fine, and 4-high coarse configurations. Each pen contained 2 feeders, each containing 1 of the 3 treatment diets. Feeders were rotated once daily within each pen for the 7-d study, with 5 pigs per pen, and 6 pens per comparison. In Exp. 1, there were no differences in ADG, ADFI or G:F between roller mill configurations. Similarly, no differences were observed for caloric efficiency or economics among roller mill configurations. In Exp. 2, when given a choice, pigs consumed 67% ($P < 0.05$) of the diet containing corn ground through the 2-high roller mill when compared to the diet containing 4-high fine corn. There was no difference in feed consumption comparing diets with 2-high roller mill corn or corn from the 4-high roller mill in a coarse configuration. When comparing corn from the two 4-high configurations, pigs consumed 63% ($P < 0.05$) of the diet manufactured in the coarse configuration and 37% when manufactured in the fine grind configuration. When given a choice, pigs preferred diets manufactured using a mill configuration producing coarser ground corn (490 to 650 µm) to fine ground corn (340 µm); however, roller mill configuration did not affect performance.

Key Words: roller mill, nursery pigs, feed preference
doi: 10.2527/msasas2016-215

---

216 Coating dog kibble with a commercial liquid acidifier reduces the risk of *Salmonella* cross-contamination. A. R. Huss*[1], A. Deliephan[1], J. C. Fuller, Jr.[2], C. K. Jones[1], [1]*Kansas State University, Manhattan,* [2]*Metabolic Technologies Inc, Ames, IA.*

In recent years, several pet food recalls have been attributed to *Salmonella* contamination. In addition to the negative impacts on animal health, pet foods contaminated with *Salmonella* have been linked to infection in humans. To help reduce the risks to humans, the Food and Drug Administration has set forth a zero-tolerance policy for *Salmonella* in pet foods. Typically, the preconditioner and extruder operate at sufficient temperatures to destroy pathogenic bacteria. However, there is the potential for post-processing cross-contamination to adulterate the product. One potential method to reduce the risk of *Salmonella* cross-contamination in pet foods is through the addition of chemical additive coatings. The objective of this research was to evaluate the ability of the liquid acid, β-hydroxy-β-methylbutyric acid (HMB; Metabolic Technologies Inc, Ames, IA), to reduce cross-contamination of dry extruded dog kibble with *Salmonella*. Liquid HMB was applied to a single formula of dog kibble at inclusion levels of 0, 0.9 and 1.5% (w:w) using a laboratory-scale mixer. The coated kibbles were then inoculated with *Salmonella enterica* subsp. *enterica* Serovar Enteritidis (ATCC 13076), grown in trypticase soy broth (TSB). Inoculated kibbles were enumerated for *Salmonella* on d 0, 1, 2, 7, and 14 post-inoculation. For enumerations, a subsample was collected, serial diluted and spread plated to Xylose Lysine Deoxycholate (XLD) agar. All inoculated plates were incubated at 37°C for 24 h, after which black colonies, typical for *Salmonella*, were counted and cfu/g calculated. The effects of HMB concentration, enumeration day and their interaction were all significant ($P < 0.0001$) on the resulting *Salmonella* concentration. *Salmonella* counts from Day 0 were 6.99, 5.59, and 4.88 $\log_{10}$ cfu/g for 0, 0.9 and 1.5% HMB, respectively. For HMB levels of 0.9 and 1.5%, counts were below the detectable limit for d 1, 2, 7, and 14. For 0% HMB, the *Salmonella* counts were found to decrease over time to 4.80, 3.99, 2.80, and 3.14 $\log_{10}$ cfu/g for d 1, 2, 7, and 14, respectively. Overall, the HMB coating was effective at reducing *Salmonella* artificially inoculated to dog kibbles. Further research is warranted to evaluate the minimum effective dose of HMB to reduce *Salmonella* in dog and cat kibbles.

Key Words: Salmonella, cross-contamination, petfood
doi: 10.2527/msasas2016-216

---

217 Proof-of-concept method to sanitize a feed mill contaminated with Porcine Epidemic Diarrhea Virus. A. R. Huss*, L. L. Schumacher, R. A. Cochrane, E. Poulsen, J. F. Bai, J. C. Woodworth, S. S. Dritz, C. R. Stark, C. K. Jones, *Kansas State University, Manhattan.*

Porcine Epidemic Diarrhea Virus (PEDV) has been linked to transmission by livestock feed or ingredients. Measures to exclude pathogens, prevent cross-contamination, and actively reduce the pathogenic load of feed and ingredients are being developed. However, research thus far has focused on the role of chemicals or thermal treatment to reduce PEDV RNA in feedstuffs, and has not addressed potential residual contamination within the manufacturing facility that may lead to continuous cross-contamination of finished feeds. The objective of this experiment was to evaluate the use of a standardized protocol to sanitize an animal feed manufacturing facility contaminated with PEDV. Environmental swabs were collected throughout the facility during the manufacturing of a swine diet inoculated with PEDV. To monitor facility contamination of the virus, swabs were collected at 5 decontamination steps: 1) baseline before inoculation, 2) after production of the inoculated feed, 3) after application of a quaternary ammonium-glutaraldehyde blend cleaner, 4) after application of a sodium hypochlorite sanitizing solution, and 5) after facility heat-up to 60°C for 48 h. The feed mill was contaminated and decontaminated 3 separate times for a total of 3 replications. Collected swabs were analyzed via RT-qPCR and categorized by surface (plastic, rubber, concrete, and metal), type (equipment and structural), and zone (1, 2, and 3). Decontamination step, surface, type, zone and their interactions were all found to impact the quantity of detectable PEDV RNA ($P < 0.05$). As expected, all samples collected from direct feed contact