

Nonruminant Nutrition: Feed Ingredients

500 Effect of different sorghum varieties on early chick growth. C. M. Rude*¹, M. A. Barrios¹, R. Rierson¹, S. Bean², and R. S. Beyer¹, ¹Kansas State University, Manhattan, ²ARS, USDA, Grain Marketing and Product Research Center, Manhattan, KS.

Although corn is the predominant cereal grain used in commercial broiler rations in the US, price advantages sometimes allow the use of sorghum in least cost rations. Similar to corn and wheat, sorghum hybrids exist for human versus animal feed. Besides costs, geographical limitations, environmental impacts, grain yields and availability of sorghum by products could allow some of these products to be used in poultry rations. An experiment was designed to test the effect of grain sorghum varieties on broiler chick growth. Broiler starter rations were formulated to NRC recommendations, using sorghum as the cereal grain. Chicks were fed one of 4 different white sorghums: Macia, straight run sorghum grown almost exclusively in Africa; F 1000, popular commercial hybrid for food; Sp3303 new food hybrid; and MMR 315–10, relatively new food hybrid grown extensively in Russia. All sorghums were grown on the same farm in western Kansas. Diets were fed to 21 d of age, with feed and BW recorded on d 0 and 21, with FC calculated from this data. Each treatment had 8 replications, with 6 birds per pen housed in Petersime battery cages. Feed and water were provided ad libitum. Differences were observed between sorghums in BWG and FC ($P < 0.05$). Sorghum hybrid F1000 had the lowest BWG with 484 g, followed by Macia at 532 g. Highest BWG of 765 g was observed with the MMR 315–10 hybrid and which was statistically similar to Sp3303 with a BWG of 747 g. Two sorghums were statistically similar, F1000 and Macia, had lower feed consumption than the other 2 sorghums, Sp3303 and R315–10, who were also statistically similar. Feed conversion was 0.744, 0.752, 0.767, and 0.783 for the Macia, F1000, Sp3303 and MMR 315–10 varieties, respectively. Differences in growth are attributed to differences in the sorghums characteristics. Hybrid F1000 is widely used in the food industry for its high dough viscosity, an attribute that could reduce broiler performance. Macia is grown for its drought hardiness and disease resistance. These results indicate that caution is required when using varieties of sorghum that have been developed for other markets than animal feeding.

Key Words: sorghum, broiler, hybrid

501 Dietary hydrolyzed yeast extract enhances early innate immune function in broiler chicks. J. L. Saunders-Blades*, K. L. Nadeau, and D. R. Korver, *University of Alberta, Edmonton, Canada.*

The effects of dietary yeast on growth and immune function of broiler chicks were studied. A bioethanol process derived yeast product was fed as either intact (I) or hydrolyzed by a 1–3 β -glucanase (H), at 4 levels (250, 500, 1000 or 2000 g/t) plus a control diet (C) with no yeast for a total of 9 diets ($n = 6$ pens/treatment). BW and feed intake were measured for the starter (0 to 10 d) and grower (11 to 28 d) periods. Whole blood was obtained weekly from 10 chicks/treatment to make in vitro assessments on the number of cells able to engulf at least one *Escherichia coli* (% phagocytosis), average number of *E. coli*/cell (phagocytic capacity), and *E. coli* bactericidal capacity. There were no diet effects on broiler production traits during the starter period. During the grower phase, lower feed intake among birds fed 500 or 2000 g/t of H ($P < 0.05$) resulted in a marginally lower BW gain ($P = 0.056$) and overall BW ($P = 0.058$); feed efficiency was not affected. At 2 wk, cells from H birds had a greater % phagocytosis (11–13% increase) and phagocytic capacity (15–31% increase) than those in the I group ($P <$

0.05). There was no difference in % phagocytosis between the cells from birds in any H groups with the C treatment, however cells from birds in the H2000 group had a 13% greater phagocytic capacity than the C treatment. At 3 wk, H2000 resulted in a 10% lower % phagocytosis than the C chicks and all levels of I (from 5 to 15%; $P < 0.05$). At 4 wk, cells from I2000 and H250 birds had a greater % phagocytosis than those from C birds (14 and 17% increase, respectively; $P < 0.05$). Diet did not affect bactericidal capability at any age. Both the I and H yeast increased early innate immune function in broilers relative to C. The H yeast (>500g/t) was most effective at increasing innate immunity at 2 wk, as the broilers aged (>3wk) the difference between the I and H was less pronounced. This may be a function of changes in the development of the immune system and the components present in the different treatments to activate it as the bird ages.

Key Words: broiler, hydrolyzed yeast, innate immune function

502 Influence of pea hulls inclusion in the diet on digestive traits and nutrient retention in broilers. E. Jiménez-Moreno*¹, J. M. González-Alvarado², S. Chamorro³, C. Centeno³, R. Lázaro¹, and G. G. Mateos¹, ¹Universidad Politécnica de Madrid, Madrid, Spain, ²Universidad de Tlaxcala, México, ³Consejo Superior de Investigaciones Científicas, Madrid, Spain.

The effects of inclusion of pea hulls (PH; 47% neutral detergent fiber and 9% starch) in the diet on the digestive traits and total tract apparent of retention (TTAR) of nutrients were studied in broilers from 1 to 21 d of age. A control diet based on cooked rice, soy protein concentrate, and fish meal that contained 3,260 kcal AME_n/kg, and 1.25% digestible Lys was diluted with 0, 2.5, 5.0, and 7.5% PH (1.6, 2.6, 3.5, and 4.5% CF, respectively). Each treatment was replicated 6 times (a cage with 12 chicks). Digestive traits and nutrient retention were recorded at 7, 14, and 21 d of age, and jejunal histology was measured at 14 d of age. The relative weight (% BW) of proventriculus ($P \leq 0.01$), gizzard ($P \leq 0.001$), and ceca ($P \leq 0.05$) increased as the level of PH in the diet increased. Digesta content of the gizzard was increased ($P \leq 0.001$) and gizzard pH was reduced ($P \leq 0.001$) with 2.5% PH. No further changes were observed with 5% and 7.5% inclusion. Crypt depth decreased linearly ($P \leq 0.05$) with PH inclusion. However, villus height and villus height: crypt depth ratio were not affected. The TTAR of soluble ash and N increased with up to 5% PH inclusion ($P \leq 0.001$). Also, TTAR of DM and OM, as well as the AME_n of the diet ($P \leq 0.001$) were improved with 2.5% PH inclusion; however, a further increase to 5% reduced TTAR of these nutrients. We conclude that an increase in dietary PH increases proventriculus, gizzard, and ceca weight in broilers from 1 to 21 d of age. Also, the inclusion of 2.5% PH increases digesta content and reduces the pH of the gizzard. The inclusion of up to 5.0% PH in the diet (3.5% CF) improves N retention but reduces the AME_n of the diets. A further increase to 7.5% PH (4.5% CF in the diet) impairs digestibility of all nutrients studied. The optimal requirement of CF in diets for young chicks might be between 2.6% and 3.5%.

Key Words: pea hulls, nutrient digestibility, broiler

503 Dietary camelina meal for broiler chickens: 2. Thigh meat fatty acid profile and sensory evaluation. P. H. Patterson*¹, R. M. Hulet¹, T. L. Cravener¹, A. Y. Pekel², and J. E. Hayes¹, ¹The Pennsylvania State University, University Park, ²Istanbul University, Turkey.

Camelina is an oilseed plant from the Brassicaceae family. It has recently been grown for biodiesel production with the meal utilized as a dietary protein supplement with a residual complement of omega-3 fatty acids. An experiment was conducted to examine the effect of dietary camelina meal (CM) supplementation on broiler live performance and meat quality. A total of 864 Ross x Cobb-500 straight run chicks were allocated to control (Con), 5% or 10% CM diet treatments with 8 pens per treatment from 1 to 35d. The CM utilized in this study contained 33.6% CP, 15.0% fat and 4.22% total omega-3 fatty acids. At the conclusion of the study, the birds were processed, cut up and meat frozen for further fatty acid analysis and sensory evaluation. Frozen thigh samples were thawed, skin was removed and then de-boned. The meat (270–280g portions) was placed in vacuum pouches, sealed under vacuum and held at 3.3C overnight before sensory evaluation. The meat was cooked sous-vide at 73.8C in a water bath for 50m. Cooked and cut meat (15–20g) was placed in insulated bowls and presented to 59 participants in a 2 triangle test sensory evaluation. Each participant received 6 bowls, 3 for test 1 and 3 for test 2. Two samples in each test were the same and participants were asked to choose the different sample. Dietary treatments significantly influenced thigh meat fatty acid profiles. Feeding the 10% CM diet increased thigh meat 18:3, 20:3, 20:5 (EPA), 22:5 (DPA), 22:6 (DHA) and total omega-3 fatty acids compared with meat from the Con and 5% CM fed birds which were not significantly different. Thigh muscle linoleic (18:3), EPA and DHA levels were increased 180, 100, and 128% by the 10% CM treatment respectively above the Con samples. Sensory evaluation showed participants were not able to distinguish between the Con and 5% CM thigh samples, yet 36 of 59 were able to identify the different sample when presented the Con and 10% CM meat ($P < 0.05$). However, it should be noted that discrimination does not imply a preference by consumers and further acceptability trials would be required for preference determination.

Key Words: *Camelina sativa*, sensory evaluation, omega-3 fatty acids

504 Effect of feeding Mexican sunflower leaf (*Tithonia diversifolia*, Hemsley A Gray) on performance of broiler chicks. A. H. Ekeocha^{*1}, A. A. Mako², T. J. Williams³, and A. Aderiyel¹, ¹Department of Animal Science University of Ibadan, Ibadan, Oyo State, Nigeria, ²Department of Agricultural Production and Management Sciences, Tai Solarin University of Education, Ijagun Ijebu-Ode, Ogun State, Nigeria, ³Department of Animal Physiology, University of Agriculture, Abeokuta, Ogun State, Nigeria.

One hundred and fifty (150) day old Abor Acre broiler chicks were randomly allocated to 5 experimental diets of 30 birds each. The first diet was the standard (basal) starter and finisher diet and served as control. The other rations contained 2.5%, 5.0%, 7.5% and 10.0% Mexican sunflower leaf (MSL) respectively as graded replacement (w/w) for maize and Soya meal. The study investigated the performance and hematological responses of the birds to the diets. Mexican sunflower leaf meal supplementation did not improve performance characteristics over basal diets and significantly ($P < 0.05$) retarded feed intake, growth rate, feed conversion except for its inclusion at 5.0%, while hematological parameters were significantly ($P > 0.05$) enhanced except for eosinophil and lymphocytes concentration. Mexican sunflower leaf is therefore a promising feed ingredient that could be cheaply incorporated into poultry rations at 5.0% level when convectional feeds are inadequate.

Key Words: lesser known sunflower, feed intake, daily weight gain

505 Effect of feeding Mexican sunflower leaf (*Tithonia diversifolia*, Hemsley A Gray) on carcass characteristics of broilers. A. H. Ekeocha^{*1}, O. A. Adu², K. D Afolabi¹, and E. J Ubah³, ¹Department of Animal Science, University of Ibadan, Ibadan, Oyo State, Nigeria, ²Department of Animal Production and Health, Federal University of Technology, Akure, Nigeria, ³Department of Animal Science, Wageningen University, Wageningen, Netherlands.

A study was conducted for 8 weeks to investigate the effect of feeding Mexican Sunflower Leaf *Tithonia diversifolia* on carcass characteristics of broilers. One hundred and fifty white day-old Abor Acre broiler chicks were used. The broiler chicks were randomly assigned to 5 treatments A, B, C, D and E. Treatment A served as control while birds in treatments B, C, D and E received Mexican Sunflower Leaf (MSL) at 2.5, 5.0, 7.5, and 10.0% respectively. Feeds and water were provided ad-libitum and the routine vaccination / medication followed the standard procedures. The results shows a significant ($P > 0.05$) decrease in all the parameters measured for carcass characteristics (shank, gizzard, head, crop, thigh, drumstick, wings, breast, back, neck, abdominal fat, spleen, heart, lung, liver, intestine and proventriculus) except for the neck weight where birds on treatment B (2.50 MSL) obtained the highest neck weight (182.31g) and the spleen with highest weight (3.60g) obtained in treatment C (5.0 MSL). The carcass quality were also significantly decreased ($P > 0.05$) except for the neck and spleen weights. The result of this study shows that inclusion of MSL at 2.5, 5.0, 7.5, and 10.0% has almost no effect on both the carcass characteristics and carcass quality of the broilers under study.

Key Words: sunflower, carcass characteristics, *Tithonia diversifolia*

506 A 42-day floor pen evaluation of broiler chickens fed standard energy and low energy diets supplemented with a blend of carvacrol, cinnamaldehyde and capsicum oleoresin with or without bacitracin. M. Sims^{*1}, D. Bravo², and A. Vikari², ¹Virginia Diversified Research Corporation, Harrisonburg, VA, ²Pancosma, Geneva, Switzerland.

A 42-d, 30 bird/pen, 6 treatment, 8 rep. (48 pens) broiler study was conducted to compare the performance, carcass/breast yield, breast moisture loss and Salmonella shedding of broiler chickens fed standard (S) or low (L) ME feeds with either a blend of carvacrol, cinnamaldehyde and capsicum oleoresin (XT, Xtract 6930) 125 ppm in starter feeds, 100 ppm in grower feeds (S/XT, L/XT) or BMD 50 ppm (S/B, L/B) or a combination of BMD 25 ppm + XT 100 ppm (S/B+XT, L/B+XT). Pen and feed weights collected at 21d and 42d, Salmonella shedding at 20d and 41d and carcass/breast yield at 43d. Each paired treatments means were analyzed by use of a 2-tailed distribution basic *t*-test model with equal variances assumed and $P = 5\%$. At 21d, BW of S/XT (2.02 kg) and S/B+XT (2.01 kg) were higher than L/XT (1.92 kg), with other groups intermediate. The 42d BW of the S/XT group (2.34 kg) was greater than each of the Low ME groups (mean = 2.24 kg) and not different from S/B (2.31 kg). FCR at 42d was lower for S/XT (1.69) than for the S/B (1.79), L/B (1.77), or L/XT group (1.75). The 0-42 day mortality with culls removed of S/XT (2.5%) was lower than L/B+XT (5.4%). Salmonella shedding at 41d was lower for S/B+XT (0%) than S/B (16.7%), S/XT (12.5%), L/XT (12.5%) and L/B (25.0%). Carcass yields were not different by pens, males, or females. Pen breast yield of S/B group (33.7%) was greater than S/XT (32.6%) and S/B+XT groups (32.0%). Pen breast moisture loss of S/XT was lower (6.9%) than all other groups (mean = 9.6%) with S/B (10.0%) and L/BMD (10.4%) being the highest. Breast yields after moisture loss means were similar for S/XT and S/B (30.3%). These data show that broilers fed diets supplemented with XT have final BW, FCR, carcass

yield, breast yield, feed cost/bird and returns on investment similar to broilers fed standard diets supplemented with BMD 50 ppm.

Key Words: essential oils, broiler, carcass yield

507 Effects of mung bean waste inclusion on mash diet characteristic, growth performance and nutrient digestibility in pigs. P. Rungcharoen*, N. Amornthawaphat, Y. Ruangpanit, S. Rattana-tabtimthong, and S. Attamangkune, *Kasetsart University, Bangkok, Thailand.*

Three experiments were conducted to evaluate the apparent metabolizable energy of mung bean waste in pigs and effects of mung bean waste inclusion in pig diets on growth performance and nutrient digestibility. In Exp 1, 2 consecutive trials were performed in starter (BW of 20 kg) and grower pigs (BW of 50 kg) in the determination of the apparent metabolizable energy of mung bean waste. Twenty 4 crossbred barrows (Large white × Duroc × Landrace) were enrolled in each trial (one pig in each cage; 12 metabolic cages per treatment). Treatments were corn soybean basal diet and 20% mung bean waste substituted basal diet. The apparent metabolizable energy of mung bean waste for a starter pig and a grower pig were $2,132.3 \pm 137.83$ and $2,557.1 \pm 50.39$ kcal/kg. In Exp 2, 2 trials were conducted in nursery phase (5 to 9 wk) and starter to finisher phase (11 to 24 wk) in a growth assay. A total of 192 pigs in each trial was allotted to a randomized completely block design (8 pigs per pen; 6 pens per treatment with 3 pens of gilts and 3 pens of barrows). Sex was a block factor. Treatments were mung bean waste inclusion of 0%, 2.5%, 5% and 7.5% in the experimental mash diets. Mung bean waste inclusion linearly decreased bulk density for all diets ($P \leq 0.001$) of both trials. There was no difference in growth performance of pigs in nursery phase and starter to grower phase. For finisher phase, however, there was decreased ADG from 712g to 597g in pigs fed mung bean waste diets ($P \leq 0.05$). In Exp 3, 24 barrows (BW of 7.5 kg) were used in the determination of nutrient digestibility (one pig in each cage; 6 metabolic cages per treatment). Treatments used were the same as in Exp. 2. Mung bean waste inclusion in the diet did not affect the digestibility of protein, fat and fiber. In conclusion, incorporation of 7.5% mung bean waste in the nursery to grower pig diets did not showed negative responses to growth performance and nutrient digestibility. However, low bulk density of mung bean waste mash diet needed to be concerned.

Key Words: pig, mung bean waste, growth performance

508 Short-term feeding of genetically modified Bt maize (MON810) to weanling pigs: Effects on gut microbiota, intestinal morphology and immune status. M. C. Walsh*¹, S. G. Buzoianu^{1,3}, G. E. Gardiner³, M. C. Rea², R. P. Ross², and P. G. Lawlor¹, ¹*Teagasc, Pig Production Development Unit, Moorepark Research Centre, Fermoy, Co. Cork, Ireland*, ²*Teagasc, Moorepark Food Research Centre, Fermoy, Co. Cork, Ireland*, ³*Waterford Institute of Technology, Waterford, Ireland.*

The objective of this study was to identify any effects short-term (31 d) feeding of genetically modified (GM) Bt (MON810) maize may have on gut microbiota, intestinal morphology and immune status of weanling pigs. Male pigs (n = 32) were weaned at ~28 d of age, blocked by weight and ancestry and randomly assigned to 1 of 2 treatments; non-GM isogenic maize or transgenic MON810 maize. Fecal samples were collected for microbiological analysis on d -1 and 30. Ileal and cecal digesta and small intestinal tissue were sampled at slaughter (d 31) for microbiological and histological analysis, respectively. Cytokine production from stimulated peripheral blood mononuclear cells (PBMCs) was measured on d 0 and 29. All data were analyzed as a randomized

complete block design using the GLM procedures of SAS. Feeding GM maize had no observed effect on fecal *Lactobacillus* or total culturable anaerobe counts or ileal and cecal counts of *Lactobacillus*, *Enterobacteriaceae* or total anaerobes. Fecal *Enterobacteriaceae* counts in GM maize-fed pigs tended to be reduced on d 30 ($P = 0.10$) compared with control pigs. Feeding GM maize had no effect on duodenal, jejunal, ileal villus height or crypt depth. However, non-GM fed pigs tended ($P = 0.10$) to have more goblet cells/ μm of duodenal villus compared with GM fed pigs. Phorbol myristate acetate stimulated PBMCs isolated from pigs fed GM maize tended ($P = 0.10$) to produce less IL-12 than control PBMCs on d 30. There was no effect of treatment on IL-10, IL-6, IL-4, TNF α or IFN γ production from resting or stimulated PBMCs. In conclusion, short-term feeding of GM maize to weanling pigs has demonstrated no observed adverse effects on intestinal morphology or systemic immunity while it was associated with a reduction in potential pathogens in the feces.

Key Words: pigs, MON810 maize, microbiota

509 Effects of dietary oat hulls and sugar beet pulp on productive performance and nutrient digestibility of broilers from 1 to 42 d of age. J. M. Gonzalez-Alvarado¹, E. Jiménez-Moreno², F. D. Royón², R. Lázaro², and G. G. Mateos*², ¹*Universidad de Tlaxcala, México*, ²*Universidad Politécnica de Madrid, Madrid, Spain.*

The effects of the inclusion of additional fiber in the diet on growth performance and digestive traits were studied in broilers from 1 to 42 d of age. The control diet was based on rice and contained 3,120 kcal AMEn/kg, 1.12% digestible Lys, and 1.5% crude fiber content. The 2 experimental diets included 3% of either oat hulls (OH) or sugar beet pulp (SBP). Growth performance was measured from 1 to 42 d, total-tract apparent retention (TTAR) of nutrients were determined at 32 d, and the relative weight (RW; g/kg BW) of the GIT and the gizzard was measured at 42 d of age. Cumulatively, broilers fed OH had higher ($P \leq 0.001$) ADG and better ($P \leq 0.01$) FCR than broilers fed SBP or the control diet. From 1 to 10 d of age, OH inclusion improved ($P \leq 0.01$) ADG (19.5 vs. 16.8 g/d) and FCR (1.215 vs. 1.333) as compared with the control diet. Also, SBP improved FCR in this period but the effects disappeared with age. In fact, from 25 to 42 d of age, SBP inclusion reduced ($P \leq 0.05$) feed intake with respect to the control diet and feed intake ($P \leq 0.05$) and BWG ($P \leq 0.001$) with respect to the OH diet. The RW of the GIT was higher ($P \leq 0.05$) with the SBP than with the control diet with the OH diet being intermediate. Also, the RW of the gizzard increased ($P \leq 0.001$) with fiber inclusion and the effects were more pronounced ($P \leq 0.05$) with OH than with SBP. Fiber inclusion increased ($P \leq 0.01$) TTAR of all nutrients and AMEn of the diet. The improvement in TTAR observed for DM was more pronounced ($P \leq 0.01$) for OH than for SBP. We conclude that OH inclusion improves growth performance at all ages in broilers fed low fiber diets. Also, SBP inclusion improves growth performance from 1 to 10 d of age but not thereafter. The TTAR of nutrients are improved by fiber inclusion and the benefits are more pronounced with OH than with SBP.

Key Words: fiber sources, digestive organ size, broiler performance

510 Influence of origin on nutritional and quality parameters of soybean meal. G. G. Mateos*¹, M. P. Serrano¹, S. Sueiro², M. González², M. Hermida², P. G. Rebollar¹, and R. Lázaro¹, ¹*Universidad Politécnica de Madrid, Madrid, Spain*, ²*Laboratorio de Mouriscade, Pontevedra, Spain.*

Soybean meal (SBM) is the main source of protein in non-ruminant diets. Most published tables of ingredient composition for feed formulation

differentiate 2 types of SBM based on its CP content (regular with 44% CP and high protein with 47 to 48% CP) and do not have into consideration the origin or processing method of the beans. However, available information indicates that processing and origin of the beans might have an effect on the nutritional value of SBM. The present research (n = 345) was conducted to determine the influence of origin (USA; Brazil, BRA; Argentina, ARG) on protein quality and nutrient value of SBM. On DM bases, USA meals (n = 139) had more CP (53.8 vs. 52.8 vs. 51.5%; $P < 0.001$) and less NDF (8.8 vs. 10.7 vs. 12.0%; $P < 0.001$) than ARG (n = 121) and BRA meals (n = 85). Sucrose and stachyose content was higher for USA than for BRA with ARG meals being intermediate (8.1 vs. 6.7 vs. 7.5% and 6.4 vs. 5.3 vs. 5.5%, respectively; $P < 0.001$). The USA meals had more phosphorus (0.79 vs. 0.68 vs. 0.74%; $P < 0.001$) than the BRA meals with ARG meals being intermediate. Also, BRA meals had more Fe (189 vs. 128 and 133 mg/kg; $P < 0.001$) but less K (2.3 vs. 2.6 and 2.5%; $P < 0.001$) than ARG and USA SBM. The USA meals had higher KOH solubility (87.6 vs. 82.3 and 84.3%; $P < 0.001$), protein dispersibility index (19.8 vs. 17.1 and 15.5%; $P < 0.001$), and trypsin inhibitor activity (3.9 vs. 3.0 and 3.0 mg/g; $P < 0.001$) than the ARG or BRA meals. The amino acid profile (% CP) varied with the source of SBM. The content of Lys (6.15 and 6.09 vs. 5.96%; $P < 0.001$), Met + Cys (2.86 and 2.86 vs. 2.75%; $P < 0.001$), Thr (3.91 and 3.92 vs. 3.83%; $P < 0.001$), and of 5 key amino acids (Lys, Met + Cys, Thr, Trp; $P < 0.01$) were higher for USA and ARG than for BRA SBM. It is concluded that the nutrient composition and protein quality parameters favor the utilization of USA meal over the South American meals in poultry diets.

Key Words: soybean meal survey, protein quality, nutritional value

511 Lactose in diet influences the degradation of mixed linked $\beta(1-3;1-4)$ -D-glucan in the small intestine of pigs. K. E. Bach Knudsen*, Aarhus University, Faculty of Agricultural Sciences, Department of Animal Health and Bioscience, Tjele, Denmark.

The objective of the current study was to investigate if lactose in diet would influence the degradation of mixed linked $\beta(1-3;1-4)$ -D-glucan (β -glucan) in the small intestine. B-glucan is an important cell wall (dietary fiber, DF) component of the endosperm of barley and oats. The digestibility of β -glucan in the small intestine from both cereals is among the highest of all DF components, but in one particular study with oat-based diets it was significantly lower than what was found in other studies. In this study whey protein containing lactose was used as protein supplement. Lactose is slowly digestible in the small intestine. To investigate if lactose could be causative for the lower digestibility of β -glucan in the study with whey protein, it was decided to quantify the content of lactose in the diets and to analyze for lactose in digesta samples from the small intestine (the small intestine was divided in 3 by length equal segments: SI1, SI2, SI3) and ileal digesta along with parameters for organic acids (lactic acids and short-chain fatty acids). Diets containing lactose were based on oat goats, oat flour, and oat bran (lactose 1.2–3.8% of DM), whereas the reference diets were based on rolled oats, rolled oats and oat bran, wheat flour with added oat bran and wheat flour with added β -glucan (lactose 0–0.1% of DM). Lactose was identified in digesta up to SI2, but disappeared in digesta from SI3 and the ileum. There was no difference in the digestibility of β -glucan among diets up to SI3, whereas the digestibility in ileum was significantly higher in diets without lactose compared with diets containing lactose. With all diets, β -glucan was virtually completely digested in the cecum. No difference was found in the concentration of organic acids between diets either in SI3, ileum or cecum. In conclusion slowly digestible lactose was the most likely cause of the reduced digestibility of β -glucan in oat diets containing lactose.

Key Words: β -glucan, digestion, pigs