
NONRUMINANT NUTRITION: FACTORS IMPACTING FEED INTAKE

1365 (W183) Antioxidant activity of intestinal mucosa in piglets fed deoxynivalenol naturally contaminated diet. F. Guay¹, M. Lessard², Y. Chorfi³, and B. V. Le Thanh⁴, ¹Université Laval, Québec City, Canada, ²Agriculture and Agri-Food Canada, Sherbrooke, QC, ³Université de Montréal, Faculté de Médecine Vétérinaire, St-Hyacinthe, QC, Canada, ⁴Université Laval, Québec City, Canada.

Deoxynivalenol (DON) is a mycotoxin commonly detected in cereals and grains, and is the most prevalent contaminating trichothecene in North American crops. In young piglets, the main effects of DON are reduced feed intake and weight gain, impaired immune response and enhanced oxidative stress. The influence of DON-contaminated feed on the antioxidant status of the intestinal mucosa in weaned piglets is not well known. Therefore, the aim of this study was to evaluate the activity of antioxidant enzymes and markers associated with oxidative stress in jejunal and ileal mucosa of piglets fed DON naturally contaminated diet. A total of 24 castrated weanling piglets with an initial weight of 6.0 ± 0.5 kg were used for a 14-d experimental period. After 1 wk post-weaning on a commercial diet, piglets were randomly assigned to either control diet or 4 ppm DON diet and housed individually. Samples of jejunum and ileum mucosa were collected at the end of the experiment to determine the total activity of glutathione peroxidase (GPx), catalase (CAT), superoxide dismutase (SOD) and xanthine oxidase (XO) as well as malondialdehyde (MDA) concentration and total antioxidant capacity (TAC). Data were analyzed using the SAS PROC MIXED in a randomized complete block design (initial body weight) with DON contamination as main independent factor. DON-contaminated diet decreased catalase activity (3.69 vs. 3.03 $\mu\text{mol}/\text{min}/\text{g}$, $P = 0.045$) and tended to increase MDA concentration in jejunal mucosa (7.09 vs. 9.86 nmol/g, $P = 0.087$). Also it decreased total SOD activity (48.1 vs. 35.9 $\mu\text{U}/\text{g}$, $P = 0.021$), but increased the total GPx activity (2.49 vs. 2.95 $\mu\text{mol}/\text{min}/\text{g}$, $P = 0.035$) in ileal mucosa. Activity of XO and TAC were not affected by DON-contaminated diet neither in jejunal nor in ileal mucosa. These results showed that DON affect intestinal enzyme activities involved in the oxidative stress reaction, which can affect the function and the integrity of the intestinal mucosa.

Key Words: piglet, deoxynivalenol, antioxidants

1366 (W184) Effects of different feed processing procedures with expander on broiler performance. M. Gierus^{*1}, C. Elwert², and S. Sternowsky³, ¹University of Natural Resources and Life Sciences – Institute of Animal Nutrition, Products, and Nutrition Physiology, Vienna, Austria, ²Feedtest, Wettin-Löbejün, Germany, ³Amandus Kahl GmbH & Co KG, Reinbek, Germany.

For particle agglomeration after grinding, pelleting is successfully used, but it does not increase considerably starch gelatinization, which would be maximized after hydrothermic treatment (HT). Among feed processing methods with HT, expanding may achieve the most efficient feed conversion rate (FCR). The objective was to compare different feed processing methods of broiler ration on animal performance. Ration was mixed with the same ingredients, differing in composition between phase I and II only. Rations were processed to obtain mash (negative control), pelleted only (positive control), or four expander processes [crumble I (2.7 kWh/t) and II (12 kWh/t), shaped crumble (30 kWh/t), and pelleting after expander processing (exp. + pel., 15 kWh/t)]. Broilers were kept in boxes of 10 animals each and were fed in two phases [age 1 to 21 d (phase I), and 22 to 36 d (phase II)]. Body weight gain and feed intake were measured. Treatments were arranged in a completely randomized design ($r = 8$); means separated by Tukey ($P < 0.05$). Among feed processing methods, feed intake was highest for pellets, crumbles I and II. Expanding could preserve coarse structure inside the expandat, in contrast to the pelleted ration. The most efficient FCR among expander treatments was achieved with the shaped crumble, next to pelleted feeds. Whereas crumble I (low energy input as kWh/t) contributed to particle agglomeration, this expander treatment was not able to increase substantially starch gelatinization or avoid selective feed intake. The shaped crumble had higher energy input (as kWh/t) than crumble II, which may explain the comparable FCR to pelleted rations. The reduced bulk density however may explain the lower feed intake for the shaped crumble treatment. The FCR of broilers fed on shaped crumbles compared to the pelleted treatments is attributed to the coarse particles inside the expandate after processing and the HT on improved starch gelatinization.

Key Words: broiler, feed processing, feed conversion

1367 (W185) Influence of pre-pelleting inclusion of whole corn on performance, nutrient utilization and digestive tract measurements of young broilers. Y. Singh¹, V. Ravindran¹, and T. J. Wester², ¹Massey University, Palmerston North, New Zealand, ²Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North, New Zealand.

The objective of the present study was to examine the effects of pre-pelleting inclusion of whole corn on performance, digestive tract measurements and nutrient utilization in broiler starters. Five diets, containing 60% ground corn or 15, 30, 45, and 60% whole corn replacing (w/w) ground corn, were formulated and cold-pelleted at 65°C. Each diet was offered ad libitum to six replicates (eight birds per replicate cage) from d 1 to 21 post-hatch. Weight gain (1005, 990, 919, 933, and 857 g/bird, respectively) and feed intake (1303, 1312, 1214, 1226, and 1136 g/bird, respectively) decreased linearly ($P < 0.001$) with increasing pre-pelleting inclusion of whole corn. Feed per gain (quadratic effect, $P < 0.05$) increased as the inclusion level of whole corn increased to 30% and then plateaued with further inclusions. Relative gizzard weight (12, 14, 15, 16, and 16 g/kg body weight, respectively; quadratic effect, $P < 0.05$) and apparent metabolizable energy (3400, 3450, 3466, 3424, and 3435 kcal/kg, respectively; quadratic effect, $P < 0.05$) increased with increasing inclusion of whole corn up to 30% and then leveled off. Ileal digestibility of starch (linear effect, $P < 0.001$) and nitrogen (linear effect, $P = 0.07$) increased with increasing inclusion levels of whole corn. Pellet quality, measured as pellet durability index (64, 78, 78, 82, and 84, respectively; quadratic effect, $P < 0.001$), increased sharply with the inclusion of whole corn to 15%, then plateaued and a further increase was observed at the inclusion level of 45%. The present data showed that, despite improvements in gizzard development, nutrient utilization and pellet quality, weight gain of broilers were poorer with pre-pelleting inclusion of whole corn due largely to the reduced feed intake.

Key Words: broilers, pre-pelleting, whole corn

Table 1367.

Treatment	Feed intake, g/day		Body weight gain, g/day		FCR 0–36 d
	Phase I	Phase II	Phase I	Phase II	
mash	55.8 ^a	169.6 ^c	40.2 ^{bc}	94.5 ^b	1.62 ^b
pelleted	57.8 ^a	181.2 ^{ab}	47.1 ^a	94.6 ^b	1.55 ^a
crumble I	60.7 ^a	185.0 ^a	47.2 ^a	99.2 ^a	1.65 ^c
crumble II	60.6 ^a	180.4 ^{ab}	42.7 ^b	103.0 ^a	1.60 ^b
shaped	55.1 ^a	166.6 ^c	39.0 ^c	93.9 ^b	1.53 ^a
exp.+pel.	54.7 ^a	175.6 ^{bc}	41.7 ^{bc}	97.9 ^{ab}	1.52 ^a
SE	0.38	0.55	0.30	0.41	0.01

1368 (W186) Divergent selection for residual feed intake may be impacted by differences in feeding behavior. S. Vigers¹, T. Sweeney², A. G. Fahey¹, C. J. O'Shea¹, and J. V. O'Doherty¹, ¹School of Agriculture and Food Science, University of College Dublin, Ireland, ²College of Agriculture, Food Science and Veterinary Medicine, University College Dublin, Belfield, Ireland.

Reduced activity related to feeding behaviour traits may explain the reduced feed intake and improved feed efficiency in low residual feed intake (LRFI) pigs, as less active animals will have a lower maintenance requirement. The objective of this study was to examine the effect of divergent selection for RFI on selected feeding behavior traits. Male pigs [$n = 75$; initial BW 22.42 kg (SD = 2.03)] were fed a standard finishing diet (12.5 g/kg lysine and 14.5 MJ/kg Digestible Energy) for 43 d to evaluate feed intake and growth for the purpose of calculating RFI. Feeding behavior was measured using electronic feeders that recorded consumption per visit and feeding time. Phenotypic RFI was calculated as the residuals from a regression model regressing DMI on ADG and midtest BW^{0.75} (MWT). Fifteen high RFI (HRFI) and 15 LRFI pigs were chosen for the purpose of examining feeding behavior parameters. RFI was strongly correlated with both ADFI ($r = 0.67$) and FCR ($r = 0.73$). LRFI pigs had lower ADFI (2.44kg vs. 1.87kg) and improved feed conversion ratio (1.96 vs. 2.48) relative to HRFI pigs ($P < 0.001$) with no difference in ADG or MWT. Behavioral analysis indicated that LRFI pigs ate less ($P < 0.0001$), spent less time eating per d ($P < 0.05$), had smaller meals ($P = 0.05$) and spent less time eating each meal than HRFI pigs ($P = 0.09$). LRFI pigs had less variation in their time spent eating ($P = 0.09$) than HRFI pigs, indicating that LRFI pigs had a more consistent feeding pattern. There were interactions between residual feed intake and the number of visits per d ($P < 0.05$) with LRFI pigs having fewer visits to the feeder than HRFI pigs across the experimental period. The results from this study suggest that LRFI pigs have lower activity related to feeding actions. This may partly explain the reduced feed intake in LRFI pigs.

Key Words: residual feed intake, feeding behavior, pigs

1369 (W187) Effect of dietary aflatoxin from contaminated corn on performance of turkey poults. A. S. Oyegunwa, E. O. Ewuola, A. F. Agboola, and E. A. Iyayi*, *University of Ibadan, Nigeria.*

Eighty 21-d-old Nicholas turkey poults were fed diets containing different levels of aflatoxin from naturally contaminated corn using *Aspergillus flavus*. The aim of the study was to investigate growth and feed intake responses in the birds to the dietary aflatoxin levels to determine the safe level of the toxin in the diets of turkey poults. The birds were weighed and assigned to 4 treatments of 4 replicates each and 5 poults per replicate in a randomized complete block design with an aver-

age initial body weight of 341 g. The diets were T1 = control; T2 = 400ppb aflatoxin; T3 = 800ppb aflatoxin; T4 = 1200ppb aflatoxin/diet. The poulters were fed the experimental diets for 2 wk, at the end of which feed intake and body weight records were taken and statistically analyzed using linear regression. At d 14 there was a significant ($P < 0.05$) reduction in feed intake (1316, 710, 519, and 306 g) and body weight (1055, 554, 383, and 306 g) for diets T1, T2, T3 and T4, respectively. Mortality was significantly higher ($P < 0.05$) in the 400, 800, and 1200 ppb aflatoxin diets compared to the control diet. Results of the study showed that dietary aflatoxin concentration of 400 ppb and above from contaminated corn is deleterious to turkey poulters reared from d 21 to 35.

Key Words: dietary aflatoxin, turkey poulters, performance

1370 (W188) Worldwide occurrence of mycotoxins in feeds and feed components in the year 2013.

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In 2013, a follow-up on the worldwide Biomim mycotoxin survey (started in 2004) covering the most important mycotoxins in feedstuffs was conducted. Information was collected concerning the presence of mycotoxins in commodities most commonly used for feed production. A total of 4218 samples (mainly corn/corn silage, soybean meal, wheat, finished feed

and other grains) sourced in America, Europe and Asia were analyzed for the presence of mycotoxins including aflatoxins (Afla), zearalenone (ZEN), deoxynivalenol (DON), fumonisins (FUM) and ochratoxin A (OTA). Samples were analyzed by high performance liquid chromatography (HPLC) and Enzyme-Linked Immunosorbent Assay (ELISA). Only single commodities were analyzed by ELISA. More complex matrices which could interfere with the ELISA method such as DDGS and finished feed were tested by HPLC. For the purpose of data analysis, the quantification limits (LOQ) of the test method for each toxin were implemented. In the more than 4000 samples analyzed worldwide, Afla were present in 30%, ZEN in 37%, DON in 59%, FUM in 55% and OTA in 23%. Average contamination levels of all positive samples were 10 ppb for Afla, 49 ppb for ZEN, 458 ppb for DON, 778 ppb for FUM and 2 ppb for OTA. In total, only 19% of the samples were tested negative for the presence of the five investigated mycotoxins. Thirty-six percent of all samples contained one mycotoxin and 45% of the samples showed a co-contamination with two or more mycotoxins. Results of this survey highlight the necessity of mycotoxin testing before the feeding of animals. More than 80% of the samples were positive for at least one mycotoxin. The presence of more than one mycotoxin in almost half of the samples draws attention to the multi-mycotoxin contamination. The results underline the necessity of constant monitoring of mycotoxins in feedstuffs and a proper mycotoxin risk management.

Key Words: mycotoxins, worldwide survey