

a positive control (Group 2), a product based on biotransformation (Group 3), a product based on adsorption by mannano-oligosaccharides (Group 4), one aluminosilicate (Group 5) and an organoclay (Group 6) were tested. For groups 2-6 a contamination of 2 ppm T-2 toxin was chosen. Feed intake, weight gain and feed conversion were evaluated weekly to test both the negative impact of T-2 toxin as well as the possible positive impact of the 4 tested feed additives. Additionally the serum activity of two enzymes, aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) was determined. At the end of the experiment the animals were sacrificed and examined for gross lesions. Fur-

thermore, the relative organ weight of liver, heart, spleen, proventriculus, gizzard and bursa Fabricius was recorded. Statistical analysis of the obtained data clearly showed that the effects of T-2 toxin in broilers were overcome by the product based on specific enzymatic degradation of mycotoxins. Furthermore Groups 4-6 showed significantly higher gizzard weights compared to control. No significant differences were found for the serum activity of LDH, however, serum AST activity was significantly lower in Group 6.

Key Words: Biotransformation, T-2 toxin, Performance, Mannano-oligosaccharide, Aluminosilicate

Tuesday, January 25 Nutrition Room: B315

S122 Testing the optimum blend of fine:large particle size limestone and dietary calcium levels for the Hy-Line W-36 and W-98 strains of White Leghorn hens. S. Scheideler*, M. Jalal, T. Weber, *University of Nebraska*.

A trial with a 2 x 2 x 3 factorial arrangement of 2 strains (Hy-Line W-36 and W-98) laying hens, 2 levels dietary Ca [average (3.65 – 3.85 g/hen/day) versus high (4.10 – 4.55 g/hen/day) and 3 limestone particle size feeding programs was conducted to ascertain the optimum particle size combination of fine:large limestone in laying hens from 18 to 70 weeks of age. The 3 limestone particle size feeding programs were: 1. 50:50 blend of fine:large particle limestone throughout the trial (18-70 wks); 2. 75:25 blend from 18-20 wks, 65:35 from 21-40 wks, 50:50 from 41-50 wks, 40:60 from 51-60 wks and 30:70 fine:large particle size from 61-70 wks, 3. 100% fine from 18-40 wks and 50:50 fine:large from 41-70 wks of age. The W-98 strain consumed more feed, weighed more and produced larger eggs with more albumen and less yolk and shell than the W-36 strain. Higher dietary Ca benefited the W-98 strain, increasing feed intake, hen weight, egg production and egg weight at different time periods of the trial. Higher Ca also improved overall egg specific gravity and % grade A eggs during the trial. Limestone particle size had no significant effects on feed intake, egg production or egg weight during this trial. Percent wet and dry shell and egg specific gravity were less for hens on Program 3 (100% fine) during the peak lay period (21-40 wks of age). After hens on this program switched to the 50:50 blend, the eggshell quality measurements recovered to normal. There were no significant differences between limestone particle size Program 1 or 2 during this trial. Thus, a 50:50 blend of fine:large particles size limestone will meet the laying hens needs for optimum egg production and shell quality. The higher level of dietary Ca was beneficial for the W-98 strain. The W-36 strain was more efficient at utilizing the lower levels of dietary Ca. For maximum yolk yield and egg shell quality, the W-36 strain was the preferred strain in this trial.

Key Words: Calcium, Limestone, Particle Size, Layer Strain, Egg Quality

S123 Effect of an E. coli-derived phytase (Quantum) on performance in broilers fed with or without a coccidiostat or cocci-vaccine in a low nutrient diet. C. Wyatt*, T. Parr, M. Araba, M. Bedford, *Zymetrics, Inc*.

Using a step-wise regression model to analyze our broiler dataset it was found that the use of a coccidiostat impacted the response to feeding a thermo-tolerant phytase (Quantum TM; Q). A 50-day used litter floor pen study was conducted with 64 pens of 17 male broilers to evaluate the response to Q phytase supplemented into a diet with or without a coccidiostat. The commercial positive control (PC) four-phase corn/soya/meat-bone meal diets were formulated with the negative control (NC) diets containing .05% less Ca, .13% less AvP, 45 kcal/kg less ME and .03% less TLYS for each phase. NC diets were fed with no drug and cocci-vaccine (NC), with salinomycin (S) but no cocci-vaccine (NC-S), or with cocci-vaccine (broilers were vaccinated using a spray cabinet

at day 0) but no drug (NC-CV). All NC diets were fed without or with 500 U/kg Q phytase except for NC-CV, which had a 1000 U/kg level resulting in 8 total diets. Day 21 cocci lesion scores were taken from 3 birds/pen within the intestinal tract for *E. acervulina* (Ea), *E. maxima* (Em) and *E. tenella* (Et). Birds fed S had significantly lower incidences of gross lesions for Ea and Em compared to no drug or CV birds. No differences in treatments were observed for gross lesions for Et and all micro lesions. Phytase had no impact on cocci lesion scores. Day 40, broilers fed Q phytase had significantly heavier BW (~10.5%) and higher FI compared to NC diets and the PC group. There were no significant differences in BW and FI between NC groups without Q phytase, but BW was lighter than the PC group. NC-S fed birds with Q phytase had significantly better FCR than any other treatment. Day 50, Q phytase fed birds had significantly heavier BW than the NC and PC groups, which was directly related to the increase in FI. NC-S diets with Q phytase had significantly better (~3.8%) FCR than the PC group. The findings suggest exposure to cocci will impact performance, although the response to Q phytase supplementation was not related and no interaction.

Key Words: Broiler, E.Coli-derived phytase, Performance, Nutrient reduction, Cocci challenge

S124 The effect of phytase in broiler diets on secretions in the gastrointestinal tract and TME. V. Pirgozliev*¹, T. Acamovic¹, M. R. Bedford², ¹*Scottish Agric. College, Zymetrics*.

A precision feeding study was conducted to compare the effects of three dietary levels of phytase on the endogenous secretions of the gastrointestinal tract (GIT), and TME of diets when fed to broilers. Fifty male Ross broilers were used and five dietary treatments (soya/maize (SM) diet, SM+ 250, +500, +2500 IU/kg phytase and a glucose only diet). Each treatment had 10 replicates in a randomised block design. The GIT secretions, measured as sialic acid, decreased when the amount of dietary phytase increased (P<0.05). The TME for diets with 500 and 2500 IU phytase/kg tended to be higher compared to the two diets with no phytase and phytase at 250 IU/kg despite using a constant correction for endogenous secretions from starved birds. The results obtained in this study are in accord with previous research involving myoinosol phosphate-enriched ingredients (Cowieson et al, 2004) which also demonstrated that phytase supplementation decreased the losses from the GIT in birds. An increase in the production of endogenous material in the GIT, which is then excreted, involves losses of amino acids and energy from the animal which is nutritionally expensive. It can be concluded that decreases in secretions from the GIT in the presence of phytase, is a mechanism involved in the mode of action of dietary phytases and which accounts for improvements seen in the performance of birds.

Key Words: Phytase, Endogenous losses, Broilers, TME

S125 Effects of ultra violet irradiation of broiler chickens on growth, bone development and phytate phosphorus utilization. H. M. Edwards, Jr*, A. Atencio, G. M. Pesti, *Departement of Poultry Science, University of Georgia.*

Studies from our laboratory have shown that ultra violet (UV) irradiation of the very young chicken from fluorescent lights (providing 3.4% power (W) in the UV range 260-400 nm) or from two mercury vapor tubes offers protection against development of vitamin D₃ deficiency rickets and tibial dyschondroplasia (TD)(British J. Nutrition 90:151). An experiment has been conducted to determine if UV irradiation of chicks by these same techniques will increase their ability to utilize dietary phytate phosphorus when the birds are fed a P deficient diet. The treatments included two vitamin D₃ levels (27.5 and 55 µg D₃/kg). At each level of D₃ there was a control group, birds exposed to fluorescent lights 24 h/d, birds exposed to irradiation from the mercury vapor lights for 30 minutes from below at 1 d of age, and birds fed 5 µg/kg of 1,25-dihydroxycholecalciferol in the diet. Dietary D₃ levels had significant effects on the retention of Ca, P and phytate P. Adding 1,25-dihydroxycholecalciferol to the diet significantly increased bone ash, plasma dialyzable P and retention of P and phytate P, while decreasing the incidence of phosphorus rickets. The UV irradiation treatment with fluorescent lights significantly increased bone ash when 55 µg D₃ was fed. The UV irradiation at the levels used appeared to have little if any effect on phytate P utilization by broiler chickens.

Key Words: 1,25-dihydroxycholecalciferol, Ultra violet irradiation, Vitamin D₃, Phytate phosphorus, Chickens

S126 Low levels of E. coli phytase (Quantum) demonstrated equivalent performance in broilers compared to higher levels of fungal phytases. T. Parr*, C. Wyatt, M. Araba, M. Bedford, *Zymetrics, Inc.*

Using a step-wise regression model on our dataset found that a thermo-tolerant, E. coli-derived phytase in Pica (Quantum; Q) was able to liberate more nutrients from a diet compared to fungal phytases. A 50 day floor pen trial using 121 pens of 16 male broilers/pen was conducted to study the effects of graded levels of Q phytase on performance of broilers compared to a constant level of fungal phytases (Ronozyme and Natuphos). The positive control (PC) corn/soya/meat-bone meal four-phase diets were formulated based on commercial averages with two negative control (NC) diets formulated to contain lower levels of AvP (.10 or .12%), ME (30 or 50 kcal/kg) and T. Lysine (.01 or .03%), respectively. 200 and 250 U/kg of Q or 500 U/kg of fungal phytase were added to the low nutrient reduction NC diet, whereas 400 and 500 U/kg of Q or 500 U/kg of fungal phytase were added to the high nutrient reduction NC diet (11 total diets). Day 18, birds fed the NC diets had lower body weights (BW; P<0.05) and a higher feed conversion (FCR) compared to those fed either the PC or phytase supplemented diets. No differences were found in feed intake (FI) across diets. Performance at days 41 and 50 showed depressed BW (21%; P<0.05), lower FI and higher FCR (P<0.05) for birds fed the high nutrient reduction NC diet compared to the PC. Addition of all levels of Q phytase to the high nutrient reduction NC diet improved BW (P<0.05) and FCR equivalent to the PC level at day 41 but not for the fungal phytases. At day 50, BW for broilers fed the high reduction NC + phytases were equivalent to the PC but FCR was poorer for the fungal phytase fed birds. At day 41 and 50, BW and FCR were found to be equivalent for birds fed lower levels (200 and 250U/kg) of Q phytase compared to the fungal phytases (500 U/kg) in the low nutrient reduction NC and PC group. This study suggested the addition of as low as 200 U/kg of Q phytase in a low nutrient reduction diet or 400u/kg of Q phytase in a high nutrient reduction diet was more effective to restore performance to PC level compared to 500 U/kg of fungal phytase.

Key Words: Broiler, E. coli phytase, Performance, Nutrient reduction

S127 A simplified *in vitro*. procedure for determining phosphorus release from a corn-soybean meal diet. J. N. Broomhead*, D. R. Ledoux, *University of Missouri.*

An *in vitro* procedure was previously developed by our lab, using pepsin and pancreatin digestion, to determine phosphorus (P) release from poultry diets through a dialysis membrane, into a surrounding buffer. Phosphorus release

was then used to predict P bioavailability. This procedure was later modified, removing the difficulty of using the dialysis membrane, with all enzymes and solutions added to a 50 ml conical tube. This *in vitro* procedure was effective in determining P release from corn samples. However, *in vitro* studies conducted on a complete corn-soybean meal (C-SBM) turkey diet resulted in an abnormally high P release. The objective of this study was to modify the *in vitro* procedure for accurate determination of P release from C-SBM diets (with and without phytase), and soybean meal (SBM) alone. Initially, the post-digestion procedures were adjusted to prevent protein precipitation from interfering with P analysis. It was determined that the initial dilution (inside the conical tube) should be completed with 0.32 M perchloric acid and the second dilution should be completed with 1 M nitric acid to prevent protein precipitation during final dilution with the color reagent. When analyzing diets containing a phytase source that is coated for protection during pelleting, at least 3 replicates of 3 g samples should be used. The high concentration and large particle size of this phytase product makes it difficult to obtain a representative quantity of phytase in a 1 g feed sample (original procedure), resulting in high variability. The concentration of enzymes and digestive solutions were increased 3 fold, to adjust for the increased sample size. When determining P release from SBM alone, xylanase and glucanase should be added, 1 g samples should be used because SBM tends to settle in the tube (preventing enzyme access), and the initial dilution should also be changed from 50 ml to 35 ml. The modified test tube method was effective in measuring P release from C-SBM diets, for evaluating phytase sources, and for analyzing SBM sources alone.

Key Words: *In vitro* procedure, P release, Diets

S128 Prediction of corn quality improvement with enzymes through NIR measurements. S. Dalsgaard*¹, M. F. Isaksen¹, M. Hruby², A. Cowieson², ¹*Enzyme Development, Danisco A/S*, ²*Danisco Animal Nutrition.*

Corn is globally the most important cereal grain and a major part of broiler feed in many countries. In 2003, the global production of corn exceeded 630M Mt and the demand for corn is expected to reach 840M Mt by 2020. In poultry diets corn is included as the primary energy source, contributing more than 60% of total feed energy, mainly due to its high starch content (>60 %). Exogenous enzymes have been used commercially for more than 15 years to improve nutrient digestibility of wheat and barley-based diets and during the past 5 years they have also shown potential in corn-based diets. As with other ingredients, the response of corn to enzyme supplementation depends on a wide range of factors and can be difficult to predict. In order to maximise the value associated with the addition of enzymes to corn-based diets a service has been developed that is capable of predicting the energy improvement value (EIV) of a given sample of corn when the corn is supplemented with the enzyme Avizyme® 1500. A sample of corn is subjected to analysis by NIR spectroscopy and a calibration developed by Danisco, which is based on more than 150 samples of corn, can predict the protein, oil, moisture and starch content of the corn as well as the digestibility of the starch. The EIV value of the corn when supplemented with the enzyme is then obtained from a model based on *in vivo* digestibility data in broilers, correlated with the *in vitro* components. Using this model it is therefore possible to follow geographical and annual trends in corn quality, including variability, and the response to exogenous enzymes. This information is invaluable for the continued production of high quality, consistent poultry products.

Key Words: Corn, Starch digestibility, Enzymes, NIR

S129 Effect of Hemicell®-W (β-Mannanase/Xylanase) on Sanhuang broiler performance fed normal and low energy diets. F. L. Jin*¹, H. Y. Hsiao¹, T. H. Kuang², X. T. Wang², ¹*ChemGen Corporation*, ²*Conti Chia Tai International Holdings Ltd.*

Extensive research has demonstrated that Hemicell® has dietary energy values of 100 to 120 Kcal/kg ME for broilers. However, there is limited information available whether the energy value is also available for Sanhuang broilers, which are the dominant broiler species in Southern China. Two experiments (EXP) were conducted with relatively fast growing commercial Sanhuang broilers. The birds were placed in floor pens and provided with Corn-SBM and Corn-SBM-Wheat based diets. Liquid Hemicell®-W was sprayed on the feed

postpelleting. Two dietary treatments in EXP 1 were 1) Corn-SBM, 2) Corn-SBM-Wheat +Hemicell[®]-W -100 Kcal/kg ME; and three dietary treatments in EXP 2 were 1) Corn-SBM, 2) Corn-SBM+Hemicell[®]-W -100 Kcal/kg, 3) Corn-SBM-Wheat +Hemicell[®]-W -100 Kcal/kg ME. A total of 600 Zhengda-88 male birds (grown from 0 to 28 days of age) were randomly assigned to 8 pens with 50 birds per pen and 4 replications per treatment in EXP 1. A total 830 Xinguang-Huang male birds (grown from 0 to 56 days of age) were randomly assigned to 26 pens with 30 to 35 birds per pen and 8 to 10 replications per treatment in EXP 2. Body weight, feed consumption, shank color and mortality were measured weekly. Weight gain, feed to gain ratio were calculated. In EXP 1, there were no significant differences ($P>0.05$) between treatment 1 and 2 in total weight gain (633.8 vs 623.8 g) and feed conversion ratio (1.851 vs. 1.850). In EXP 2, treatment 2 and 3 significantly improved Sanhuang broiler performance over Treatment 1 in total weight gain (2.022 and 1.995 vs. 1.917 kg, $P<0.05$) and feed conversion ratio (2.18 and 2.20 vs. 2.22, $P<0.1$). There were no significant differences in mortality and shank color among the treatments. These data demonstrate that Hemicell[®]-W improved live performance of Sanhuang broilers with at least 100 Kcal/kg increase in ME.

Key Words: Sanhuang broiler, Hemicell[®]-W, β -Mannanase, ME value

S130 Experiments to test the energy sparing effects of β -Mannanase (Hemicell) on performance and body weight uniformity in broiler chickens provided with corn-soybean meal diets. M. Jackson^{*1}, D. Anderson¹, H. Hsiao¹, F. Jin¹, G. Mathis², ¹ChemGen Corp, ²Southern Poultry Research.

The enzyme β -mannanase has been shown to improve growth, feed conversion and body weight uniformity in broilers. The mechanism results in an improvement in energy utilization through degradation of highly anti-nutritive β -mannans present in all soybean meals. Two, 42-day pen trials were conducted in floor pens with male Cobb X Cobb broilers provided with corn-soybean meal based diets. In both experiments, 3 treatments were compared, namely: (1) control; (2) as (1) minus 120 Kcal/kg ME; and (3) as (2) plus β -mannanase. The first study involved 50 birds/pen and 10 replications, and the second involved 30 birds/pen and 8 replications. At the conclusion of Experiment 2, all birds were individually weighed to determine body weight uniformity on a pen basis. Decreasing ME significantly decreased the 42-day body weight (2.19 vs. 2.12 kg) in Experiment 1 only. Feed conversion significantly worsened in Experiments 1 (1.81 vs. 1.85) and 2 (1.82 vs. 1.90). Addition of β -mannanase to the low ME diets significantly improved body weight by 3.2 and 1.9% and improved FCR by 4 and 6 points in Experiments 1 and 2, respectively. Broiler performance in the low ME treatments with the enzyme was not significantly different from that of the high ME treatments without the enzyme in both experiments. In Experiment 2, body weight uniformity was significantly better in the enzyme treatment group (CV=8.44%) than in the low and high energy treatments (CV = 11.66 and 10.25%, respectively). Results of these studies suggest that β -mannanase can spare approximately 120 Kcal/kg ME and improve body weight uniformity under practical conditions.

Key Words: β -Mannanase, Broilers, Energy, Uniformity

S131 Effect of β -Mannanase (Hemicell) and phytase on broiler chicken performance to 42 days provided with corn-soybean meal diets at varying energy levels. M. Jackson^{*1}, D. Anderson¹, H. Hsiao¹, F. Jin¹, G. Mathis², ¹ChemGen Corp, ²Southern Poultry Research.

β -mannan is a polysaccharide found in soybean meal and other plant proteins. Low concentrations of β -mannan have been shown to reduce carbohydrate metabolism and energy utilization in monogastrics. In many experiments with broilers, the enzyme β -mannanase has been shown to improve growth and feed conversion. Phytase is used extensively in broiler diets and little information is available about the effects of combining phytase and β -mannanase on broiler performance and energy utilization. A 42-day pen trial was conducted in floor pens with 50 male Cobb X Cobb birds per pen, 5 diets, and 7 replications. Dietary treatments were: (1) Positive control; (2) as (1) minus 110 Kcal/kg ME; (3) as (2) plus β -mannanase; (4) as (1) minus 160 Kcal/kg ME; and (5) as (4) minus 0.1% Ca and P plus β -mannanase and phytase. At 42 days of age, reducing the ME by 160 Kcal/kg significantly decreased body weight. FCR was significantly worse minus 110 Kcal/kg (1.90 vs. 1.85) and further deteriorated

by reducing 160 Kcal/kg (1.94 vs. 1.90). β -mannanase significantly improved FCR in the diet with 110 Kcal/kg ME reduction (1.86 vs. 1.90) and the combination of β -mannanase and phytase significantly improved FCR with the 160 Kcal/kg ME reduction diet (1.86 vs. 1.94). Body weight was also significantly improved by adding the enzyme combination (2.16 vs. 2.00 kg). The experiment demonstrated that a combination of phytase and β -mannanase in broiler diets can have additive effects regarding both enzyme's positive effect on energy utilization.

Key Words: β -mannanase, Phytase, Broilers, Energy

S132 Mintrex[™] zn organic trace mineral (zinc bis[2-hydroxy-4-methylthiobutyrate]) serves as a zinc and methionine source, and improves performance, intestinal epithelial lifespan, gut breaking strength and tibia zinc in broilers. J. Richards^{*}, T. Hampton, C. Wuelling, M. Wehmeyer, M. Kitchell, J. Dibner, Novus International, Inc.

Organic zinc sources provide performance and health benefits in broilers even when fed on top of a zinc-sufficient diet. Mintrex[™] zn organic trace mineral is an organic zinc source with 2-hydroxy-4(methylthio) butanoic acid (HMTBA) as the organic ligand. We tested whether Mintrex zn provides benefits with respect to early gut development, gut breaking strength, growth performance and tibia zinc levels in broilers. Cobb x Cobb broilers were fed diets that were zinc deficient (35ppm), supplemented with 70ppm zinc sulfate, or 70ppm zinc sulfate + 35ppm organic zinc (zinc-methionine or Mintrex zn). At day 20 half the birds were put on a coccidiostat, and on day 24 half were coccidiosis challenged. Mintrex zn improved epithelial lifespan versus the low-zinc diets. Only Mintrex zn gave a significant improvement in gut breaking strength. All supplemented diets improved feed conversion, but only Mintrex zn significantly improved body weight, breast percent and performance index. Tibia zinc levels were highest in the birds fed Mintrex zn. Thus, Mintrex zn is an effective zinc source that provides performance and tissue benefits when compared to a zinc-deficient diet, or a diet supplemented with inorganic zinc. We also investigated whether the HMTBA in Mintrex zn is used as a methionine source. Broilers were gavaged with equimolar amounts of 14C-HMTBA in the form of zinc bis(-2-hydroxy-4-methylthiobutyrate) or HMTBA. Birds were rested for 60-90 minutes, various tissues were collected and scintillation counted, and radioactivity incorporated into protein was determined. These experiments show that the HMTBA in Mintrex zn is an effective source of methionine activity. [™]Mintrex is a trademark of Novus International, Inc.

Key Words: Zinc bis(-2-hydroxy-4-methylthiobutyrate), Mintrex, Zinc, Methionine, Broiler

S133 Effect of Verszyme[™] and dietary protein levels on growth performance of broilers using industry-based criteria for evaluation. M. Fosnaught^{*}, N. Odetallah, BioResource International, Inc.

Verszyme[™], a protease-based feed additive, was supplemented in diets formulated to Agristats Company Averages for 2.00-2.73 kg broilers (2003) varying only in low (95), medium (100), and high (105)% CP levels. Diets were fed from 0-50 d of age with and without VZ (0.10% w/wt) in a 2X3 factorial arrangement. The respective low (LP), medium (MP), and high (HP) CP diets were fed throughout phases as follows: Starter: 21, 22, 23%; Grower: 19, 20, 21%; Finisher: 17, 18, 19%; and Withdraw: 16, 17, 18%CP. In each diet, amino acid content was maintained relative to CP%. The experimental unit was a pen of 106 mixed-sex broilers with 8 pens/treatment. BW and FCR adjusted for mortality and culls (aFCR), breast meat yield, and uniformity were measured. No interaction effects were observed. Increasing CP from 95 to 100 and 105% resulted in enhanced BW (2.31, 2.37, 2.41 kg) and aFCR (1.93, 1.88, 1.86), respectively. Supplementing with VZ at the low CP level had a 4.5% increase in BW (LP+VZ=2.42 vs. LP=2.31 kg, $P=0.01$) and 3.2% improvement in aFCR (LP+VZ=1.86 vs. LP=1.93, $P<0.01$) resulting in a reduction of feed cost/kg live weight by \$.0025. Feeding the MP+VZ also improved aFCR (MP+VZ=1.85 vs. MP=1.88, $P=0.02$) while effects on BW at the MP level approached significance (MP+VZ=2.42 vs. MP=2.37 kg, $P=0.08$). VZ supplementation of the HP diet only resulted in numerical improvements in BW and aFCR. VZ's enhancement of breast meat yield in LP or MP diets was limited ($P>0.05$), but VZ markedly increased breast meat yield (% of live weight) in

the HP diet (HP+VZ=32.4% vs. HP=31.5%, P=.001). Flock uniformity was improved when comparing respective diets with and without VZ. In conclusion, feeding diets containing 95%-105% industry average CP levels plus VZ improved broiler performance as denoted by increased BW and aFCR at lower CP and breast meat yield at higher CP. Benefits of VZ were optimized in low CP diets which indicate improved protein availability and a potential for feed cost savings.

Key Words: Versazyme™, Broiler performance, Enzyme, Protein, Breast meat

S134 Enzyme-based protein digestibility (IDEA™ kit accurately predicts poultry *in vivo* amino acid digestibility for fishmeal. C. Schasteen¹, J. Wu^{*1}, M. Schulz¹, C. Parsons², ¹Novus International, Inc., ²Department of Animal Sciences, University of Illinois.

IDEA™ is a patented enzyme-based assay designed for rapid determination of amino acid digestibility of poultry feed ingredients including soybean meal, meat and bone meal, poultry byproduct meal, and feather meal. The objective

of this study was to evaluate the applicability of IDEA™ technology to predict digestibility of fishmeal produced for animal feed. An autoclave experiment was conducted to assess the effect of processing (heat and moisture) on amino acid digestibility of fishmeal. Increasing autoclaving times from 0 to 120 min at 120°C, 16 psi of a commercial Menhaden meal (n=4) resulted in decreases in true lysine digestibility determined in the precision-fed cecectomized rooster assay (Fernandez & Parsons, 1994). IDEA analysis of these samples indicated a strong correlation of IDEA values with the true lysine digestibility determined in roosters (r² of 0.97). Next we evaluated 9 US commercial fishmeal products collected from the field. True amino acid digestibilities were varied over a wide range, particularly for Lys (66.5% to 94.8%) and Cys (37.4% to 87.2%). IDEA analysis of these samples yielded results correlated well with those of the rooster assay (r² of 0.69 and 0.75, respectively). Results of this study suggested that variations in amino acid digestibility existed among US commercial fishmeal products. IDEA™ provided a good prediction of *in vivo* poultry digestibility of fishmeal. Extension of IDEA™ testing with fishmeal from other world areas is underway.

Key Words: IDEA, *In vitro* assay, Fishmeal, Amino acid digestibility, Poultry

POSTERS

Monday, January 24

Room: 308-309.

S135 Withdrawn.

S136 Molecular characterization of avian influenza viruses isolated in Texas. B. Lupiani¹, P. Suchodolski¹, K. Turbyfill¹, J. El-Attrache^{*1}, J. Linares², C. Cardona³, S. Reddy¹, ¹Texas A&M University, ²Texas Veterinary Medical Diagnostic Laboratory, ³University of California Davis.

Avian influenza (AI) virus represents an important threat for the poultry industry and human health. Wild birds are reservoirs of AI viruses and an important source of virus infection that affect commercial poultry. In Texas, different subtypes of AI, including a highly pathogenic virus, have been isolated. However, there has not been a comprehensive phylogenetic characterization of these isolates. In the present study we report the phylogenetic analysis of AI viruses, from different subtypes, isolated in Texas from 1979 to 2002.

Key Words: Avian influenza, Phylogenetic analysis

S137 Evaluation of a defined competitive exclusion product upon *Salmonella enterica* serovar *enteritidis*. horizontal transmission in Leghorn chickens. M. A. Juarez-Estrada^{*}, J. A. Molina-Hernandez, Department of Animal Production: Poultry, FMVZ-UNAM.

This experiment was carried out in order to evaluate a defined competitive exclusion product (DCE). First at all, 240 male Leghorn chickens were divided in three groups of 20 birds each one with four replicates by group, they were placed at floor pens with wood shaving litter. The groups were identified as follow A) At first day chickens received PBS, after that at 3 days old, they were challenged *per os* with 1x 10⁸ CFU of *Salmonella enterica* serovar *enteritidis* (SE PT13^A)/bird. B) At 1 and 3 days old these chickens received PBS. C) Chickens received DCE at first day old, they received PBS at three days old too. Two replicates from each group were euthanized at 13 and two replicates at 15 days of age. SE PT13^A was recovered from liver-spleen (LS) and cecal tonsils (CT). At 13 days of age group C showed up the lowest SE PT13^A isolates (7.5%)^c (p<0.05) from LS than B (27.5%)^b and A (75.0%)^a groups. SE PT13^A isolates from CT into the group B (57.5%)^a apparently was lower (p<0.05) than group A (100%)^a but it was higher than group C (25%)^b. At 15 days of age SE PT13^A isolates from LS for the B (10.0%)^b and C (12.5%)^b groups were lower

(P<0.05) than group A (57.5%)^a. SE PT13^A isolates from CT into group B (27.5%)^b and group C (42.5%)^b were lower than the group A (87.5%)^a. DCE reduce horizontal transmission and diminish SE PT13^A from LS and CT into the chickens that they received DCE at first day of age, but into negative control chickens without DCE, SE PT13^A isolates were diminished too. In fact, this percent reduction into group B was clearly showed up at 15 days of age, possibly the group B were receiving DCE from group C by horizontal way. The defined competitive exclusion products are a good option upon SE control at chicken growing up in Layer Farms.

Key Words: Probiotics, Salmonella control, Breeder Leghorn Hens, Salmonella infection, Layer hens

S138 Fowl cholera vaccination in laying hens: local and systemic humoral immune response. R. Merino^{*}, L. Avina, Departamento de Produccion Animal: aves, FMVZ, UNAM, Mexico.

Fowl cholera is an infectious disease that affects the egg production; vaccination is useful in order to reduce this effect. However, to measure the local immune response is not common. The aim of this study was to use an ELISA test to detect both IgA and IgG in vaccinated laying hens. A commercial flock of laying hens was vaccinated against *Pasteurella multocida* at 4, 10 and 17-wk of age. Serum samples and Harderian gland (HG) extract were taken at different ages in the period between the first vaccination and the laying peak. The humoral immune response was evaluated 12 times for IgG (serum samples) and 8 times for IgA (Harderian gland) using the same ELISA test (Synbiotics Co.). The manufacturer's directions were used to test the serum samples; for IgA detection in the HG samples, the same ELISA plate was used, but one anti chicken IgA - HRPO conjugate and TMB as substrate were used. Prior vaccination all tested sera were negative for IgG and IgA. The ELISA titers were the following for IgG: For the 5, 9, 10, 11, 12, 13, 18, 19, 21, 22, 23, 25 wk of age the antibody titers were 2204, 1878, 2131, 1262, 1708, 2397, 3707, 2636, 1856, 2525, 1796 and 2175 respectively. The ELISA titers for IgA at 12, 13, 14, 18, 19, 21, 22, 23, 25 wk of age were 685, 106, 390, 3755, 1178, 1591, 2359, 548 and 566 respectively. The highest titers from both IgG (3707) and IgA (3755) were gotten at 18 wk of age, 1 week after the last vaccination. This study shows the relationship between IgG and IgA in laying hens immunized against *P. multocida*. A similar investigation on IgA antibodies against fowl