T139 Attenuation characteristics of ArkGA, a new Ark-type IBV vaccine candidate Grace Albanese*1, Dong-Hun Lee2, Deborah Hilf1, Mark Jackwood1, Brian Jordan1 1University of Georgia; 2Southeast Poultry Research Laboratory

The Arkansas serotype of IBV is the most frequently detected IBV type in the field. The current vaccine, ArkDPI, does not infect and replicate adequately to stimulate proper protection from challenge. Previously, our laboratory identified mutations in the S1 region of the spike glycoprotein of ArkDPI that are deleterious to its success as a vaccine. A new Ark-type IBV vaccine candidate, ArkGA, is a highly attenuated and protective vaccine derived from the former Ark99 vaccine. Initial work to develop ArkGA showed that the vaccine was highly pathogenic in one-day-old broiler chicks, however, 60 passages in embryonating eggs reduced the reactivity sufficiently, although the mechanism for attenuation of IBV and the changes occurring in the genome remain unclear. Whole genome Illumina sequencing was performed on ArkGA passages 1, 20, 40, and 60 to analyze the viral genome during attenuation. Additionally, viral material from choanal cleft palate swabs of broiler chickens vaccinated with the ArkGA passages was sequenced to identify mutations occurring during viral replication in the chicken. Illumina sequencing showed that 14 single nucleotide polymorphisms (SNPs) evolved between the pathogenic Ark99 sequence and the consensus ArkGA P60 sequence, including SNPs in the leader sequence, the nsp3 protein gene, and the spike protein gene. SNPs recorded within each passage indicated that the viral genetic population became more stable and homologous over subsequent passage. Although changes occurred in the S1 gene region between ArkGA passages, two amino acid mutations seen in the P60 vaccine were shown to revert to P1 sequence in virus obtained from vaccinated birds. When comparing the whole genome consensus sequences of the ArkGA passages with ArkDPI sequence, there are numerous amino acid changes seen in the spike gene, and many more seen throughout the genome that indicate that ArkGA and ArkDPI, although the same serotype, are highly different viruses. These changes seen in the ArkGA vaccine during embryo passage provide increased insight into the attenuation process of IBV.

Key Words: IBV, vaccine, Arkansas

T140 A severe outbreak of Avibacterium paragallinarum serovars A-2 and B-1 in coinfection with Gallibacterium anatis biovar haemolytica and the non-hemolytic biovar anatis in commercial layers. Nancy Christy*1, Sergio Carrasco2, Edgardo Soriano3, Vladimir Morales3 1Boehringer Ingelheim; 2Avicampo; 3UAEM

Infectious Coryza is one of the highly infectious respiratory tract diseases of poultry caused by Avibacterium paragallinarum. It has emerged as a big problem of commercial poultry because increased number of culls and reduced egg production. (10-40%)

Gallibacterium anatis report a variety of signs such as respiratory problems, necrosis in livers, peritonitis, salpingitis, hemorrhagic and ruptured follicles and a drop in egg production.

In México, during the last years, the outbreaks were associated with Avibacterium paragallinarum serovar C1, however in this case we found serovar A-2 and B-1, this is important because the last report of serovar A-2 in México was in 2001.

Other important reason is that both agents produced egg drop, and there is not enough information about simultaneous infection.

During 2017, a suspected clinical case of Infectious Coryza in layers was confirmed by serological and molecular identification of Avibacterium paragallinarum. The clinical signs were nasal discharge; conjunctivitis with swelling of the sinuses, face and wattles; decreased feed and water intake with reduced egg production. At necropsy, hemorrhages were in mucous membrane of nasal passage and trachea. Gallibacterium anatis was confirmed by Gram staining, motility, oxidation/fermentation, growth in Hugh and Leifson’s medium with glucose, and for urease, catalase and cytochrome oxidase activity and to confirm the identification; a section of the 16S rDNA gene was sequenced.

Samples were submitted to Universidad Autónoma del Estado de México for the analysis.

Results showed the simultaneous presence of Avibacterium paragallinarum serovar A-2, B1 and Gallibacterium anatis biovar haemolytica and anatis in layers.

This paper reports the simultaneous presence, the prevalence of serovar A-2, B-1 in layers and the importance to include a vaccine with Gallibacterium anatis and Avibacterium paragallinarum with specific serovars in the vaccination program in order to avoid egg drops caused by A. paragallinarum and Gallibacterium anatis.

Key Words: Coryza, serovarA-2, Gallibacterium, serovarB-1

Metabolism & Nutrition - Amino Acids

T141 Effect of dietary supplementation of arginine on feed efficiency and breast meat yield in fast-growing broiler chickens. Marco Zampiga*1, Massimiliano Petraccl1, Giulia Baldi1, Filiberto Ceccaroni2, Adele Meluzzi1, Sami Dridi3, Federico Sirri1 1University of Bologna; 2Gesco Consorzio Cooperativo srl; 3University of Arkansas

Understanding the amino acid requirement of modern broiler strains is fundamental to better exploit their genetic potential. Recent findings suggest that the recommended levels of dietary arginine might be suboptimal for the current fast-growing chicken hybrids. The present study aimed at evaluating the effect of the dietary supplementation of synthetic arginine on vital economic traits including feed efficiency and breast yield in broilers. A total of 1,168 1-d-old male chicks (ROSS 308) was weighed and divided in two experimental groups (9 replicates each) fed a commercial basal diet (CON group; Arg/Lys ratio 105-105-106-107 of each feeding phase, respectively) or the same basal diet supplemented with synthetic arginine (ARG group; Arg/Lys 115-115-116-117). Productive performance were recorded at the end of each feeding phase (12, 22, 33, 43 d). At slaughter (43 d), carcass and cut-up yields, and incidence of foot pad dermatitis (FPD) were assessed on each bird. Moreover, incidence and severity of breast myopathies were evaluated (n=150/group). Meat quality traits, as pH, color, drip and cook losses, AK shear force were assessed on 12 fillets/group. ARG group showed a significant lower feed conversion rate (FCR) than CON group at 12 d (1.352 vs. 1.401, respectively; P<0.05), 22 d (1.398 vs. 1.420, respectively; P<0.01) and 33 d of trial (1.494 vs. 1.524 respectively; P<0.05). Arginine supplementation tended to improve FCR in the overall period of trial (1.646 vs. 1.675, respectively for ARG and CON; P=0.09). Body weight was significantly affected by the dietary treatment at 33 d (1.884 vs. 1.829 g., ARG and CON respectively; P=0.05). At slaughter, ARG group showed higher breast yield than CON (30.4 vs. 29.3%). No significant effect of arginine was observed on breast meat quality traits, incidence of breast meat myopathies and FPD. Overall, these results indicate that the arginine/lysine ratio currently suggested for the modern broiler genotypes is not adequate to exploit their productive potential with particular regard to feed efficiency and breast meat yield. Ongoing molecular studies will add critical insights regarding the underlying
mechanisms behind the improvement in feed efficiency and breast meat yield observed in the supplemented group.

Key Words: broiler chicken, arginine, productive performance, feed efficiency, breast yield

T142 The impact of particle size and pelleting temperature on ileal digestibility of soybean meal for broiler chickens. Antoniel Franco*, Alex Maiorka2, Rex Newkirke1, Henry Classen1 1University of Saskatchewan; 2Universidade Federal do Paraná

The objective of this work was to determine if the impact of particle size and pelleting condition on the amino acid digestibility of soybean meal (SBM) Two 21d trials were conducted. Study one examined the effect of particle size on the digestibility of SBM at four different particle sizes (649, 824, 937 and 1234µm) in a maize-based diet. Study two examined the effects of pelleting temperature on SBM digestibility in a corn-soybean diet. The SBM was pelleted at 5 temperatures in the conditioner (55, 65, 75, 85 and 95°C). The resulting pelleted SBM products were ground prior to addition to the test diets which were pelleted at 55°C and crumbled prior to feeding. In both, Ross 308 birds were randomly divided into 5 groups in trial 1 and 6 groups in trial 2. Each treatment replicated with 4 birds/cage and 5 cages/diet. Regression was completed in JMP Pro 13. Diets were fed to broiler chickens to determine the ileal digestibility of various amino acids. The digestibility of methionine, lysine, threonine, arginine, isoleucine and valine had a positive quadratic response (p<.05) as particle size increased from 649 to 824µm, but were reduced at 937 and 1234µm. Peak digestibility occurred with 824µm, except for lysine that responded with a linear decrease (p<.05) as particle size increased. This may be related to gizzard development, which reflects intestinal motility, influencing the nutrient absorption. In trial two, amino acid digestibility responded to conditioning temperature in a quadratic fashion (p<.05), with 75°C showing the highest ileal digestibility of all amino acids tested, with the exception of methionine (no effect). The lower digestibility at low processing temperatures may be explained by the presence of anti-nutritional factors that are intrinsic in the SBM. Higher temperatures likely reduced digestibility through severe denaturation of protein and the formation of indigestible protein fractions as well as Maillard reaction, that occurs between the amino acid and carbohydrate, in a presence of higher temperatures. In conclusion, a particle size around 824µm and processing temperature of 75°C are important to maximize amino acid digestibility of SBM in broiler chickens.

Key Words: Amino acids, Digestibility, Soybean meal, Particle size, Pelleting temperature

T143 The effect of a mono-component exogenous microbial protease on standardized ileal amino acid digestibility of soybean meal and full-fat soy for broilers. Aaron Cowsion1, Jose Otavio Sorbara2, Levy Teixeira1, Sandra Bonaspetti3, Aneclir Scher1, Maurilio Xavier4, Luiz Albino5, Horacio Rostagno6 DSM Nutritional Products; 7Sebra Foods; 8Universidade Federal de Viçosa/UFV, Departamento de Zootecnia

2128 male Cobb 500 broilers with an average weight of 890 g were used. Broilers were distributed in randomized blocks in a 19x2 factor arrangement (nine FFSBB or SBM samples - 40% included + a protein free diet (PFD) - 60%, without or with the addition of protease). Totaling 38 treatments and eight replicates with seven birds each. Celite was added at 1% to all experimental diets. The product used (RONOZYME ProAct) was added at a rate of 200 ppm. The effect of protease and soy source was run as a 2-way ANOVA with a full factorial arrangement of treatments and significance was set at P<.05. The contribution of various chemical characteristics of SBM or FFSB to the digestibility of the standardized ileal digestibility (SID) of amino acids was assessed using a mixed model multiple regression analysis. The SID of essential amino acids in general was higher in FFSB than in SBM (89.2 vs. 86.9%; P < .001). However, in the case of Val and Thr the digestibility was higher (P <.001) in SBM than in FFSB. The SID of Lys was increased by the addition of protease more in SBM than in FFSB resulting in a significant interaction between diet and enzyme (P<.01). Conversely, the SID of Met was increased by the addition of protease more in FFSB than in SBM, resulting in an interaction (P<.05) between diet and enzyme for this amino acid. There were no interactions between diet and enzyme for any other essential amino acid and the addition of exogenous protease resulted in increase in the SID of Thr, Ile, Leu, Val, His, Phe and Arg of around 3-6%. In general, the inherent digestibility of amino acids in SBM was a stronger predictor of protease response than was the case for FFSB. However, in most cases (the only exception was Sld Lys for FFSB), the inherent digestibility of the amino acid in the control group was a significant explanatory of protease effect (P<.05 to <.001 depending on the amino acid). The effect of protease on the SID of Met was particularly strongly predicted by the inherent SID of Met in the control. The usefulness of exogenous protease to enhance the nutritional value of soy products for broilers is clearly demonstrated.

Key Words: Enzymes, Soy, Protein, Quality, Nitrogen

T144 Broiler responses to varying balanced protein intake: economic optimization based on stochastic approach. Matheus Reis*, Nilva Sakomura, Gabriel Viana, Fernando Antayhua, Rony Lizana UNESP

The Avinesp is a broiler growth model that considers the genotype of an average or a group of individuals as well as the influence of diet and environmental factors, to predict nutritional requirements, performance, and economic responses. Simulations were performed in Avinesp model, using 25 representative individuals to estimate maximum broiler performance and profit based on different feeding programs. Five diets in the starter (1 – 21 d) and finisher (22 - 42 d) phases were formulated varying balanced protein (BP) content, resulting in 25 feeding programs. In the first phase, BP ranged from 23.87 to 20.51%, whereas in the following it ranged from 22.73 to 17.29 %. In both phases it was respected an interval of 0.10% in digestible lysine (Lys) between diets, and amino acid ratios with Lys were kept constant. The feed cost ranged from 0.77 to US 1.032 in the starter phase and from 0.705 to US 0.879 in the finisher phase. Broiler population were generated using a weighted sampling method, varying 2 genetic parameters (protein weight at maturity (1.041±0.062) and protein growth ratio (0.051±0.005)) and five weightings from normal curve (-2, -1, 0, 1, and 2 standard deviations (SD)), obtaining 25 individuals (25 different growth potentials). In total, 625 simulations were performed (25 feeding programs x 25 individuals) to predict feed intake, body weight (BW) and breast, thigh, drum, and wing weight, which in turn, had their market selling prices considered as 2.00, 5.00, 3.21, 3.80 and US 4.52, respectively. The feed cost was reduced from the revenue to calculate profit. On 42 d, BW (3358±528g), breast (859±169g), thigh (322±57g), drum (407±75g), and wing (253±43g) weights were all optimized by the BP level of 23.87 (starter) and 20.51% (finisher). Considering BW, the BP which optimized profit, was estimated in 22.75 (starter) and 19.06% (finisher), predicting a BW of 3161±410g. Based on the parts, the BP for maximum profit was estimated in 23.31 (starter) and 17.29% (finisher) which estimated breast, thigh, drum and wing weight in: 859±169g, 322±57g, 407±75g, 253±43g, respectively. These outcomes indicate that maximum performance is not always followed by maximum economic return and growth models are useful tools in nutrition and selling market decisions.

Key Words: Balanced-Protein, Chicken, Stochastic, Growth-model

T145 Muscle fiber growth, collagen deposition, and in vivo collagen synthesis in Pectoralis major at d 35 and d 57 broilers. Pramir Maharjan*, Michael Schlumbahm, Garrett Mullinen, Katie Hilton, Antonio Guerra, Barbara Mallmann, Juan Cueva, Maria Cortes, Judith England, Casey Hanning, Craig Coon University of Arkansas

A study was conducted to understand muscle fiber growth over age, collagen deposition at age d57 and in-vivo soluble and insoluble collagen fractional synthesis rate (FSR) at two different ages in Cobb 700 broilers. Birds were fed standard Cobb 700 diet throughout the study except the amino acid levels (120% of recommended level). For muscle fiber study,
Metabolism & Nutrition - Enzymes

T146 The Effect of Different Levels of Nano Selenium on Growth Performance, Meat Quality and Quantity Traits of Broiler Chickens

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This study was carried out to investigate the effect of different levels of nano selenium (Nano-Se) as a source of Se on growth performance, quantity and quality carcass of broiler chickens in the starter period. A total of 240 one-day male broilers (Ross-380) distributed in a completely randomized design with four treatments. Four replicates with 15 birds were allocated to each experimental unit and birds were reared for 21 days. Experimental diets were T1 (control), T2, T3, T4, and T5 supplemented with 0.2, 0.4 or 0.6 mg Nano-Se/kg, respectively, with ad-lib feed and water throughout the experiment. Body weight (BW), feed intake (FI) and feed conversion ratio (FCR) were recorded as weekly. At the end of the experiment, two birds from each experimental unit were selected and after slaughtering, separation of carcasses, thigh and breast samples were stored in -20°C until analysis of meat quality traits. The results indicated that body weight, FCR, dressing carcass, breast and thigh weight were higher in birds fed diet T2 (0.4 Nano-Se) than the other experimental groups (P<0.05). Dry matter and crude protein in the breast and thigh muscle was higher (P<0.05) in birds fed diet T1 (0.4 Nano-Se). Regression analysis was performed to estimate optimal dietary Nano-Se level in the presence of linear or quadratic responses. According to the linear model, the optimal level of Nano-Se from hatch to 21 d of age were 0.31 and 0.34 mg/kg for LBW and dressing weight respectively. In conclusion, the results of the present research showed that addition of Nano-Se (as a source of Se) during the starter period could be improve performance, slaughter yields and carcass quality of broilers.

Key Words: Broiler, Performance, Nanoparticles, Selenium, Carcass

T147 Corn particle size separation and hammer mill performance

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Corn particle size (PS) is a relatively unexplored topic regarding its impact on commercial poultry performance. Additionally, there are potential feed fabrication aspects to consider, as mills could potentially save machine energy, wear, and money by modifying PS. Two hammer mills (100 and 150 HP Sprout, model 3818) were used to generate four ground corn treatments (Wenger Feeds, LLC) with goal geometric mean diameters (GMD) of 600, 900, 1200, and 1500 µm. Random samples of the corn treatments were taken for DM, ME, ether extract, crude protein, crude fiber, and ash determinations in triplicate. Particle size distribution was measured using a W.S. Tyler sieve shaker (ASABE procedure S319.4) and GMD and geometric standard deviation (GSD) were calculated. Energy expenditures of the hammer mills were investigated for electrical usage to grind the corn to each given PS treatment. Percent separation data was analyzed using the GLM procedure of SAS (9.4) with Tukey’s test for multiple means comparison with application of an arcsine transformation on all percentage data and significance determined at a threshold of P<0.05. Percent separation between treatments revealed the 3360 and 2380 µm screens held the greatest percentage of 1500 µm corn at 53.28% compared to the 600, 900, and 1200 µm corn (P<0.0001), while the remaining screens held no more than 13.89% each. The 1190 and 841 µm screens trapped the most significant amount of the 600 µm treatment corn at 16.74%, and 11.41%, respectively. Feed mill measurements included power and amperage of the motors using during grinding, rate at which corn was ground in tonnes/hr (TPH), efficiency, cost ($/tonne and $/KWhr), and speed of (hr/tonne) grinding. The actual GMD of the corn PS treatments fell within 200 µm of the PS goal and the GSD was calculated to be very low between 0.30 and 0.47. Economic analysis indicated lower cost and higher TPH with greater PS. In conclusion, based on the results of hammer mill energy usage and TPH, feed mills would benefit from grinding larger PS corn for poultry diets whenever feasible.

Key Words: corn, particle, milling, separation, poultry

T148 In vitro assessment of peptide size fractionation with endogenous proteases or endogenous proteases supplemented with Astra PRO

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The objective of this work was to characterise the cleavage profiles of endogenous proteases and endogenous proteases supplemented with an exogenous protease using a soy protein isolate in an in vitro digestion model. The endogenous proteases tested in this experiment were pepsin (Roche Applied Science) and pancreatin (Sigma Aldrich). The exogenous protease tested was Astra® PRO (PRO: Danisco Animal Nutrition). Incubations containing pepsin were carried out at pH 3.7 and incubations containing pancreatin were carried out at pH 6.5. The experiment had 4 treatments: pepsin, pancreatin, pepsin + PRO and pancreatin + PRO. In all treatments, the soy protein isolate (SUPRO®760 IP) was incubated with the protease at a ratio of 20:1 at 37°C for 1 hour before being subject to liquid chromatography and mass spectroscopy. The size distribution of identified peptides was illustrated as the number of peptides within a range of m/z 100 Da, relative to the total number of identified peptides. Data were analysed using ANOVA and means separated with Tukey’s. The endogenous proteases tested in this experiment were pepsin (Roche Applied Science) and pancreatin (Sigma Aldrich). The exogenous protease tested was Astra® PRO (PRO: Danisco Animal Nutrition). Incubations containing pepsin were carried out at pH 3.7 and incubations containing pancreatin were carried out at pH 6.5. The experiment had 4 treatments: pepsin, pancreatin, pepsin + PRO and pancreatin + PRO. In all treatments, the soy protein isolate (SUPRO®760 IP) was incubated with the protease at a ratio of 20:1 at 37°C for 1 hour before being subject to liquid chromatography and mass spectroscopy. The size distribution of identified peptides was illustrated as the number of peptides within a range of m/z 100 Da, relative to the total number of identified peptides. Data were analysed using ANOVA and means separated with Tukey’s. Approximately 2600-2700 peptides were detected in each digest apart from the pancreatin treatment which generated 3278 peptides. The relative size distribution was similar between pepsin and pepsin + PRO. In both cases around 13% of the peptides detected were 0-1000 kDa, 58-59% of the peptides were between 1000-2000 kDa and 27-28% were >2000 kDa. Peptides generated by the pancreatin alone had a size distribution with a