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Campylobacter jejuni as a Primary Colonizing Biofilm Former

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Campylobacter jejuni can be difficult in the environment and extremely fragile, therefore carry-over between flocks has been difficult to explain. The aim of the study was to determine if the survival of *C. jejuni* outside the host could be due to a capability to form biofilms. In these experiments, *C. jejuni* was cultured under conditions of starvation, temperature variations, different cell concentrations, after passage through a chick gastrointestinal tract or with a conditioning film. However, no evidence of attachment and biofilm formation was found outside of growth conditions. Since growth conditions usually do not occur outside the host, it may be concluded that *C. jejuni* is most likely not a primary biofilm colonizer outside the host. These studies indicate that *C. jejuni* may utilize a strategy other than primary biofilm formation to survive outside the host. *(International Journal of Poultry Science 8 (1): 1-6, 2009;* ***doi:*** *10.3923/ijps.2009.1.6)*

Influence of Rearing Photoperiod and Age and Mode of Transfer to Final Photoperiod on Performance in Egg-Type Pullets

Peter D. Lewis, Linda Caston and Steve Leeson

Lohmann White pullets were reared on 6, 9 or 12-h photoperiods and abruptly transferred to 14 h at 16 or 18 weeks or in a series of increments from 16 weeks. Body weight at and feed intake to 16 and 18 weeks increased with photoperiod. There were no interactions of rearing photoperiod with photo stimulation age/mode for any performance parameter. Sexual maturity was advanced by rearing on the longer photoperiods and by photostimulating at 16 rather than 18 weeks. Birds reared on 9 or 12 h laid significantly more eggs than 6-h birds, but neither age nor mode of photostimulation significantly affected egg production. Egg numbers were significantly correlated with age at sexual maturity. Mean egg weight was significantly heavier for pullets reared on 9 or 12 h than on 6 h, despite the former's earlier maturity and for birds photostimulated at 18 rather 16 weeks. Mean daily feed in the laying period was not significantly affected by rearing photoperiod or photostimulation age/method and shell quality, though significantly reduced by rearing on longer photoperiods, was minimally affected by the lighting regimens in practical terms. The trend towards rearing egg-type pullets on longer photoperiods was vindicated, irrespective of photostimulation

age or method. *(International Journal of Poultry Science 8 (1): 7-13, 2009; **doi**: 10.3923/ijps.2009.7.13)*

Use of Organic Acid, Herbs and Their Combination to Improve the Utilization of Commercial Low Protein Broiler Diets

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Two experiments were conducted to investigate the growth performance, carcass characteristics, organ weights, plasma proteins and fecal N excretion in broilers fed a 18% crude protein diet supplemented with *Thymus vulgaris*, *Curcuma longa*, citric acid, lactic acid or their combinations. In the first experiment, 98 broiler chicks were fed a control diet or a control diet with 0.2% Thyme (TH), 0.2% *Curcuma longa* (CL), 0.2% Citric acid (CIT), 0.2% TH + 0.2% CL, 0.2% TH + 0.2% CIT, 0.2% CL + 0.2% CIT. In the second experiment, 98 broiler chicks were fed a control diet with 0.2% TH, 0.2% lactic acid (LAC), 0.2% CIT, 0.2% TH + 0.2% LAC, 0.2% TH + 0.2% CIT, 0.1% LAC + 0.1% CIT. Addition of 0.2% TH, or TH + CIT increased weight gain in 21 day-old birds in experiment 1 ($p<0.05$). Addition of supplements did not produce any significant increase in day 42 body weight. No significant effect of supplements on carcass characteristics, feed conversion, plasma proteins or organ weights were observed except for liver which was higher in birds fed CIT (experiment 1) ($p<0.05$). No difference was observed in the total protein, albumen or globulin in the plasma. No difference was noticed between dietary treatments on the percentage of fecal Nitrogen (N), AME or Nitrogen retention (NR). Although not significant, the birds fed TH + CL excreted 12.9% less fecal N than Control birds. Similarly, the NR was 13.25% higher in TH + CL when compared with Control birds. Considering the role of low protein diets in reducing feed cost and fecal N excretion, further studies are needed to evaluate the role of plant extracts and organic acids and their optimal levels for broiler birds fed a low protein diet that are raised under suboptimal commercial conditions. *(International Journal of Poultry Science 8 (1): 14-20, 2009; **doi**: 10.3923/ijps.2009.14.20)*

Chicken Management Systems and Egg Production in Delta State Nigeria

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The study was necessitated by the need to stir the minds of chicken egg producers towards adopting the best chicken management system. The extensive system of

rearing chicken for egg is old and still remained the most popular in the study area. Commercial eggs production was carried out on a large scale by the few farmers who practiced the intensive (battery cage) chicken management system. A significant ($p < 0.05$) and high degree of positive relationship ($r = 0.70$) was found between chicken management system and level of egg production. Majority of the farmers would require general education, fund and technical training in poultry production to enable them adopt the intensive (battery cage) management system of rearing chickens for egg production. Mostly local chickens were reared under the extensive system. No matter the popularity, the extensive system of rearing chickens lacks the potential for increased egg production. Egg protein is regarded as luxury to the extent that children who consume eggs are regarded as thieves among most of the poor in Nigeria. More poultry farmers need to embrace the intensive (battery cage) system in order to meet the egg protein needs of the people of Delta State, Nigeria. *(International Journal of Poultry Science 8 (1): 21-24, 2009; **doi:** 10.3923/ijps.2009.21.24)*

Animal Feed Additive and the Effect of the *Fusarium* Toxin Deoxynivalenol on the Electrophysiological Measurement of Transepithelial Ion Transport of Young Chickens with Ussing Chamber Technique

W.A. Awad, K. Ghareeb and J. Böhm

The presence of mycotoxins in poultry feeds is a significant factor for financial losses to animal industries. Ingestion of mycotoxin-contaminated feed by chickens causes injury to the gastrointestinal tract. DON has negative effects on the active transport of some nutrients in the small intestine of chickens. We tested the hypothesis that prefeeding with probiotic (*Eubacterium* sp.) or inulin, as a prebiotic, would attenuate these effects. Whereas, there is evidence in chicken that dietary supplementation with probiotic and prebiotic affect the intestinal microflora, increased the paracellular permeability and increased the villus length and villus area of the small intestine. The question of whether these changes affect the toxic effects of DON on the electrogenic glucose transport in the chicken intestine or not needs to be clarified. Therefore, an experiment was conducted to study the effects of DON in the presence or absence of dietary (*Eubacterium* sp.) or inulin on the electrophysiological response of the gut to glucose. The results indicated that in the absence of clinical signs and without impaired performance, DON appeared to alter the gut function of broilers. The addition of *Eubacterium sp.* may be useful in counteracting the toxic effects of DON on intestinal glucose transport. But, the dietary inulin supplementation of the broilers improved the glucose transport in the presence of DON and kept it at normal levels. *(International Journal of Poultry Science 8 (1): 25-27, 2009; **doi:** 10.3923/ijps.2009.25.27)*

Possible Effect of Antibiotic-Supplemented Feed and Environment on the Occurrence of Multiple Antibiotic Resistant *Escherichia coli* in Chickens

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The purpose of this study was to determine the occurrence of antibiotic resistant *Escherichia coli* isolated from chicks and chickens. This study was carried out on three flocks of birds fed commercial feeds supplemented with antibiotics from three commercial farms. The chicks and chickens in the fourth flock were reared in a chicken house, given feed without antibiotic supplementation. Cloacal swabs were taken from 50 birds per flock at 1, 21 and 42-day old. A total of 507 *E. coli* were isolated from these birds. The resistance of *E. coli* isolated form 1-day-old chicks to chloramphenicol (10 μg), cephalothin (30 μg), cephalaxin (30 μg), enrofloxacin (5 μg) and neomycin (30 μg) was 0-45% compared to the other four antibiotics, nalidixic acid (30 μg), streptomycin (10 μg), tetracycline (30 μg) and trimethoprim (5 μg) which was 75-100%. The rates of resistance to antibiotics increased with the age of the chicks. Most of the isolates were resistant to at least 6 to 7 antibiotics. The highest rates of resistance to antibiotics were seen in 21 and 42 day old chickens. *Escherichia coli, Klebsiella* and *Pseudomonas* sp. isolated from feed samples were resistant to 4-9 antibiotics. The study suggests that the colonization antibiotic-resistant *E. coli* in the intestinal tracts of chicks and chickens were not necessarily due to the use of antibiotics in the feed as supplementation but may also be acquired from the immediate "contaminated" environment. *(International Journal of Poultry Science 8 (1): 28-31, 2009;* ***doi:*** *10.3923/ijps.2009.28.31)*

Response of Broiler Chicks to Graded Levels of Alphamune G Supplementation

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A study was conducted on 120 day-old broiler chicks fed graded levels of Alphamune G (0.00, 0.04, 0.05 and 0.06%) in a Completely Randomized Design. The experiment was conducted for 8 weeks. Feed intake and weight gain were significantly influenced ($p<0.05$) by the inclusion levels of Alphamune G. Broiler chicks fed 0.04% inclusion level of Alphamune G had the highest weight gain (35.85 g) with the least feed to gain ratio (2.36). Carcass characteristics also revealed broiler chicks on 0.04% inclusion of Alphamune G to be significantly better than the control diet in weight of keel, drumstick and thigh (20.65, 13.79

and 12.22 g, respectively). Heamatological values did not show any significant effect ($p>0.05$) except in PCV value where 0.04% inclusion of Alphamune had significantly lower value (31.00%). However all values fall within the normal range. Histological studies revealed morphological changes in broilers fed Alphamune G supplemented diet viz- a-viz the control diet. Alphamune G at 0.04% inclusion in diets of broilers may help improve performance. *(International Journal of Poultry Science 8 (1): 32-34, 2009; **doi**: 10.3923/ijps.2009.32.34)*

Effect of Different Feed Restriction Regimes During the Starter Stage on Productivity and Carcass Characteristics of Male and Female Ross 308 Broiler Chickens

D.J. Novel, J.W. Ng'ambi, D. Norris and C.A. Mbajiorgu

An experiment was conducted to determine the effect of different feed restriction regimes during the starter stage (14-21 days) on productivity and carcass characteristics of male and female Ross 308 chickens. A 3 (feeding levels: *ad-libitum intake*, 50% *ad-libitum* intake and 75% *ad-libitum* intake) × 2 (male and female chickens) factorial arrangement in a complete randomized design was used. Feed restriction affected ($p<0.05$) live weight of chickens at the age of 21 days and male chickens were heavier ($p<0.05$) than females at the same age. Chickens on 75% *ad libitum* feeding attained complete compensation in live weight at 42 days of age while those on 50% *ad libitum* feeding did not. However, male chickens attained higher ($p<0.05$) live weights than female chickens at 42 days of age. It is suggested that 75% *ad libitum* restriction feeding during the starter stage from 14 up to 21 days of age may offer some economic advantage over *ad-libitum* feeding regimen, mainly by enhancing feed utilization. It may, therefore, be a useful nutritional strategy to reduce the cost of commercial starter grain based-diets. *(International Journal of Poultry Science 8 (1): 35-39, 2009; **doi**: 10.3923/ijps.2009.35.39)*

Effects of Dietary Energy Level and Tanniferous *Acacia karroo* Leaf Meal Level of Supplementation at Finisher Stage on Performance and Carcass Characteristics of Ross 308 Broiler Chickens in South Africa

J.W. Ng'ambi, P.M. Nakalebe, D. Norris, M.S. Malatje and C.A. Mbajiorgu

The study was conducted to determine the effect of dietary energy level and tanniniferous *Acacia karroo* leaf meal level of supplementation at finisher stage on

performance and carcass characteristics of male and female Ross 308 broiler chickens. Three hundred and sixty, 21 days old male and female broiler chickens were assigned to twelve treatments with three replications of ten birds in a 2 (sex) x 3 (dietary energy level) x 3 (tanniniferous *Acacia karroo* leaf meal level) factorial, complete randomized design. Supplementation with *Acacia karroo* leaf meal had no effect on diet intake, digestibility and live weight of broiler chickens. However, supplementation with 9 and 12 g of *Acacia karroo* leaf meal per kg DM feed reduced fat pad weights in male broiler chickens by 26 and 29% points, respectively. Similarly, supplementation with 9 and 12 g of *Acacia karroo* leaf meal per kg DM feed reduced fat pad weights in female chickens by 26% points. These reductions were achieved without any significant reduction in feed intake and digestibility. However, the physiological explanation for this effect is not clear and it, thus, merits further investigation. *(International Journal of Poultry Science 8 (1): 40-46, 2009;* ***doi:*** *10.3923/ijps.2009.40.46)*

Neem (*Azadirachta indica*) Seed Cake in the Diets of Cockerel Chickens

A.A. Odunsi, S.A. Adegbile, T.O. Akande and T.B. Olayeni

The response of cockerel chickens fed graded levels of untreated and treated neem seed cake as partial replacement of Soya Bean Meal (SBM) was investigated. A total of 180 cockerels were subjected to an 8 week feeding trial in a 3x2 factorial design. There were 6 dietary treatments: diets 1 and 2 contained Untreated Neem Seed Cake (UNSC) at 10 and 20%, diets 3 and 4 contained Water Soaked Neem Seed Cake (WNSC) at 10 and 20% levels while diets 5 and 6 contained Charcoal supplemented Neem Seed Cake (CNSC) at 10 and 20% each replacing soyabean meal. The charcoal in diets 5 and 6 was added at a dose of 4 kg/tonne of feed. Results obtained showed that Feed Intake (FI), Body Weight Gain (BWG) and Feed Cost per kilogram Weight Gain (FCWG) were significantly different ($p<0.05$) across the treatments while feed gain ratio and feed cost did not show any difference among treatment means. Cockerels on WNSC diets had higher FI and BWG while those on UNSC had the least values. FCWG was similar in WNSC and CNSC and was better ($p<0.05$) than UNSC. Cockerels fed UNSC based diets produced least result in nearly all the carcass indices measured. Bigger breast plate, thigh, drumstick and back parts ($p<0.05$) were observed for birds on WNSC diets up to 20% level of inclusion. Blood parameters did not show any significant differences ($p>0.05$) among dietary treatments. It is concluded that treated neem seedcake may replace part of SBM used in the diet of cockerel chickens at the levels studied. *(International Journal of Poultry Science 8 (1): 47-51, 2009;* ***doi:*** *10.3923/ijps.2009.47.51)*

Experimental Vaccination Against Newcastle Disease in Japanese Quails (*Coturnix coturnix japonica*): Clinical and Immunological Parameters

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Clinical and immunological parameters of vaccinated Japanese quails against Newcastle disease were evaluated. Two-hundred and forty birds were distributed into five different experimental groups, vaccinated or not against Newcastle Disease (ND): G1 (Ulster 2C strain), G2 (B1 strain), G3 (LaSota strain), G4 (LaSota strain inactivated and emulsified in mineral oil) and G5 (not vaccinated-control). The immune response was evaluated by the HI test. The vaccinations of Japanese quails with NDV LaSota strain inactivated and emulsified in mineral oil strain produced high antibody levels. Ulster 2C, B1 and LaSota live strains produced moderated antibody levels and did not cause any clinical signs associated with post-vaccinal reactions. *(International Journal of Poultry Science 8 (1): 52-54, 2009;* ***doi:*** *10.3923/ijps.2009.52.54)*

Socio-Economic Status of Women in Rural Poultry Production in Selected Areas of Kwara State, Nigeria

I. Ogunlade and S.A. Adebayo

This paper examines the socio-economic status of women in rural poultry production in selected areas of Kwara State, Nigeria. This is based on the hypothesis that there is no significant relationship between women's participation and their socio-economic status such as age, marital status, level of education and occupation. The study was conducted in selected villages in Kwara State. A total of one hundred and twenty (120) women involved in rural poultry production were interviewed using random sampling. Data collected from the study were subjected to chi-square analysis. It was discovered from this study that the ages of the women mainly ranges from 21 years to 50 years (57%-97%) across the villages. Most of the women are married (70%-100%). Many of the women have no formal education with the largest percentage at Share (63%). Majority of women involved in rural poultry production are traders (50%-73%). Most benefits enjoyed by the women through rural poultry production include income generation to buy other necessities (10%-70%), income generation for local savings (Ajo) (10%-70%), provision of meat for consumption (35%-95%), provision of meat

to entertain special guests (55%-97%), provision of meat during festive seasons (55%-97%), source of gifts (50%-100%), provision of employment opportunity through the sales of egg and chicken (40% - 75%) and improvement of household diets through consumption of eggs and meats (30% - 95%). The results of the chi-square analysis showed that the variables (age, educational level, marital status and occupation) have no significant relationship with the level of participation of rural women in poultry production. From the result, it is recommended that rural poultry production should be supported and the women should be more enlightened on how to keep their birds more successfully. *(International Journal of Poultry Science 8 (1): 55-59, 2009; **doi:** 10.3923/ijps.2009.55.59)*

Influence of Dietary Glutamine Supplementation on Growth Performance, Small Intestinal Morphology, Immune Response and Some Blood Parameters of Broiler Chickens

M.A. Soltan

The objective of this experiment was to evaluate the influence of glutamine (Gln) supplementation in the diet of broiler chickens on the growth performance, immune response as well as some blood parameters. Two hundred fifty one day old broiler chickens were allotted into five equal groups (50 chicks per each) of mixed sex. Five experimental diets were formulated to be isonitrogenous and isocaloric with different levels of Gln, first group fed on basal diets without Gln supplementation (control group), while Gln included at 0.5, 1.0, 1.5 and 2.0% and fed to chick groups (2-5) respectively for continuous 6 weeks. The results revealed that 1% Gln supplementation significantly ($p \leq 0.05$) improved body weight. Weight gain, Feed Conversion Ratio (FCR), Protein Efficiency Ratio (PER) and Efficiency of Energy Utilization (EEU) when compared with the control, while 0.5% Gln supplementation non significantly ($p>0.05$) improved broiler chick performance and the higher inclusion levels had negative effect on broiler growth performance. Moreover, 1% Gln supplementation significantly ($p \leq 0.05$) improved blood pictures, phagocytic activity, antibody production and increase immune organs relative weights, while the lower and higher Gln level had no effect. Chicks fed diet with Gln supplementation at different levels had heavier intestinal relative weights and longer intestinal villi ($p \leq 0.05$) as compared with the control. The results indicate that the addition of 1 % Gln to the broiler chick's diet improves growth performance and may stimulate development of the gastrointestinal tract and immune response, while higher level had negative effects. *(International Journal of Poultry Science 8 (1): 60-68, 2009; **doi:** 10.3923/ijps.2009.60.68)*

Effect of Spirulina on Biochemical Parameters and Reduction of Tissue Arsenic Concentration in Arsenic Induced Toxicities in Ducks

M.S. Islam, M.A. Awal, M. Mostofa, F. Begum, A. Khair and M. Myenuddin

The present study was undertaken for the effect of spirulina on biochemical parameters and reduction of tissue arsenic concentration in arsenic induced toxicities in ducks. One hundred and seventy 5 ducklings were divided into five equal groups separately. One group (T_0) of ducklings was kept as control. One group (T_1) of ducklings were given arsenic trioxide @ 100 mg/L drinking water and rest three groups of ducklings (T_2, T_3 and T_4) were given arsenic trioxide @ 100 mg/L plus spirulina in three different doses i.e. 30, 60 and 120 mg/L in drinking water daily for 90 days starting from day 15. Five birds were sacrificed from each group in every 15 day intervals and biochemical parameters were determined. All the biochemical parameters (SGPT, SGOT, ALP, LDH and ACP) were significantly ($p<0.01$) elevated in arsenic treated groups. However, the elevation of these parameters was less in arsenic plus spirulina treated groups (T_2, T_3 and T_4). The distribution of arsenic concentration was highest in liver and lowest in faeces. Maximum reduction of arsenic was recorded in all organs following highest doses of spirulina (120 mg/L). The present study reveals that spirulina may be helpful for reducing the tissue burden of arsenic in ducks. *(International Journal of Poultry Science 8 (1): 69-74, 2009;* ***doi:*** *10.3923/ijps.2009.69.74)*

Effect of Spirulina on Toxic Signs, Body Weight and Hematological Parameters in Arsenic Induced Toxicities in Ducks

M.S. Islam, M.A. Awal, M. Mostofa, F. Begum, A. Khair and M. Myenuddin

The present study, was undertaken for the effect of spirulina on toxic signs, body weight and hematological parameters in arsenic induced toxicities in ducks. One hundred and 75 ducklings were divided into 5 equal groups separately. One group (T_0) of ducklings was kept as control. One group (T_1) of ducklings were given arsenic trioxide @ 100 mg/L drinking water and rest three groups of ducklings (T_2, T_3 and T_4) were given arsenic trioxide @ 100 mg/L plus spirulina in three different doses i.e. 30, 60 and 120 mg/L in drinking water daily for 90 days

starting from day 15. Five birds were sacrificed from each group in every 15 day intervals and toxic signs, body weight and hematological parameters were recorded. Ducks of T_1 group (only arsenic trioxide) showed depression, reduced feed intake, dullness and ruffled feathers which were in mild in nature in other groups i.e. arsenic plus spirulina. In arsenic treated groups (T_1) the not gained body weight was maximum (14.93%), whereas in arsenic plus spirulina treated groups (T_2, T_3 and T_4)the not gained body weight in ducks (4.08-11.26%) were better than only arsenic treated groups. Reduction of TEC, Hb and PCV values and rise of ESR values were significant ($P<0.01$) in T_1 (arsenic treated) groups. However, in arsenic plus spirulina treated rest groups reduction of TEC, Hb and PCV were less than arsenic treated groups. The present study reveals that spirulina may be helpful for reducing the body burden of arsenic in ducks. *(International Journal of Poultry Science 8 (1): 75-79, 2009;* ***doi:*** *10.3923/ijps.2009.75.79)*

Effects of Copper Sulfate on Productive, Reproductive Performance and Blood Constituents of Laying Japanese Quail Fed Optimal and Sub-Optimal Protein

I.M. Abaza, W. Ezzat, M.S. Shoeib, A.A. El- Zaiat and I.I. Hassan

A (3X3) factorial design experiment was conducted to study the effect of three levels of crude protein (16, 18 and 20%) and three levels of copper sulfate (0, 100 and 200 mg/kg diet) as a growth promoter on productive and reproductive performances, egg quality, blood serum constituents and economical efficiency of laying quail hens through 8 weeks. A total number of 270 hens and 135 males of Japanese quail at 8 weeks of age with nearly equal body weight and average rate of laying were randomly divided into 9 groups (30 hens and 15 males each). Each group of birds was sub divided into 3 replicates (10 hens and 5 males) and each replicate was housed in one wire cage. The results showed that the layer body weights at 12 or 16 weeks and weight gain at 12-16 and 8-16 weeks of age were significantly increased with increasing crude protein level from 16-18 or 20%, while there were no significant differences between the groups fed 18 and 20% crude protein throughout the experimental intervals and the whole period. Egg number, rate of laying and egg mass of laying quail hens increased with increasing crude protein at levels 16-18 or 20% (except at 12-16 week of age), while insignificant differences were found between the groups fed 18 and 20% crude protein throughout the experimental intervals and the whole period. Addition of copper sulfate at levels of 100 and 200 mg/kg to laying quail diets significantly improved egg number, rate of laying, egg mass and feed conversion ratio except

at 8-12 weeks of age as compared with group non-supplemented with copper sulfate during the experimental period. The highest values of body weight and egg mass were recorded with 20 % protein plus 100 mg copper sulfate/kg diet, while, the best values of feed conversion and The highest values of egg number and rate of laying were recorded with 20 % protein plus 200 mg copper sulfate/kg diet from 8-16 weeks of age for quail layer as compared with other treatments. Laying quails hens fed diet contained copper sulfate levels significantly increased hatchability of fertile eggs percentage (except at 12 wks of age) as compared with those un-supplemented group. Various levels of crude protein or copper sulfate containing diets did not significantly affect on egg quality parameters, while egg yolk cholesterol was significantly decreased with increased copper sulfate levels. The highest values for total serum protein and serum albumin were recorded with experimental groups fed 18 or 20% protein levels compared with those received 16% protein diet, while serum cholesterol values were significantly decreased with increased crude protein. However, dietary copper sulfate supplementation reduced serum tri-glycerides, total cholesterol and low density lipoprotein cholesterol, but increased serum high density lipoprotein cholesterol. The best value of economic efficiency was recorded with laying quail hens fed 18% protein with 100 mg copper sulfate/kg diet compared with other treatment groups. *(International Journal of Poultry Science, 8 (1): 80-89, 2009;* ***doi:*** *10.3923/ijps.2009.80.89)*

New Approach for the Incidence of Ascites Syndrome in Broiler Chickens and Management Control the Metabolic Disorders

Mohammad Hassanzadeh

Metabolic diseases such as ascites in broiler chickens result in significant economic losses to the poultry industry. The syndrome is multifactorial and mainly caused by exogenous and/or endogenous factors. Occurrences among faster growing lines are even more pronounced under conditions that imposed an additional metabolic load on the birds such as low ambient temperature. So, particular interactions between the environmental as well as with the genetic factors, play an important role. The purpose of this paper is to review some of predisposing factors that increase ascites incidence and the preventive procedures that have emerge for reducing the incidence of metabolic disorders in broiler chickens. Additionally, spontaneous hypoglycaemia or spiking mortality syndrome is also briefly mentioned. *(International Journal of Poultry Science 8 (1): 90-98, 2009;* ***doi:*** *10.3923/ijps.2009.90.98)*

Using Different Methods to Tenderize Spent Hens Meat

N.A. Nadia Al-Hajo

The aim of this study is tenderizing spent hens meat by using cheap local materials such as bitter orange juice, vinegar, salt and sugar for 1,2, 3 and 4h, distill water is used (T_1) in curing to make it as standard. Bitter orange juice (acidity of 1.5) (T_2), vinegar (acidity of 7) (T_3), table salt (2%) (T_4) and sugar (2%) (T_5) were used. The processed meat was storied under -18°C ± 2°C for a month to investigate the influence of the type of treatment and the periods of storing and submersion on the sensory properties and chemical qualities through estimating the percentage of moisture, hydrogen number pH, volume of the released extract. A sensory properties evaluation of the qualities of flavor, juiciness, tenderness and overall acceptance was carried out. Results of curing in the different solutions revealed a decreased pH value in (T_2) and T_3; while the highest significant differences ($p<0.05$) was in samples T_4. Besides, there were no significant differences concerning the periods of curing. As far as the period of freezing is concerned, a significant increase in pH of the samples was noticed, T_4 had the upper degree. There were no significant differences concerning the periods of curing. The percentage of moisture increased significantly ($p<0.05$) of the treatment groups compared with T_1. The highest significant differences ($p<0.05$) were found in T_4. A significant ($p<0.05$) increase occurred in the percentage of moisture when it was frozen and cured. Besides, there were significant differences ($p<0.05$) concerning the period of curing. A decrease was noticed of the volume of the released extract. The highest significant ($p<0.05$) difference was in T_1 and the lowest one was in T_4. It was also noticed that significant ($p<0.05$) increase of the frozen sample, the highest significant difference ($p<0.05$) was in T_1 and the lowest one was in T_4. Results of sensory evaluation indicated the improvement of the sensory qualities of the samples treated with the different solutions especially of tenderness and juiciness. These results were reflected on the quality of general acceptance by the consumer of the samples. Results of sensory evaluation revealed that T_2 and T_4 was the best sample. Significant differences ($p<0.05$) as far as the periods of curing were noticed. Thus we can recommend using 2% salt and bitter orange juice (1.5 acidity) in curing spent hens meat. *(International Journal of Poultry Science 8 (1): 99-103, 2009;* ***doi:*** *10.3923/ijps.2009.99.103)*

Diagnosis of *Mycoplasma gallisepticum* from a Broiler Breeder Flock: Comparison of Three Diagnostics Methods

J.D. Evans, D.L. Thornton and S.L. Branton

NPIP-mandated serological screening of a multiplier breeder flock detected possible *Mycoplasma gallisepticum* (MG) exposure. The flock was quarantined and further samples including blood and choanal swabs were collected and sent to a research facility for independent testing and confirmation. Subsequent analyses included diagnosis by Serum Plate Agglutination (SPA), MG-specific Polymerase Chain Reaction (PCR) and culture identification. Results of the various diagnostic tests were compared. The findings of the various diagnostic tests were in agreement and confirmed MG infection of the breeder flock. Time requirements of the various diagnostic procedures were recorded and were 1 h, 27 h and 30 days for SPA, MG-specific PCR and culture identification, respectively. The results affirm the validity of the diagnostic procedures and emphasize the importance of timely screening and diagnostic procedures for control of MG. *(International Journal of Poultry Science 8 (2): 104-107, 2009;* ***doi:*** *10.3923/ijps.2009.104.107)*

Detection of *Mycoplasma gallinarum* by Real-Time PCR

S.A. Leigh and J.D. Evans

Mycoplasma gallinarum colonizes poultry as well as mammals, but is considered to have a commensal relationship with its hosts. Though unable to cause poultry disease by its self, reports have been published suggesting a synergism during mixed infections between *M. gallinarum* and respiratory viruses or their vaccine strains that can precipitate airsacculitis. Currently, little research is being done on *M. gallinarum* and little is known about its carrier rate in chickens and other poultry. Two primer sets were tested for their ability to detect *M. gallinarum* using real-time PCR. One set published by Lauerman amplifies a fragment from the *M. gallinarum* 16S ribosomal DNA sequence. The other set (101-2) was developed in this laboratory and amplifies a short segment of DNA that appears to be unique to some strains of *M. gallinarum*. The Lauerman primer set is specific for *M. gallinarum* and has a detection limit of 100 genomes. The 101-2 primer set is specific for some strains of *M. gallinarum*, although, it is 100-fold less sensitive than the Lauerman primer set. The 101-2 primer set appears to be unsuited for *M. gallinarum* detection, but it does provide a method of differentiating *M. gallinarum* strains by PCR. These primer sets provide a

means to rapidly determine the *M. gallinarum* carrier status of flocks by real-time PCR and will help in identifying *M. gallinarum* in mixed infections. *(International Journal of Poultry Science 8 (2): 108-111, 2009; **doi:** 10.3923/ijps.2009.108.111)*

Role of Water Hardness in Rinsing Bacteria from the Skin of Processed Broiler Chickens

Arthur Hinton, Jr. and Ronald Holser

The effect of water hardness on the ability of water to rinse bacteria from broiler skin was examined. Very hard water (total hardness = 200 ppm) was prepared by dissolving calcium chloride and magnesium chloride in distilled (soft) water and moderately hard water (total hardness = 100 ppm) was prepared by diluting 1 part very hard with 1 part soft water. After five consecutive rinses of skin in soft, moderately hard, or very hard water, samples were stomached in 0.01 M potassium phosphate buffer with 0.025% ethylenediaminetetraacetic acid to recover bacteria remaining on the skin. Bacteria in stomached rinsates were enumerated on Plate Count (PC), Levine Eosine Methylene Blue (EMB), Campylobacter (CA), Pseudomonas (PS) and Staphylococci (ST) Agars. Results indicated that significantly ($p \leq 0.05$) fewer bacteria were recovered on CA and PS Agars from skin rinsed in soft water than from skin rinsed in moderately or very hard water, and fewer bacteria were recovered on EMB Agar from skin rinsed in soft water than from skin rinsed in very hard water. Skin was also rinsed in very hard water that had been softened by adding 0, 1.0, 2.5, or 5.0% potassium citrate. Results indicated that fewer bacteria were recovered on EMB and CA Agars from skin rinsed in water softened with 5.0% citrate than from skin rinsed in water with 0, 1.0, or 2.5% citrate. Chemically softened water was not bactericidal. Findings indicate that reducing water hardness may increase the ability of water to remove bacteria from broiler skin. *(International Journal of Poultry Science 8 (2): 112-115, 2009; **doi:** 10.3923/ijps.2009.112.115)*

Effect of Prior Passage Through Laying Hens on Invasion of Reproductive Organs by *Salmonella enteritidis*

Richard K. Gast, Jean Guard-Bouldin, Rupa Guraya and Peter S. Holt

The colonization of reproductive tissues in infected laying hens is a pivotal stage in the production of contaminated eggs that can transmit *Salmonella enteritidis* infections to humans. In an earlier study, a series of passages through infected

laying hens increased the frequency at which an *S. enteritidis* isolate was deposited inside eggs. The present study evaluated the effect of *in vivo* passage of an *S. enteritidis* isolate on its ability to invade to internal tissues, including three different regions of the reproductive tract. In each of three trials, a group of laying hens was infected orally with a PT13a strain of *S. enteritidis* (prepared from a separate stock culture each time). After internal organ samples were removed from this first passage group for culturing at 7 days post-inoculation, an *S. enteritidis* isolate from the upper oviduct of an extensively infected hen was used to infect another (second passage) group of hens in each trial. The overall frequency of *S. enteritidis* isolation from internal organs increased between passages in only one of the three trials and no increases were observed between passages in the frequency of *S. enteritidis* recovery from any of the three reproductive tissue sites. Therefore, passage of *S. enteritidis* through infected chickens did not always select for either higher overall invasiveness or for a higher ability to colonize reproductive organs in the present study. *(International Journal of Poultry Science 8 (2): 116-121, 2009;* ***doi:*** *10.3923/ijps.2009.116.121)*

Immunomodulatory Effect of Recombinant Chicken Interferon-gamma (rchIFN-γ) on Specific and Non-specific Immune Responses in Chicken Vaccinated Against Newcastle Disease Virus (NDV)

Basavaraj Binjawadagi, Y. Hari Babu and E. Sreekumar

Present study was undertaken to evaluate the immunomodulatory effect of recombinant chicken interferon -gamma (rchIFN-γ) on specific and non-specific immune responses in chicken vaccinated against Newcastle Disease Virus (NDV). A total of 180 day old layer chicks (BV-300) were divided into three groups. Test Group I (TG-I) (64 chicks) was injected with 5 microgram/chick subcutaneously of rchIFN-γ along with ND vaccinations (LaSota and R_2B strains), Test Group II (TG-II) (64 chicks) was injected with same dose and route of rchIFN-γ 6 h after ND vaccinations on both occasions, whereas, third group remained as vaccinated control group (52 chicks). Haemagglutination Inhibition (HI) test and Migration Inhibition (MI) in percentages estimated by Leukocyte Migration Inhibition Test (LMIT) were conducted to evaluate humoral and cell mediated immune responses respectively. Nitroblue Tetrazolium (NBT) reduction assay was conducted to evaluate the non-specific immune response by estimating the Phagocytic Index (PI) in percentages. The test results revealed that, significantly ($p \leq 0.05$) increased specific (humoral and cell mediated) and non-specific immune

responses were recorded in the groups treated with rchIFN-γ i.e., higher results when given along with the vaccine and highest results when given 6 h after vaccinations. The results advocated that, rchIFN-γ may be used as an immunopotentiator in chicken vaccinated against NDV. *(International Journal of Poultry Science 8 (2): 122-127, 2009; **doi**: 10.3923/ijps.2009.122.127)*

The Effects of Direct-fed Microbial, Primalac®, or Salinomycin Supplementation on Intestinal Lactate Isomers and Cecal Volatile Fatty Acid Concentrations in Broilers[1]

J. Croom, M. Chichlowski, M. Froetschel, B.W. McBride, R. Qui and M.D. Koci*

Direct-Fed Microbials (DFM) are a putative alternative to the feeding of sub-therapeutic levels of antibiotics in the production of poultry and other livestock species. This study was designed to examine the effects of a commercial DFM (Primalac®), or salinomycin (SAL), a commonly used antibiotic and coccidiostat supplement, on fermentation patterns and lactate production in the cecum and the lower intestinal tract of broiler chickens. L-lactate and total lactate concentrations in the digesta fluid of the ileum decreased ($P<0.01$) with the DFM feeding in comparison to CON and SAL treatments while d-lactate concentration increased ($P<0.04$) in comparison to CON. Total cecal VFA concentration was lower ($P<0.003$) with DFM feeding and SAL than the CON. In the present study both dietary supplements, DFM and SAL, altered lactic acid and VFA concentrations in the cecum and intestines of experimental animals; however the full spectrum of mechanisms responsible for antibacterial properties and growth promotion associated with those changes remains to be elucidated. *(International Journal of Poultry Science 8 (2): 128-132, 2009; **doi**: 10.3923/ijps.2009.128.132)*

Purified Cell Wall of *Saccharomyces cerevisiae* Increases Protection Against Intestinal Pathogens in Broiler Chickens

B. Baurhoo, F. Goldflus and X. Zhao

A study was conducted to determine effects of a mannanoligosaccharide prebiotic, derived from cell wall of the yeast *Saccharomyces cerevisiae*, on morphological development of the intestines and microbial populations of the ceca and litter. Dietary treatments included: antibiotic-free diet (CTL), diet 1 + virginiamycin (VIRG; 16.5 mg/kg feed) and diet 1 + ActiveMOS (MOS; 1.5 kg/T starter diet and 1 kg/T grower diet). Each treatment was assigned to 3 pen replicates (55

birds/pen). At day 14, 24 and 34, cecal contents were used for *Lactobacilli*, *Bifidobacteria*, *E. coli* and *Campylobacter* quantification whereas litter was analyzed for *Campylobacter* and *E. coli*. At same time points, jejunum samples were used in histological analysis. MOS significantly increased goblet cell number in the jejunum ($p<0.05$) at day 24 and 34. In contrast to the CTL and VIRG diet, MOS consistently increased cecal populations of *Bifidobacteria* ($p<0.05$) at all times. Moreover, at day 34, MOS increased cecal populations of *Lactobacilli* ($p<0.05$) and reduced *E. coli* and *Campylobacter* concentrations ($p<0.05$). None of the dietary treatments altered *E. coli* and *Campylobacter* concentrations in the litter. In comparison to antibiotics, MOS, therefore, improved intestinal health conditions by increasing goblet cell number into the villi membrane, stimulating growth of beneficial bacteria and reducing colonization by pathogenic bacteria. *(International Journal of Poultry Science 8 (2): 133-137, 2009; **doi**: 10.3923/ijps.2009.133.137)*

Age-Related Effects of Varying Ammonia Concentrations on Hematophysiological Variables in Broiler Chickens

H.A. Olanrewaju, J.L. Purswell, S.D. Collier and S.L. Branton

This study examined the response of different aged birds of the same genetic strain exposed to ammonia (NH_3) at set concentrations on blood gases, electrolytes and acid-base balance under environmentally controlled conditions. The experiment consisted of a 4×4 factorial with a randomized design. The 16 treatments consisted of 4 levels (0, 25, 50 and 75 ppm) of NH_3 concentrations and 4 different ages (1-d, 7-d, 14-d and 21-d) of birds. Venous blood samples were collected at the end of each 7 d of atmospheric NH_3 exposure. Partial pressure of CO_2 (pCO_2), pH, Hematocrit (Hct) and Hemoglobin (Hb) increased significantly ($p\leq0.05$), whereas partial pressure of O_2 (pO_2), bicarbonate (HCO_3^-) and K^+ decreased with increasing NH_3 concentration compared with 0 ppm. In addition, pO_2, pCO_2, HCO_3^-, Hct, Hb, Na^+ and Anion gap (Angap) increased significantly ($p\leq0.05$), while pH, glucose and corticosterone decreased as bird's age increased. Ammonia x age interactions were observed for pH, anion gap and HCO_3^-. Plasma corticosterone concentrations were significantly different for age and were not affected by NH_3. The effect of age was more pronounced than that of NH_3 on examined variables. This effect of age on examined blood physiological variables improved as the age of birds increased from 1-d to 21-d old birds. Most blood physiological variables of different aged birds of the same genetic strain respond differently to set NH_3 concentrations of 0 to 75 ppm and younger birds have a more intense reaction to the NH_3 than older birds. *(International Journal of Poultry Science 8 (2): 138-144, 2009; **doi**: 10.3923/ijps.2009.138.144)*

Effects of Broiler Rearing Environment on Transmission of F-Strain *Mycoplasma gallisepticum* from Commercial Layer Hens to Broiler Chickens: Role of Acid-Base Balance

H.A. Olanrewaju, J.L. Purswell, S.D. Collier and S.L. Branton

Two trials were conducted concurrently to determine and compare, blood pH, blood gases, hematocrit and hemoglobin in F-strain *Mycoplasma gallisepticum* (FMG) inoculated layers and FMG contact-infected broilers. At the termination of the study, FMG-inoculated layers had the highest partial pressure of O_2 and the lowest partial pressure of CO_2 as compared with the other treatment groups. Blood pH values were unaffected by FMG inoculation. Hematocrit and blood concentrations of hemoglobin were slightly higher and HCO_3^- levels were lowest in FMG contact-infected broilers in comparison to the other treatments groups. *Mycoplasma gallisepticum* inoculated layers also resulted in a significant increase in blood concentrations of K^+, a decrease in Na^+, but no significant effects on blood concentrations of Ca^{2+} and Cl^-. There were no differences in plasma glucose, cholesterone, triglyceride and anion gap, but osmolality was significantly reduced in FMG contact-infected broilers. Results indicate that inoculation of layers with FMG vaccine results in changes in plasma acid-base status along with changes in other blood metabolic variables. However, the FMG inoculation did not prevent homeostatic regulation of acid-base balance, as indicated by constant blood pH. The significant increase in pO_2 in FMG inoculated layers is generally associated with an oxygen-dependent improvement in tissue oxygenation. Elevated arterial partial pressure of oxygen is beneficial to maximize oxygen transport capacity along with high concentrations of hemoglobin and hematocrit to carry oxygen throughout the body. It was concluded that in addition to protecting birds from MG infection, an FMG vaccine may improve the layer chicken's ability to withstand the harmful effects of stressors on their performance and well-being. *(International Journal of Poultry Science 8 (2): 145-150, 2009;* ***doi:*** *10.3923/ijps.2009.145.150)*

Epidemiological Surveillance on Environmental Contaminants in Poultry Farms

S. Essam Soliman, P.G. Reddy, A.A. Mohamed Sobeih, H. Busby and E. Sara Rowe

A total of 416 environmental samples (litter, water, swabs and air) were collected from commercial poultry farms located in Ismailia and Zagazig Governorates

during the period January through July of 2008. These samples were tested by conventional cultural methods and then were confirmed biochemically. The bacterial isolates that were identified included: *Citrobacter spp., E. coli, Klebsiella oxytoca, Proteus vulgaris, Pseudomonas aureuginosa, Salmonella sp, Shigella sp, Staphylococcus aureus, Streptococcus fecalis* and *Streptococcus pneumonie.* The suspected colonies for *Salmonella spp.* were cultured onto a selective media (Selenite F broth and S-S agar) for further confirmation. Prevalence and frequencies of the microorganisms were calculated to detect the most predominant microorganisms. Swab samples showed higher prevalence of bacterial isolates (37.7%). Samples collected from closed house system had higher prevalence of bacterial isolates in swab samples (20.5%) as compared to samples from open house system (17.2%). *Citrobacter sp* (8.3%), *Proteus vulgaris* (8.3%) and *Pseudomonas aureuginosa* (16.7%) predominated in litter samples from closed house system. *E. coli* (35.7%) predominated in air samples of closed house system. *Klebsiella oxytoca* (10.0%) predominated in water of open house system. *Salmonella sp* (35%) predominated in swab samples of open house system. *Shigella sp* prevalence was similar between water samples of opened house system (6.0%) and swab samples of closed system (5.9%). *Staphylococcus aureus* (50.0%) predominated in air of closed house system. *Streptococcus pneumonie* (17.8%) predominated in air samples of open house system. *Streptococcus fecalis* (5.3%) predominated in litter samples of open house system. A total of 266 environmental and non-environmental samples were collected during the period September of 2008 through January of 2009 by the Alabama State Veterinary Diagnostic Laboratory as part of the National poultry improvement plan. These samples were examined using highly selective media for *Salmonella sp* The positive samples were confirmed biochemically and sero-grouped. The highest prevalence of *Salmonella spp.* was in environmental swabs (38.6%) with special reference to slat swabs (10.2%), fans (8.1%) and sills (6.9%). The highest predominant group of *Salmonella spp.* was C3 (50.4%) followed by group B (24.0%) and group C2 (13.9%). *(International Journal of Poultry Science 8 (2): 151-155, 2009;* ***doi:*** *10.3923/ijps.2009.151.155)*

Allelotyping PCR for Detection and Screening of *Salmonella enterica* Serovar *Enteritidis* and *Typhimurium*

S. Essam Soliman, C. Kilpatrick, S. Mohamed Ahmed, M. Eman Abouelhassan, R. Nimmanapelli and P.G. Reddy

Classical *Salmonella* sero-typing is an expensive and time consuming process that requires implementing a battery of O and H antisera to detect 2541 different

Salmonella enterica serovars. During this study a rapid multiplex Polymerase Chain Reaction (PCR) scheme was developed to screen for the prevalent *Salmonella enterica* serovar *Enteritidis* and *Typhimurium*. By analyzing the nucleotide sequences of the genes for O-antigen biosynthesis including wba operon and the central variable regions of the H1 and H2 flagellin genes in *Salmonella*, designated PCR primers for two multiplex PCR reactions were used to detect and differentiate *Salmonella* serogroups A/D1, B, C1, C2, or E1; H1 antigen types i, g, m, r or z_{10} and H2 antigen complexes, I: 1,2; 1,5; 1,6; 1,7 or II: e, n, x; e,n,z_{15}. Through the detection of these antigen gene allele combinations, the study was able to distinguish among *Salmonella enterica* serovars *Enteritidis* and *Typhimurium*. The assays were useful in identifying *Salmonella* with O and H antigen gene alleles representing ten distinct serovars. While the H2 multiplex could discriminate between unrelated H2 antigens, the PCR could not discern differences within the antigen complexes, 1,2; 1,5; 1,6; 1,7 or e, n, x; e,n,z_{15}, requiring a final confirmatory PCR test in the final serovar reporting of *Salmonella enterica*. *(International Journal of Poultry Science 8 (2): 156-160, 2009;* ***doi:*** *10.3923/ijps.2009.156.160)*

B-Complex Alleles Immunity to *Salmonella enteritidis* in Chickens

E.S. Soliman, P.G. Reddy, R. Nimmanapelli and E.M. Abouelhassan

Six experiments were conducted during which a total of 12 congenic lines homozygous for various *B*-complex alleles, were challenged by intraperitoneal injection with either of two isolates of *Salmonella enteritidis*. Because these *B* alleles were expressed on a common genetic background and mortality differences among lines were statistically significant in three of the six trials and morbidity (body weight) differences were significant in another trial; it is suggested that *B*-complex alleles affect the degree of immunity to these isolates. When all lines and trials were compared, line 342 (*B*C/*B*C) emerged as particularly resistant, whereas lines 253 (*B*18/*B*18) and 254 (*B*15/*B*15) were more susceptible. The remainders of the lines were of neutral (intermediate) susceptibility. Sex did not appear to influence the results of the challenge, but more resistance was observed with an increase in the age at inoculation. Although the mechanism that determined this resistance is unknown it was present as early as 3 d of age and it is suggested that complement proteins, which have a known role in protection from bacterial infections and are encoded by genes located within the *B*-complex, or acute phase proteins, may account for these observations. *(International Journal of Poultry Science 8 (2): 161-165, 2009;* ***doi:*** *10.3923/ijps.2009.161.165)*

Economics of Poultry Egg Marketing in Benin City, Edo State, Nigeria

P.A. Ekunwe and G.O. Alufohai

This study examined the profitability of egg marketing as well as the market structure and marketing margin of poultry egg in Benin City, Edo state, Nigeria. Six markets (Uselu, Oliha, Ogida, Oba, Osa and New Benin markets) in Benin City were purposively selected for the study, after which ten egg sellers were randomly selected from each of the six markets giving a sample size of 60. Primary data were obtained through the use of a well-structured questionnaire and personal interview. The data obtained were analyzed using descriptive statistics, Gini coefficient and Gross margin. The results of the analysis showed that majority (96.7%) of the respondents were females. The mean age of the respondents was 45 years while the household size was 6 persons. A Gini coefficient of 0.81296 obtained in the study indicates a high level of inequality in income distribution among the respondents. The profitability analysis showed a gross margin per seller of 12,029.50 Naira ($104.61) and a net return per seller of 10,779.50 Naira ($93.74). Finally, a marketing margin of 60.67 Naira ($0.53) was obtained in the study area. *(International Journal of Poultry Science 8 (2): 166-169, 2009;* ***doi:*** *10.3923/ijps.2009.166.169)*

Combined Maximum R and Partial Least Squares Method for Wavelengths Selection and Analysis of Spectroscopic Data

N. Abdel-Nour, M. Ngadi, S. Prasher and Y. Karimi

The selection of wavelengths in multivariate analysis is of utmost importance in order to build a strong and robust predictive model. The aim of this research was to investigate the feasibility of an automated selection of sets of relevant wavelengths in Visible/Near Infra-Red (VIS/NIR) spectroscopy by combining Maximum R^2 (MAXR) method with Partial Least Squares (PLS) regression (MAXR-PLS) to build a PLS predictive model. The data used to test this method was derived from the determination of albumen pH and Haugh Unit (HU) as tools for testing the egg quality. For this purpose, 360 eggs were stored during 16 days under a temperature of 18°C and a relative humidity of 55%. For each egg, the VIS/NIR transmission spectra and the two most widely used methods for the assessment of egg quality namely the HU and the albumen pH were performed. A PLS model was built using the full spectra and compared with the models built by selected wavelengths using MAXR-PLS method. Using the mentioned method,

the correlation coefficients between the measured and predicted values were up to 95% and the Root Mean Square Error for Cross-validation (RMSECV) were 0.05 and 5.05 for pH and HU, respectively. In addition, this method reduces the complexity of the models by reducing the Latent Variables (LV). Despite the complexity of the spectral data, the Maximum R^2 method leads to a robust predictive model that uses the informative wavelengths. *(International Journal of Poultry Science 8 (2): 170-178, 2009;* ***doi:*** *10.3923/ijps.2009.170.178)*

Analysis of Morphological Traits of Geographically Separated Population of Indigenous Muscovy Duck (Cairina Moschata)

D.M. Ogah

Inter and intra specific variation among muscovy duck ecotypes from three agroecological zones of Nigeria were studied The work evaluate the morphological variation of three ecotypes (rainforest ecotypes, humid or guinea savanna and dry savanna ecotypes) covering southern or coastal region, central and northern part of Nigeria. Twelve morphological traits including weight were considered. Significant ($p<0.05$) variation exist within and between ecotypes using population coefficient of variation (ANOVA) bill height had the highest coefficient of variation 79.52 while body length recorded the least variation. There are marked differences in body morphology between sexes in all the ecotypes indicating significant sexual dimorphism. Correlation between the traits were low to high. The inter specific variations in bill structure and body morphology are indication of adaptation to the environment and influence of ecological condition. *(International Journal of Poultry Science 8 (2): 179-182, 2009;* ***doi:*** *10.3923/ijps.2009.179.182)*

Physiological Responses of Weaner Rabbits Fed Graded Levels of Poultry Litter

O.J. Owen, A.O. Amakiri and E.M. Ngodigha

A study was carried out to determine the effect of feeding graded levels of poultry litter on the physiological characteristics of rabbits. The litter was heat treated by deep stacking at a temperature range of 40.10-55°C (104.20-131°F) for 21 days. This was done to ensure pathogenic microbial safety when used as animal feed supplement. A twelve week feeding trial was conducted using 24 (2-3 months-old) Chinchilla rabbits to asses the effect of substituting Poultry Litter (PL) for Soya Bean Meal (SBM) on cortisol, total protein, cholesterol and enzyme serology of the rabbits. Soya bean meal in the diets was replaced with poultry litter at 0%

(Diet A-Control), 5% (Diet B), 10% (Diet C) and 15% (Diet D). The rabbits were divided into four groups with each group assigned to one of the four dietary treatments in a Completely Randomized Block Design (CRBD). Each treatment was replicated three times. At the end of the feeding trial, blood samples were collected from three rabbits from each treatment group for cortisol, total protein, cholesterol and enzymological analysis. Results obtained showed that the inclusion of poultry litter had no significant ($p>0.5$) effect on cortisol, total protein, cholesterol and enzymes (Serum Glutamic Oxaloacetic Transaminase (SGOT), Serum Glutamic Pyruvic Transaminase (SGPT) and Alkaline Phosphatase (ALP). However, the rabbits on Diet A (0% PL) and Diet B (5% PL) gave better values numerically in cortisol and chemical components. This study justifies the practical possibility of having poultry litter as dietary protein source for animals using rabbits as a model and also provides an environmentally and economically friendly way of disposing this pollutant. *(International Journal of Poultry Science 8 (2): 183-187, 2009; **doi:** 10.3923/ijps.2009.183.187)*

Effects of Refined Petroleum Product (Kerosene) Flame and Fumes on the Performance of Broiler Chickens

A.O. Amakiri, O.J. Owen and I.I. Iboh

An investigation was carried out to evaluate the effects of refined petroleum product (kerosene) flame on body weight gains, feed intake, feed conversion, mortality and internal organ weights (liver, lungs, kidney and heart) of broiler chickens. One hundred and twenty day old broiler birds (Aboika breed) were randomly assigned to 4 treatment groups of 30 birds per treatment, replicated thrice with 10 birds per replicate using Completely Randomized Design (CRD). Kerosene flame in a designed burner was placed 4, 8 and 12 metres from the birds respectively, which represented treatments 1, 2 and 3 while treatment 4 was in another poultry house without flame. The birds were fed *ad-libitum* on a proprietary starters mash for 5 weeks and a broiler finisher mash for 3 weeks. Water was provided *ad-libitum.* Routine inoculations and other medications were administered when due. Burning was from 6.00 am-10.00 pm daily for 56 days. Results indicated that the distances (treatments) did not significantly ($p>0.05$) affect mortality and organ weights. However, the flame distance significantly ($p<0.05$) affected weekly feed conversion, body weight gains and feed consumption. This research was a simulation of what obtains in a gas field, where gas flaring is carried out close to poultry farms and also to determine the impact of using kerosene in lanterns and stoves for brooding day old chickens. *(International Journal of Poultry Science 8 (2): 188-191, 2009; **doi:** 10.3923/ijps.2009.188.191)*

Erythrocyte Osmotic Fragility of Nera Black Fowls of Two - Age Groups

O.I. Azeez, J.O. Oyewale and O.O. Okunola

The erythrocyte osmotic fragility and other erythrocyte indices in fowls of two different age groups (7-9 week-old and 49 week-old) were studied using Nera Black strain usually raised commercially for egg production in Nigeria. Erythrocytes in the 49 week-old birds were more fragile than those in the 7-9 week-old at sodium chloride (NaCl) concentrations of 0.2% ($p<0.05$), 0.7% ($p<0.05$), 0.8% ($p<0.01$) and 0.9% ($p<0.01$). The mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCH) values were also higher in the adults, but the packed cell volume (PCV) was lower. The haemoglobin (Hb) concentration, red blood cell (RBC) count and mean corpuscular volume (MCV) were similar in the two age groups. *(International Journal of Poultry Science 8 (2): 192-194, 2009; **doi:** 10.3923/ijps.2009.192.194)*

Effect of Dietary Inclusion of Cassava Yeast as Probiotic Source on Egg Production and Egg Quality of Laying Hens

Songsak Chumpawadee, Anut Chantiratikul and Suwannee Sataweesuk

The study was conducted to investigate the effect of dietary inclusion of cassava yeast as a probiotic source on laying hens performance and egg quality. Two hundred and sixteen Roman breed laying hens (26 week of age), were used. The laying hens were randomly allocated to 24 pens containing 9 laying hens each with 6 replicates and assigned to receive one of 4 dietary treatments (1. Control, 2. *S. cerevisae* $1x10^6$ organisms/kg, 3. *S. cerevisiae* $1x10^7$ organisms/kg, 4. *S. cerevisiae* $1x10^8$ organisms/kg) in a completely randomized design. The results showed that feed intake, feed conversion efficiency, albumin weight, yolk weight and haugh unit were not significantly different among treatments ($p>0.05$). Significant differences were observed in egg production, egg weigh and shell thickness. Cassava yeast as probiotic source had positive effect on egg weigh and shell thickness, but has negative effect on egg production. The results of the present experiment showed that dietary inclusion of cassava yeast as a probiotic to laying hens seems to have minimal influence on laying hens performance. *(International Journal of Poultry Science 8 (2): 195-199, 2009; **doi:** 10.3923/ijps.2009.195.199)*

Seroprevalence, Seasonal Occurrence and Clinical Manifestation of Newcastle Disease in Rural Household Chickens in Plateau State, Nigeria

U. Musa, P.A. Abdu, I.I. Dafwang, J.U. Umoh, L. Sa'idu, U.M. Mera and J.A. Edache

A study on seroprevalence, seasonal occurrence and clinical manifestation of Newcastle Disease Virus (ND) among rural household chickens and Live Birds Markets (LBM) was conducted using haemagglutination Inhibition Test (HI) and questionnaires. A total of 1, 208 chickens reared under extensive management system in four Local Government Areas (LGAs) of Plateau State were used for the study. The seroprevalence of ND virus antibodies in rural chickens showed that there was no statistically significant ($p \geq 0.05$) difference among the four LGAs and of the 1,208 sera tested, 51.9% had detectable antibodies to NDV but only 14.1% of the chickens had HI antibody titre of $\geq 4\log_2$ which was considered as protective. About 86.2% of the chickens sampled were at risk of suffering from clinical ND. Newcastle disease outbreaks occurred year round in the villages sampled with the highest incidence of 86.6% observed from November to March (Dry season) and September to October, 8.31% (Pre-dry season). During outbreaks of ND, infected birds exhibit the following major clinical signs; nervous signs (32.4%), weakness (16.6%), whitish/greenish diarrhea (16.2%), coughing/sneezing 13.6%, anorexia 9.39% and others 11.8%. It was concluded that the prevalence of ND in the four LGAs of Plateau State is high. At the time of the study over 80% of rural chickens in Plateau State were at risk of dying from ND when exposed to a virulent NDV. It is therefore recommended that vaccination and improved management practices as a means of prevention against ND before the period of outbreaks should be instituted. *(International Journal of Poultry Science 8 (2): 200-204, 2009;* ***doi:*** *10.3923/ijps.2009.200.204)*

Maximum Profit Feed Formulation of Broilers: 1. Development of a Feeding Program Model to Predict Profitability Using non Linear Programming[1]

Sandro Cerrate and Park Waldroup

Maximum Profit Feed Formulation (MPFF) is proposed as a new approach to formulation of broiler diets which predicts the best profit for given ingredient and broiler prices, nutrient requirements and performance. Absolute and relative equations for body weight and feed intake as a function of Dietary Nutrient Density

(DND) were developed and included into the objective function of Maximum Profit Programming 3.0. Maximum performance and profitability were compared in terms of DND. Factors such as livability, temperature, processing cost, ingredient and broiler prices, starting and ending broiler prices as well as comparisons of two dynamic models, Body Weight (BW) or cut-up parts (CW), were evaluated to determine changes in DND and to compare the profitability between MPFF and Least-cost Feed Formulation (LCFF). Starter, grower and finisher DND were calculated from the mean of DND obtained by the MPFF. The maximum performances for cut-up parts and body weight were 3.250 and 3.300 ME kcal/g of DND respectively using simulations of the calculated equations, whereas the maximum profits for them were at 3.169 and 3.177 ME kcal/g respectively using the MPFF. Livability slightly decreased the DND, while temperature and processing cost did not affect the DND. However, the ingredient and broiler prices did affect the DND. As broiler meat or corn price increased, the DND was also increased but as the price of soybean meal or poultry oil increased, the DND tended to decrease. For the above variables, use of the MPFF resulted in better profits than did use of LCFF. As expected, the use of ending broiler prices produced better profitability than use of starting broiler prices. If the starting broiler prices were used, the MPFF resulted in higher profits than with LCFF and had similar pattern in profits as ending prices. The dynamic model CW estimated a narrower range of DND compared with those of dynamic model BW. Both dynamic models were more profitable than those of the LCFF model. Starter, grower and finisher DND decreased as the bird aged. This new formulation method can be used to complement least cost formulation to get the best profitability and is recommended for Ross male lines (on which the performance data was developed) with the static nutrient requirement and ingredients used. Requirements for other strains should be quantified by dose-response. *(International Journal of Poultry Science 8 (3): 205-215, 2009; **doi:** 10.3923/ijps.2009.205.215)*

Maximum Profit Feed Formulation of Broilers: 2. Comparison among Different Nutritional Models

Sandro Cerrate and Park Waldroup

Four economic nutritional models including a constant calorie-nutrient ratio (C-E:P), a variable calorie-protein ratio (V-E:Pg), a constant protein-amino acid ratio (DBP) and a variable calorie-protein ratio for the finisher period (V-E:Pd) were compared in terms of relative performance, economic nutrient requirements and profitability based on relative performance expressed as a function of nutrients, relative or real prices of feedstuffs and broilers and maximum profit feed

formulation. The relative body weight or feed intake in response to nutrient contents tended to increase or decrease respectively with particular differences for each model. The economic nutrient requirements were different for each model such as 3.139 Mcal/kg for C-E:P, 2.968 Mcal/kg and 20.7% of protein for V-E:Pg model, 22.44% of protein for DBP model, 3.167 Mcal/kg for V-E:Pd and 3.134 Mcal/kg for C-E:P-3.15 model. As the price of broilers or corn increased, the energy or protein content was increased for C-E:P, V-E:Pg and DBP models except the energy level of V-E:Pg model. However, as the Soybean Meal (SBM) or poultry oil price increased, the energy or protein content was reduced for the three models indicated above except the energy level of V-E:Pg model. Energy levels of the V-E:Pd model were kept almost constant as the broiler or ingredient price raised. Under relative price of feedstuffs and broilers the best profits depended on the model used, being more economical when the broiler or corn price increased for the C-E:P or DBP models respectively. The best profitability using real price of broiler, corn or SBM for twelve months came from the C-E:P model followed by the DBP model. From the two models, V-E:Pd and C-E:P-3.15 models, the V-E:Pd model had the best benefit but with a narrow range of growth response and economic conditions. These data suggest that the C-E:P model is the best method of formulation to maximize performance or profitability; however, for some corn price variation the DBP model can be more profitable though the carcass quality can be negatively affected. *(International Journal of Poultry Science 8 (3): 216-228, 2009;* ***doi:*** *10.3923/ijps.2009.216.228)*

Effects of Dietary Bamboo Charcoal Powder Including Vinegar Liquid on Growth Performance and Histological Intestinal Change in Aigamo Ducks

J. Ruttanavut, K. Yamauchi, H. Goto and T. Erikawa

To investigate effects of a mixture of bamboo charcoal powder and bamboo vinegar solution (SB) on growth performance and histological intestinal change, 48 mixed sex Aigamo ducks were fed the basal commercial diet supplemented with SB at 0, 0.1 and 1% *ad libitum* for 49 days. Although, feed intake, weight gain and feed efficiency were not significantly different, the growth performance tended to be improved with increasing dietary SB. In these birds, also the intestinal villus height, villus area, epithelial cell area and cell mitosis in all intestinal segments tended to be increased with increasing dietary SB and increased in 1% dietary group ($p<0.05$). Besides, protuberated cells were observed on the villus apical surface in SB groups. These histological intestinal alterations of the villi and epithelial cells suggest that the intestinal function would be hypertrophied by the

dietary SB and that the dietary SB can use at 1% level for Aigamo duck diets. *(International Journal of Poultry Science 8 (3): 229-236, 2009;* ***doi:*** *10.3923/ijps.2009.229.236)*

In vitro Efficacy Comparisons of Disinfectants Used in the Commercial Poultry Farms

Z. Moustafa Gehan, W. Anwer, H.M. Amer, I.M. EL-Sabagh, A. Rezk and E.M. Badawy

Studies have indicated variations in the degree of efficacy of the commercial disinfectants commonly used in poultry production facilities. An adequate method of *in vitro* testing was used to compare the efficacy of some of these disinfectants while testing them in conditions similar to those of the poultry facilities. Five commercially available disinfectants were tested against 7 selected bacterial, fungal and viral isolates. The obtained results indicated that, most of the tested disinfectant products were effective at the manufacturer recommended level within 30 min contact time when tested in the absence of organic matter. However, when organic matter was present longer contact times were needed to demonstrate the effectiveness. *Pseudomonas aeruginosa*, *Fusarium* species and Newcastle disease virus showed variable degrees of resistance to some of the tested disinfectant products in the presence of organic matter. Conclusively, monitoring program should be adopted regularly in poultry facilities to test the problematic microbes individually for their resistance against commercial disinfectants. *(International Journal of Poultry Science 8 (3): 237-241, 2009;* ***doi:*** *10.3923/ijps.2009.237.241)*

Response of Alexandria Cockerels Reproductive Status to GnRH (Receptal) Injection

Samar A. Elnagar

Fourty, 40 weeks old Alexandrian cockerels were distributed among 4 treatments to study the effect of GnRH analogue (Receptal) administration, on their reproductive performance. Birds of the second, third and fourth group were individually intramuscularly injected weekly with 0.1, 0.2 and 0.4 ml of Receptal, respectively for 2 months. Birds of the first group served as control. Receptal had significantly increased testosterone. Birds injected with the 0.1 and 0.2 ml of Receptal had significantly higher ejaculated volume as it increased by 49 and 38% respectively. On the other hand, the highest dose of Receptal decreased the ejaculate volume to 52 and 56% of the untreated males' volume on the first and

second month, respectively. Birds injected with the 0.1 and 0.2 ml of Receptal had significantly higher sperm concentration as it increased by 28 and 18% respectively, meanwhile, raising the Receptal dose to 0.4 ml did not show any significant difference. The 0.1 and 0.2 ml doses of Receptal had significantly higher motility as it increased to reach 133 and 129% of control respectively, meanwhile, birds treated with 0.4 ml of Receptal had similar sperm motility as the controls. Cholesterol has increased significantly in a dose dependent manner. Total protein did not show significant differences except with the medium dose of Receptal as it increased to reach 112% of controls level. Seminal plasma constitutes showed a reflection of the blood status. It was concluded that the synthetic GnRH was capable of improving 40 week old cockerels' reproductive status. *(nternational Journal of Poultry Science 8 (3): 242-246, 2009;* ***doi:*** *10.3923/ijps.2009.242.246)*

Diurnal Fluctuation in Haematological Parameters of the Domestic Fowl in the Hot Humid Tropics

O.I. Azeez, A.A. Oyagbemi and J.O. Oyewale

Diurnal fluctuation in haematological parameters such as packed cell volume (PCV), red blood cell (RBC) count, haemoglobin concentration (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and erythrocyte osmotic fragility of the domestic fowl in the hot humid tropics was investigated using Nera Black cocks. Blood samples were collected from the birds at 6:00 am, 10:00 am, 2:00 pm, 6:00 pm, 10:00 pm and 2:00 am during a 12-hour light and a 12-hour dark period. PCV showed considerable diurnal variation with the lowest value obtained at 10:00 am and the peak value recorded during the early morning (2:00 am). RBC, Hb, MCH and MCHC values also varied according to the time of the day, with the lowest values observed at 2:00 pm, probably as a result of haemodilution following increased feed and water consumption at this period of the day. Peak values for RBC, Hb, MCH and MCHC were observed at 10:00 pm when the birds were already roosting (during the dark phase of the day) as a result of which physical and metabolic activities were generally lowered. Haemoconcentration so produced might be responsible for the higher haematological parameters during the night because the birds were neither eating nor drinking water at this period of the day. Erythrocyte osmotic fragility at 0.3% NaCl concentration was also significantly higher ($P < 0.05$) at 6:00 am than at any other period of the day. *(International Journal of Poultry Science 8 (3): 247-251, 2009;* ***doi:*** *10.3923/ijps.2009.247.251)*

Pathogenicity for Chickens of Avian Influenza Virus Strain H9N1 Isolated from Water Coot in India

B.P. Shankar, R.N.S. Gowda, B.H. Manjunath Prabhu, B. Pattnaik, S. Nagarajan, S.S. Patil H.K. Pradhan

Avian Influenza (AI) is caused by Type A Influenza virus belonging to the family *orthomyxoviridae*, which is classified into 16 HA and 9 NA subtypes based on two surface glycoprotein's Haemagglutinin (HA) and Neuraminidase (NA). Influenza A viruses are divided into 2 distinct pathotypes on the basis of their virulence, highly pathogenic and low pathogenic. Highly pathogenic AI viruses are restricted to H5 and H7 subtypes and these are capable of causing severe respiratory disease and high mortality in infected chickens and can be transmitted directly to humans. In the present study one H9N1 (A/Wc/India/5844/05) Avian Influenza virus was isolated from Water Coot sample. Virus isolate showed HI titer of 1:128 with H9 subtype specific serum. RT-PCR, using HA gene specific primers yielded specific amplicons of 488bp. Intravenous Pathogenicity Index (IVPI) test was conducted by inoculating 0.2 mL of 4HA unit of 1:10 diluted virus to 3 week old chicks and observed for 10 days. Two birds were showed mild respiratory distress on 3rd and 5th day after inoculation, recovered on 7th day. All birds were sacrificed after ten days. The H9N1 virus showed an IVP index of 0.05/3.0, it indicates the present H9N1 virus isolated in India is of low pathogenic. Grossly 2 birds were showed thigh muscle hemorrhages with mild congestion of spleen, liver and lung. Microscopically hyperactive mucus glands, ballooning, infiltration of lymphocytes with deciliation in trachea, congestion with swollen neurons in brain, secondary lymphoid follicles in spleen, congestion, hemorrhages with heavy infiltration of lymphocytes in lung, necrosis of pancreatic gland, fibrous replacement and secondary lymphoid follicles were noticed in pancreas. *(International Journal of Poultry Science 8 (3): 252-255, 2009;* ***doi:*** *10.3923/ijps.2009.252.255)*

Performance and Economic Characteristics of Broilers Fed Varying Dietary Levels of Neem Leaf Meal (*Azadirachta indica*)

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The performance and economic indices of broilers fed varying dietary levels of sun dried Neem Leaf Meal (NLM) were investigated using ninety 'Ross' unsexed two weeks old broilers. The birds were randomly assigned to five treatment groups of eighteen birds each in which NLM was incorporated at 0, 0.5, 1.0, 1.5 and 2%

for treatments 1, 2, 3, 4 and 5 respectively. Each treatment was further replicated twice with nine birds per replicate in a Completely Randomized Design. Results showed that treatment effect on Average Final Body Weight (AFBW), Average Daily Gain (ADG), Average Daily Feed Intake [ADFI] and Feed Conversion Ratio (FCR) were significant ($P<0.05$). Birds on the 0.5% NLM had significantly ($P<0.05$) superior AFBW, ADG and FCR. ADFI of birds on the 0.5% NLM was statistically the same with the control birds but differed from the rest treatments on NLM. Gross margin analysis reveals that a profit of N707.30 is made per bird on the 0.5% NLM as against N630.97, N620.73, N621.81 and N507.06 for birds on the control, 1.0, 1.5 and 2.0% NLM respectively. It is concluded that inclusion of 0.5% NLM in the diets of broilers will support optimum performance and economic benefit. *(International Journal of Poultry Science 8 (3): 256-259, 2009; **doi:** 10.3923/ijps.2009.256.259)*

Rapid Detection of Highly Pathogenic Avian Influenza H5N1 Virus by TaqMan Reverse Transcriptase-Polymerase Chain Reaction

B.P. Shankar, R.N.S. Gowda, B. Pattnaik, B.H. Manjunath Prabhu, S.S. Patil and H.K. Pradhan

Highly pathogenic Avian Influenza (AI) H5N1 viruses have been spreading from Asia since late 2003. Early detection and classification are paramount for control of the disease because these viruses are lethal to birds and have caused fatalities in humans. Here we describe a TaqMan Reverse Transcriptase-Polymerase Chain Reaction Assay for rapid detection of Avian Influenza virus and for H5 subtyping by targeting HA gene of AI viruses. The assay was highly sensitive than RT-PCR and virus isolation in chick embryos. In the present study all samples (field samples) which are positive for HI and RT-PCR were tested by using TaqMan Reverse Transcriptase-Polymerase Chain Reaction Assay for reconfirmation. AI viruses (H5N1) were detected from nine samples which are received from Maharashtra during Avian influenza outbreak in India in 2006. Real-Time PCR assays was also conducted for detection of viral genome in different organs of experimental infected chickens revealed presence of the virus in all organs with high virus concentration in brain, heart, intestine and cloaca. This test allows definitive confirmation of an AI virus as H5 within hours, which is crucial for rapid implementation of control measures in the event of an outbreak. *(International Journal of Poultry Science 8 (3): 260-263, 2009; **doi:** 10.3923/ijps.2009.260.263)*

Mortality and Diseases Status in Layer Chicken Flocks Reared in Traditional Farms in Khartoum-Sudan

M.A. Babiker, A. Tawfeig, I.E. Yahia and K. Noura

Ten poultry flocks of layer chicks were followed up and monitored during the first 16 weeks in Khartoum-Sudan. The management, diseases status and the mortality during this period were recorded. through direct visits. Each flock was visited at least once a week. Information were collected from a veterinarian supervising the flock and the flock owner as well using data sheet and semi-structured interview. The management including housing, hygiene measures, vaccination practices, diseases occurred and mortality were observed and recorded. The diseases and conditions causing mortality were found to be; Newcastle Disease (ND), Infectious Bursal Disease (IBD), Salmonellosis, Coccidiosis, Chronic Respiratory Disease (CRD), Tape Worms and different physical conditions (accidental death) which occupied 41.24, 25.9, 2.6, 4.93, 1.84, 1.66 and 11.42% of the total mortality respectively. These diseases caused mortality rates ranged as follows: ND = 7.77-43.47%, IBD = 16.32-24.44%, Salmonellosis = 1.6-10.78%, CRD = 1.11-5.59%, Coccidiosis = 2.88-6.41%, Tape Worms = 0.2-5.5% and physical conditions = 0.56-10.88%. *(International Journal of Poultry Science 8 (3): 264-269, 2009;* ***doi:*** *10.3923/ijps.2009.264.269)*

Lipid Profile of Chicken (*Gallus domesticus*) in Response to Dietary Supplementation of Garlic (*Allium sativum*)

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Garlic is widely distributed and used in all parts of the world as a spice and herbal remedy for various ailments, including its role in diabetes, blood coagulation, metabolism and immune functions. But there are scanty reports regarding its effect on lipid profile in poultry. The study was conducted on 24 broiler chicks divided randomly into 3 groups, each group consisting of 8 birds. Group I birds were used as control kept on conventional diet. Group II and III birds were supplemented with garlic at the rate of 1.5 and 3.0%, respectively (on dry matter basis) of total feed for a period of 8 weeks. Lipid profile viz. total cholesterol, triglycerides, Low Density Lipoprotein (LDL), Very Low Density Lipoprotein (VLDL) and High Density Lipoprotein (HDL) were studied. The total cholesterol, triglycerides, LDL and VLDL were significantly decreased, while HDL was significantly increased by garlic supplementation in chicken upto 8 weeks of age in comparison to control group. There was a significant increase in total cholesterol with advancement of age and this increase was prevented by garlic supplementation in feed. The present findings suggest that the garlic supplementation in feed is effective in regulation of

lipid metabolism, which is the predisposing factor for the coronary heart diseases. Further, our results suggest that the garlic is effective in regulation of cholesterol level with advancement of age. In conclusion, garlic is effective in regulation of lipid profile. *(International Journal of Poultry Science 8 (3): 270-276, 2009; **doi:** 10.3923/ijps.2009.270.276)*

Economics of Alternative Incubation Technology in the Development of Subsistence Poultry Enterprise: Evidence Involving Indigenous Knowledge in Katsina State, Nigeria

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The study examined sound reasons, principles and techniques employed by subsistence farmers in the art of masterminding Nigerian native hens to incubate, hatch and brood guinea fowl chicks in Katsina State of Nigeria. Ninety subsistence poultry farmers were randomly selected without replacement from the three agricultural zones of the state. Sources of primary data were structured questionnaires, market survey and observations of field activities and interviews. Descriptive statistics, Kolmogorov-Smirnov (K-S) one sample statistics and gross margin analysis were employed in data analyses. Results showed that lack of technical know-how on incubator operations and the breeding of exotic birds, poor capital base and the broodiness of the Nigerian native hens, were the major reasons for farmers adoption of the indigenous technology. Further results showed that 33% and 39% of the farmers each can produce 3,250 and 2,200 guinea fowl eggs respectively per breeding season of about four months per annum. A gross margin of Niara 5875.00 per Nigerian native hen was obtained from the analysis. The paper concludes with emphasis on the need for mass adoption of the indigenous technology by other small-holder farmers in the country because it is economical. This can be achieved through vigorous awareness campaigns on the technology by development agencies that are interested in bettering the living standards of the rural populace. *(International Journal of Poultry Science 8 (3): 277-282, 2009; **doi:** 10.3923/ijps.2009.277.282)*

Assessment of Pathogenic Potential of Two Indian H5N1 Highly Pathogenic Avian Influenza Virus Isolates by Intravenous Pathogenicity Index Test

B.P. Shankar, R.N.S. Gowda, B.H. Manjunath Prabhu, B. Pattnaik, S. Nagarajan, S.S. Patil and H.K. Pradhan

Intravenous Pathogenicity Index (IVPI) test was conducted to assess the pathogenicity of two H5N1 (A/Ck/Ind/7966/06 and A/Ck/Ind/7972/06) AIV

isolates. Both the H5N1 virus isolates were isolated from natural outbreaks during 2006, both isolates caused death of all birds with in 48 h after inoculation experimentally, birds showed typical clinical signs, gross and microscopic lesions of Avian influenza. IVPI of A/Ck/Ind/7966/06 and A/Ck/Ind/7972/06 was 2.96 and 2.95 respectively. This test showed that both H5N1 isolates are highly pathogenic. Virus could be re-isolated from all the organs of infected chickens and it was reconfirmed by RT-PCR using WHO and Lee primers. *(International Journal of Poultry Science 8 (3): 283-290, 2009;* ***doi:*** *10.3923/ijps.2009.283.290)*

Influence of Some Dietary Organic Mineral Supplementations on Broiler Performance

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A trial was set up to evaluate the influence of some dietary organic mineral supplementations on broiler performance. A total of 1,500 day-old Ross 308 broiler chicks was allotted into 10 groups with 3 replicates of 50 birds each. Two control diets (negative control with inorganic minerals and positive control with organic minerals) were formulated to meet nutrient requirements of chicks recommended for Ross 308. The premix was formulated to contain the requirements of trace elements in combination of either inorganic (sulphate form) or organic form (peptide chelate form). Diets were supplemented with the organic form of zinc, copper, manganese or iron (peptide chelate at the rate of 50% or 100% of the total requirements of the elements recommended for Ross broiler chicks). Production performance was measured during the 35 day trial period and mineral excretion was evaluated at 28 day of age. Results indicated that chicks fed diets containing 100% organic minerals (Zn, Cu, Mn and Fe) had significantly higher body weight, better feed conversion, higher % tibia ash and higher immunity compared with those of inorganic control minerals treatment. Also, when organic minerals were fed as a single element while the rest of minerals were inorganic forms at a level of 100% or 50%, the performance parameters were not significantly different from those resulted from all organic minerals together but were significantly better than those of inorganic control treatment. Fecal mineral excretions from broilers receiving the organic mineral diets were lower than those of inorganic control treatment. No significant effects were observed on muscle characteristics among the different treatments. However, organic mineral diets had a positive effect on economic efficiency. It is concluded that replacing inorganic minerals with organic sources improved bird's performance and enhanced immune response of chicks. *(International Journal of Poultry Science 8 (3): 291-298, 2009;* ***doi:*** *10.3923/ijps.2009.291.298)*

A Model for the Genetic Employment of Chickens Local to Warm Climate 1. Crossing with a Fast Growing Strain and Growth Patterns of the Crossbreds

Essam A. El-Gendy

A breeding program aims to develop a chicken population inherent for heat tolerance and fast growth was started using a naked-neck local breed in Egypt that performs heat tolerance. The local breed was crossed with the sire line of a normally feathered commercial broiler strain. The crossbreds were raised in a heating treatment (35°C from hatch to 6 weeks, then reduced to 24°C) or a non-heating treatment (35°C from hatch to 3 days, and reduced gradually to reach 24°C). Body weights of the crossbreds, across ages, were significantly around twofold heavier than those of the locals. The crossbreds weighed 641.8 g at 6 weeks of age versus 303.0 g for the locals. The 2-4 week growth rate was 73.7% for the crossbreds versus 60.2% for the locals. The Na/na crossbreds were significantly heavier than na/na crossbreds when heated, and the differences were not significant when non-heated. The spread of 6-week body weights of the crossbreds was remarkably different from that of the locals and the difference was mainly attributed to the variation brought in through the flow of genes. The heterotic effects on body weights were significant in both heated and non-heated crossbreds and expressed a large source of non-additive genetic variation. Heterosis estimates in body weights and growth rates were age and environment specific, and were significantly higher for the heated than for non-heated crossbreds, indicating the flow of genes influence growth and heat tolerance. The results demonstrate remarkable changes in the frequencies of non-allelic genes that influence growth and propose the genetic selection for increased 6-week body weight in the naked-neck and normally feathered crossbreds. *(International Journal of Poultry Science 8 (3): 299-306, 2009; **doi:** 10.3923/ijps.2009.299.306)*

Effect of Protein and Amino Acid Levels on Bone Formation in Diets Varying in Calcium Content[1]

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The effect of different dietary levels of amino acids, calcium and phosphorus as influenced by phytase supplementation was evaluated in broiler chickens. The

experimental design consisted of a 3 x 4 x 2 factorial arrangement with three levels of digestible lysine (1.10, 1.30 and 1.50%), four levels of calcium (0.50, 0.70, 0.90 and 1.1%) and diets containing 0.35% AP with and without phytase for a total of 24 treatments. Remaining amino acids levels were adjusted with respect to the digestible lysine level using the ideal ratios suggested by Rostagno *et al.* (2005). Each experimental diet was fed to six replicates pens of five male chickens during 21 days. Body weight, FCR, feed intake, bone development (TD), bone mineralization (toe ash), and phosphorus excretion as Total Phosphorus in excreta (TP), Water Soluble Phosphorus in excreta (WSP) and the WSP/TP ratio were evaluated. Birds fed lysine levels higher than 1.1% expressed better body weight in a non-linear trend. Feed intake was decreased by increasing the lysine level while feed conversion improved as lysine level increased. Increasing levels of Ca decreased feed intake, the 1.1% Ca level was detrimental for body weight. Phytase supplementation was effective to alleviate widened-suboptimal Ca:P ratios in terms of feed intake and body weight. The 1.5% digestible lysine level improved toe ash; however, high levels of lysine were also related to a higher incidence of TD. Ca levels equal or greater than the NRC (1994) recommendation were adequate for optimum bone mineralization. Increasing levels of Ca reduced the incidence and severity of TD. Moreover, Ca levels greater than those suggested by NRC (1994) were adequate to assimilate higher lysine levels without compromising bone development. The higher lysine levels fed reduced TP in excreta but increased the WSP/TP ratio. The supplementation of phytase increased WSP and the WSP/TP ratio. Increasing levels of Ca reduced WSP and the WSP/TP ratio in excreta. Furthermore, high levels of Ca were also effective to overcome the increased WSP and WSP/TP ratio caused by the supplementation of phytase. *(International Journal of Poultry Science 8 (4): 307-316, 2009; **doi:** 10.3923/ijps.2009.307.316)*

Effect of Dietary Protein and Peptide in Corn-Soy Diets on Hen Performance, Egg Solids, Egg Composition and Egg Quality of Hy-Line W- 36 Hens During Second Cycle Phase Three

P. Gunawardana, G. Wu, Kun Yuan, M.M. Bryant and D.A. Roland, Sr.

A 5 × 2 factorial arrangement of five protein levels with and without Peptiva was conducted to evaluate the effect of Peptiva on performance, egg composition, egg solids, and egg quality of commercial Leghorns. Hy-line W-36 hens (n=1200, 98 weeks old) were randomly divided into 10 dietary treatments (8 replicates of 15 hens per treatment). The experiment lasted 12 weeks. Protein had a significant

effect on feed consumption, egg weight, egg production, egg mass, egg specific gravity, egg albumen solids, and percent egg components. As dietary protein increased from 13.53 to 15.62%, egg production, feed consumption and egg weight increased by 6.14%, 8.2% and 5.18% respectively. Feed consumption of hens fed the diets supplemented with Peptiva was significantly lower than that of hens fed the diets without Peptiva. Peptiva supplementation also significantly increased egg production of hens during week 98 and numerically higher in week 99, 103, 105, 106, 107, 109 and overall egg production. There was also a significant effect of peptiva on egg mass and feed conversion during first week but the significant effects were lost after second week. Peptiva significantly decreased feed intake without causing any adverse effects on egg weight and egg production. Peptiva might be more beneficial for young hens. More research is needed with young hens to evaluate performance and profits of commercial layers at different egg and ingredient prices. *(International Journal of Poultry Science 8 (4): 317-322, 2009;* ***doi:*** *10.3923/ijps.2009.317.322)*

Effect of Dietary Energy on Performance, Egg Components, Egg Solids, Egg Quality and Profits in Seven Commercial Leghorn Strains During Second Cycle Phase Two

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This study was a 3 X 7 factorial arrangement with three dietary energy levels (low, medium and high) and seven commercial Leghorn strains. The objective of this experiment was to determine the effect of increasing dietary energy on performance, egg composition, egg solids, egg quality, and profits in seven commercial Leghorn strains during second cycle phase 2 (from 88 to 97 week of age). This experiment lasted 10 weeks. Seven strains of hens (n=245 of each strain) at 88 week of age were randomly divided into 21 treatments (6 replicates of 15 birds per treatment). Strain had a significant effect on feed intake, egg production, egg specific gravity, egg weight, percent whole egg solids, and haugh unit. There were no interactions between strain and dietary energy on any parameters during second cycle phase 2 (88 to 97 weeks of age). Dietary energy had no significant effect on any parameter. However as dietary energy increased, egg production, final body weight of hens, egg mass, egg yolk color and egg yolk weight numerically increased; moreover feed conversion numerically improved from 2.06 to 2.02, resulting in a 1.94% improvement of feed conversion. It is difficult to determine an ideal dietary energy level for the hens in second cycle phase 2 because increasing dietary energy had no significant effect on feed intake, egg mass and feed conversion. Because feed ingredient and egg price

vary, there can be no fixed ideal dietary energy requirement for optimal profits. *(International Journal of Poultry Science 8 (4): 323-327, 2009; **doi:** 10.3923/ijps.2009.323.327)*

The Effect of Different Feed Restriction Programs and Dietary L-Carnitine Supplementation on Hepatic Lipogenesis, Plasma Heterophil to Lymphocyte Ratio and Yolk IgY Content of Broiler Breeder Hens

M. de Beer and C.N. Coon

Two experiments were conducted to determine effects of Everyday (ED) or Skip-a-day (SK) feeding and dietary L-carnitine on lipid metabolism and stress in broiler breeders. In Experiment 1 a 2x2 factorial design was used to compare feeding regimens (ED vs SK) and L-carnitine supplementation (0 vs 50 mg/kg). L-carnitine supplementation began at d 1 and lasted throughout the 45 weeks experimental period. SK programs were implemented from 28 days of age to 5% production. Parameters measured included *in vitro* Lipogenesis (IVL), Heterophil/Lymphocyte ratio (H/L) and yolk IgY content. Liver and blood samples were taken 1 h after feeding, at various intervals during the rearing and production periods. Both SK feeding and L-carnitine increased liver wts during rearing but differences dissipated after onset of lay. Part of the increase in liver weight in SK birds was due to higher lipid contents. L-carnitine tended to reduce liver lipid during rearing. IVL was increased by SK feeding during the rearing period. L-carnitine and SK feeding interacted to increase IVL at 20, 22 and 27 weeks. H/L was elevated at 7 weeks in SK birds, but no differences were observed after that. Neither L-carnitine nor feeding regimens affected maternal IgY transfer to egg yolks. In Experiment 2, the same effects were tested but a low density grower diet was used from 4-18 weeks. The grower diet had 9% less energy and 7% less protein than in experiment 1. Liver wt was increased in SK and L-carnitine supplemented birds up to 20 weeks. By 40 weeks, ED birds had higher liver weights than SK. Liver fat was generally higher in SK birds than ED during rearing. SK feeding increased IVL but unlike Experiment 1, L-carnitine did not. H/L ratio was elevated in SK up to 20 weeks of age after which no differences occurred. L-carnitine did not affect H/L. In conclusion, feeding regimens and L-carnitine can alter hepatic lipid synthesis. Feeding regimens like SK, incorporating lengthy periods without feed can result in elevated H/L ratios but birds are generally able to adapt to such regimens over time. *(International Journal of Poultry Science 8 (4): 328-341, 2009; **doi:** 10.3923/ijps.2009.328.341)*

Effect of Different Calcium Sources and Calcium Intake on Shell Quality and Bone Characteristics of Laying Hens at Sexual Maturity and End of Lay

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The influence of supplemental calcium given in flour or granular form and calcium intake on bone properties and egg characteristics of brown-egg laying hens was investigated at sexual maturity and at end of lay. Physical and mechanical bone characteristics were determined using 3-point and torsional tests. There was no effect of calcium source on the measured bone characteristics at sexual maturity. Bone breaking strength was positively correlated with both stiffness and total calcium intake. At 72 weeks, birds which had been offered additional calcium of either source exhibited considerably higher bone breaking strength than did control birds. Bone stiffness of birds offered limestone granules was significantly higher than control birds. Regression analysis showed strong relationships between calcium intake, bone stiffness and breaking strength. Shell quality was significantly better for birds consuming limestone in a granular form than for control birds. Shell quality for birds given limestone flour was intermediate between the other two groups. It is concluded that calcium supplementation increases egg quality, mechanical properties of the bone and as a consequence, may be able to reduce the risk of broken bones at the end of laying period. These effects are independent of the form of the supplemented calcium. *(International Journal of Poultry Science 8 (4): 342-348, 2009;* ***doi:*** *10.3923/ijps.2009.342.348)*

Influence of Herbal Early Chick Nutritional Supplement on the Growth Performance, Serum Biochemicals and Immune Response of Broiler Chicken

A.S. Kadam, M.G. Nikam, V.R. Patodkar, D.M. Muglikar, V.D. Lonkar, G.B. Yadav, S. Maini, K. Ravikanth and M.D. Meshram

The experiment was conducted on 150 day-old straight-run "Vencob" broiler chicks for a period of 6 weeks. Day old chicks were randomly divided into three groups I, II and III to evaluate effect of early chick nutritional polyherbal supplement AV/NNC/17 (supplied by Ayurvet Ltd. Baddi, India) on the performance of broilers. The control group I was given basal diet 48 h after hatch. The group II and III were treated with 6 g and 8 g of AV/NNC /17 paste per chick immediately after hatching during transportation period/day till 48 h and then

switched over basal diet up to the age of marketing. The overall results of the study indicated that the early chick nutritional supplement AV/NNC/17 @ 6g and 8 g/chick has significant effect upon early growth, gain in weekly weight, feed efficiency and carcass traits between treatment and control indicating an overall beneficial effect of polyherbal product in initial 48 hours of life. In addition to these parameters, immune response, intestinal morphogenesis, intestinal development and gut health are also recorded to improve significantly in treatment groups. *(International Journal of Poultry Science 8 (4): 349-354, 2009;* ***doi:*** *10.3923/ijps.2009.349.354)*

Nutrient Composition of Main Poultry Feed Ingredients Used in Sudan and Their Variations from Local Standard Tables Values

M.S. Babiker, C. Kijora, S.A. Abbas andand J. Danier

Sorghum (Feterita), Groundnut Cake (GC), Sesame Cake (SC) and Wheat Bran (WB) are considered the main poultry feed ingredients in Sudan. Because the nutrient values of these ingredients are reported in the form of fixed figures in local standard tables, a study was undertaken to know if it is necessary to make analyses for feed ingredients before formulating the diets. Samples of the feed components were brought from local markets of Khartoum. Each sample was analyzed for proximate composition, minerals and amino acid contents. Considerable variations were observed between samples and the local standard table's values. Crude protein of sorghum (Feterita) was 16.65%, whereas Metabolizable Energy (ME) was 14.25 MJ/kg. Values for fat, fibre and ash were 3.86, 1.97 and 1.81%, respectively. Total concentrations of critical Amino Acids (AA) were: methionine, 0.2925%; lysine, 0.3501% and threonine, 0.4822%. Levels of Calcium (Ca) and Phosphorus (P) were 0.03 and 0.41%, respectively. Crude protein of GC was 53.44%, whereas calculated ME was 11.80 MJ/kg. Values for fat, fibre and ash were 7.47, 8.55 and 5.27%, respectively. Total concentrations of critical AA for groundnut cake were: methionine, 0.4868%; lysine, 1.8185% and threonine, 1.4230%. The GC levels of Ca and P were 0.08 and 0.65%, respectively. Crude protein of SC was 44.42%, whereas calculated ME was 11.53 MJ/kg. Values for fat, fibre and ash were 13.11, 8.75 and 14.15%, respectively. Total concentrations of critical AA for SC were: methionine, 1.2852%; lysine, 1.0943% and threonine, 1.5449%. Levels of Ca and P were 1.93 and 1.17%, respectively. Crude protein of WB was 18.69%,

whereas ME was 12.43 MJ/kg. Values for fat, fibre and ash were 4.88, 8.75 and 5.66%, respectively. Total concentrations of critical AA for WB were: methionine, 0.2676%; lysine, 0.8136% and threonine, 0.6036%. Levels of Ca and P for WB were 0.08 and 1.36%, respectively. The variation observed between samples and tables values strongly indicates that confirmatory analyses should be conducted prior to use of sample for formulating the poultry diets especially in the field of research. *(International Journal of Poultry Science 8 (4): 355-358, 2009; **doi:** 10.3923/ijps.2009.355.358)*

Serum Protein Profiles of Juvenile Ring-Necked Pheasants Vaccinated or Not Against Newcastle Disease

Elizabeth Moreira dos Santos Schmidt, Antonio Carlos Paulillo, Rosangela Locatelli-Dittrich, Olair Beltrame and Janine Denadai

The aim of this study was to investigate blood protein parameters in juvenile ring-necked pheasants using Ulster 2C, B1 and LaSota vaccines strains of the Newcastle disease virus. Total serum protein, albumin and globulin concentrations showed significantly differences among vaccinated and non-vaccinated birds. Significant variations were not observed in the analyses in relation to protein electrophoresis profile. *(International Journal of Poultry Science 8 (4): 359-362, 2009; **doi:** 10.3923/ijps.2009.359.362)*

The Use of Linear Mixed Models to Estimate Optimal Vaccination Timing for Infectious Bursal Disease in Broilers in Paraguay

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The objectives of this study were (1) to fit linear mixed models for Maternally Derived Antibody (MDA) values for estimating optimal days of age for Infectious Bursal Disease (IBD) vaccination in broiler chicks and (2) to evaluate how optimal vaccination timing estimates varied, based on the field data collected in Paraguay. The MDA titres were measured by Enzyme-linked Immunosorbent Assay (ELISA) with sera collected from 20 chicks per flock (n = 14) at 1, 8 and 15 days of age. Both Restricted Maximum-likelihood (REML) and Markov Chain-Monte Carlo (MCMC) estimation methods were used to fit linear mixed models for the

dependent variable log-transformed MDA. There is a slight dissimilarity of each estimate between the two models because of the difference in mathematical algorithms and handling method of missing data. The study flocks with the earliest and latest estimated optimal timing for vaccination had a mean days of age of 15.1 [95% Bayesian Credible Interval (BCI): 13.3-17.0] and 23.7 [95% BCI: 21.7-25.7], respectively. This variation could be partly explained by a limited understanding of the true biological variability representing the variety of factors affecting MDA in the study chicks. Although the results of the study can be used as a benchmark to establish IBD vaccination programmes in the study area, it is recommended for estimating optimal IBD vaccination timing to measure the MDA level by ELISA tests on a routine basis. *(International Journal of Poultry Science 8 (4): 363-367, 2009;* ***doi:*** *10.3923/ijps.2009.363.367)*

Comparative Study of Thigh Muscles and Bones Conformation and Some Carcass Traits of Local vs. Imported Turkey Strain

N.T. Taha and M.T. Farran

Four males and four females of each of imported BUT-9 and local strain of turkey were slaughtered at marketing age, to study live body weight, som carcass traits, in addition to drumstick's bones at Tibia region "Nazarian bones[2]" which radiography and chemically analyzed for fat-free bone parameters. The results indicated that BUT-9 revealed higher ($p<0.05$) live body weight, ready to cook carcass weight percent (dressing percent), breast weight and percent, left drum-stick weight and percent as compared with local strain of turkey. BUT-9 strain also significantly ($p<0.05$) had more number of drum-stick's muscles, tibia weight and width, drum-stick's thickness and width and drum-stick's bones percent. However, local strain had significantly ($p<0.05$) more drumsticks bones "Nazarian bones" while BUT-9 had no Nazarian bones in their drum-stick's muscles. Males had more ($p<0.05$) live body weight, neck, drum-stick's width, length and tibia length, breast weight, width and depth and shank weight as a percent of live body weight. As compared with fibula there were no significant differences between those bones and fibula for dry matter, phosphorus and magnesium percents, while a significant ($p<0.05$) differences were noticed for ash and calcium. But fat percent didn't show any significant differences between Nazarian bones themselves but were noticed with fibula. Sex had no significant effect on bone parameters except for males turkey bones which had more ($p<0.05$) dry matter than females. *(International Journal of Poultry Science 8 (4): 368-372, 2009;* ***doi:*** *10.3923/ijps.2009.368.372)*

The Effect of Feed Restriction Programs and Growth Curves on Reproductive Performance, *in vitro* Lipogenesis and Heterophil to Lymphocyte Ratios in Broiler Breeder Hens

M. de Beer and C.N. Coon

An experiment was conducted to compare Everyday (ED) and Skip-a-day (SK) feeding programs and early Slow growth (SLOW) and Broilerized (BROIL) treatments. Feed restriction programs were implemented from 4 weeks to 5% production. The SLOW group was fed to reach 75% of standard BW by 12 weeks and then to reach standard BW by 21 weeks. The BROIL group was fed *ad libitum* till 7 weeks and then severely restricted to reach standard BW by 21 weeks. Parameters measured included BW, uniformity, age at Sexual Maturity (SM), total and settable egg production, body composition, liver size and composition, *in vitro* Lipogenesis (IVL) and Heterophil-Lymphocyte ratio (H/L). Breeder production performance was evaluated through 45 weeks of age. Birds fed ED grew more efficiently than SK or SLOW. The BROIL treatment resulted in significantly worse feed utilization than all other groups. Frame size was consistently greater in BROIL pullets and consistently smaller in SLOW pullets. Birds fed ED reached SM before SK, who in turn reached SM before SLOW or BROIL birds. Egg production was significantly higher in ED than SK, which in turn was higher than either SLOW or BROIL. The difference of nearly 17 total eggs per hen between ED and BROIL hens could not be explained by differences in BW or body composition. Liver weight and IVL was elevated in SK and SLOW pullets above ED pullets during rearing. Liver weight and IVL were lower in BROIL pullets than other groups during rearing, but after photostimulation dramatic increases in liver weight and IVL resulted in this trend being inverted by 27 weeks. As an indicator of stress, H/L ratios were elevated above ED pullets in SK, SLOW and BROIL pullets at various times during rearing. These times generally coincided with the periods of most severe feed restriction. Feeding regimens and growth curves have a major influence on efficiency and reproductive performance in broiler breeders. These effects were not attributable solely to differences in BW and body composition. The depression of IVL in broilerized pullets even after restricted feeding was implemented was of great interest and warrants further examination. *(International Journal of Poultry Science 8 (4): 373-388, 2009; **doi:** 10.3923/ijps.2009.373.388)*

Evaluation of the Production Performances of an Endangered Local Poultry Breed, the Famennoise

N. Moula, N. Antoine-Moussiaux, F. Farnir and P. Leroy

The Famennoise is a Belgian poultry breed which is greatly endangered. Like most of the local breeds in this situation, the Famennoise remains largely unknown and is representative of the continuous loss of genetic diversity that is threatening the future of animal production. From preliminary results, egg production traits in this breed showed valuable economic assets. The present study is, thus, aimed at assessing its production performances with the prospect that it might be conserved for future valorization. Egg production as well as growth traits were estimated. Both aspects showed exploitable performances. In absence of past selection for these traits, eggs presented a mean weight of 55.43 ± 3.03 g, so being in the middle class of marketable eggs, a yolk to albumen ratio of 50.7 ± 5.02 %, an eggshell resistance (maximal force of breakage of 36.03 ± 3.3 N) equal to commercial strains and superior to already valorized local breeds. In broilers, a mean weight 980.67 ±16.62 g was reached at 8 weeks, 1815.90 ± 36.55 g at week 12 and 2191.90 ± 48.31 g at week 15. The Famennoise is, therefore, suggested for use as a dual-purpose breed with a good potential of selection for both productions. It could further serve in crosses for improvement of commercial strains. In conclusion, it appears to be highly urgent to screen endangered local poultry breeds for economically exploitable traits which would motivate conservation programs of biodiversity, before this extraordinary scientific and economic potential get irremediably lost. *(International Journal of Poultry Science 8 (4): 389-396, 2009; **doi**: 10.3923/ijps.2009.389.396)*

Effect of Graded Level of Alphamune G on Performance, Blood Chemistry and Histology of Cockerel Chicks

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A study was conducted to determine the response of day-old cockerel chicks to graded levels of Alphamune G (0.00, 0.04, 0.05 and 0.06%). The experiment which was conducted for 8 weeks employed a completely randomized design. Feed intake and nutrient retention were not significantly influenced ($p>0.05$) by dietary inclusion levels of Alphamune G. However, weight gain and feed to gain ratio were significantly improved ($p<0.05$) for cockerel chicks fed 0.06% inclusion level when compared with the control. The values were 7.78 and 4.58 g/bird/week, respectively. Haematology and serum indices did not show any

significant effect as a result of the graded levels of dietary Alphamune G. Histological characteristics revealed slight morphological changes in specific organs of birds fed Alphamune G supplemented diet vis-a viz the control diet. Inclusion of Alphamune G at 0.06% in the diets of cockerel chicks gave the best performance. *(International Journal of Poultry Science 8 (4): 397-400, 2009; **doi:** 10.3923/ijps.2009.397.400)*

Study on Immunomodulatory Activity of Dietary Garlic in Chickens Vaccinated against Avian Influenza Virus (Subtype H_9N_2)

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Fresh garlic powder was evaluated for ability to potentiate the immune response of broiler chicks to Avian Influenza Virus (AIV) vaccine. For this purpose, 280 day-old chicks (Ross 308) were randomly allocated to 4 groups A, B (52 each) C and D (88 each). The birds in groups A and B were given control diet during the experiment, but those in groups C and D received diet supplemented with 1 and 3% garlic powder, respectively. After 2nd bleeding, half of the chicks in groups C and D were separated as groups E and F and fed control diet thereafter. On 9th day of age, the chicks in all groups except A were immunized subcutaneously against AIV (subtype H_9N_2) with a commercial oil-based inactivated vaccine (Merial, France). Fifteen chicks from each group were bled on days 14, 24 and 34 post vaccination and also 5 just before vaccination. The sera were used for antibody titration against AIV by both HI and ELISA tests. The results showed that antibody levels were considerably higher in the vaccinated chicks than those in the non-vaccinated control throughout the experimental period ($p<0.05$) but not affected by the treatment ($p>0.05$). In addition, the removal of garlic from diet had no significant ($p>0.05$) effect on serum titer. It is suggested that diet supplementation with garlic powder can not stimulate the humoral response of chickens against AIV vaccine. *(International Journal of Poultry Science 8 (4): 401-403, 2009; **doi:** 10.3923/ijps.2009.401.403)*

Antibiotic Resistance in Poultry

D.F. Apata

The worldwide increase in the use of antibiotics as an integral part of the poultry and livestock production industry to treat and prevent infectious bacterial diseases and as growth promoters at sub-therapeutic levels in feeds has led to the problem of the development of bacterial antibiotic resistance during the past years. Recent

scientific evidence has shown that resistance to antibiotics is not only due to the natural ability of a tiny fraction of the bacteria with unusual traits to survive antibiotic's attack, enabling resistant strains to multiply, but also stems from the transmissibility of acquired resistance to their progeny and across to other unrelated bacteria species through extrachromosomal DNA fragment called the plasmid which provide a slew of different resistances. The emergence and spread of resistant bacterial strains like *Campylobacter* sp, *Escherichia coli* and *Enterococcus* sp. from poultry products to consumers put humans at risk to new strains of bacteria that resist antibiotic treatment. Resistant bacteria thwart antibiotics by interfering with their mode of action via a range of effectors' mechanisms, including synthesis of inactivating enzymes, alteration in the configuration of cell wall or ribosome and modification of membrane carrier systems. These mechanisms are specific to the type of resistance developed. Because of the growing global concerns that resistance bacteria can pass from animals to humans, there is an increase in public and governmental interest in phasing out inappropriate antibiotic use in animal husbandry. Improvement in the hygienic practice of handling raw animal products and adequate heat treatment to eliminate the possibility of antibiotic resistant bacteria surviving may play a role in preventing the spread. More attention should be focused on increasing antibiotic surveillance capacity to cope with the spread of emerging resistances and on the alternative approach to sub-therapeutic antibiotics in poultry, especially the use of probiotic micro-organisms that can positively influence poultry health and produce safe edible products. *(International Journal of Poultry Science 8 (4): 404-408, 2009;* ***doi:*** *10.3923/ijps.2009.404.408)*

The Effect of Different Feed Restriction Programs and Dietary L-Carnitine Supplementation on Reproductive Performance, Efficiency, Frame Size and Uniformity in Broiler Breeder Hens

M. de Beer and C.N. Coon

Two experiments were conducted to determine the effect of Everyday (ED) or Skip-a-day (SK) feed restriction programs and L-carnitine supplementation on breeder reproductive performance. In Experiment 1 a 2 x 2 factorial design was used to compare feeding regimens (ED vs. SK) and L-carnitine supplementation (0 vs 50 mg /kg). L-carnitine supplementation began at day 1 and lasted throughout the 45 week experimental period. SK feeding programs were implemented from 28 days of age to 5% production. Feed allocation was adjusted to ensure equal BW between groups. At 21 weeks, 60 pullets from each treatment combination were housed individually. Feeding ED improved the feed conversion ratio by 0.24 units for 21 week pullets, resulted in 3 days earlier attainment of

Sexual Maturity (SM), produced 4.6 more total eggs and 5.0 more settable eggs than SK fed pullets. Uniformity was less for ED fed pullets (2.07 higher CV). Egg size was increased by 1.16g with dietary L-carnitine. Body composition was not affected by either feeding regimen or L-carnitine. In Experiment 2, the same effects were tested but a low density grower diet was used from 4-18 weeks. L-carnitine was supplemented from day 1 and SK programs began at day 28 and extended to 5% production. Feed allocation was adjusted to maintain equal BW and 80 pullets per treatment were individually housed at 21 weeks. L-carnitine and ED feeding through 21 wk improved the FCR by 0.06 and 0.12 units, respectively. Feeding ED resulted in 5.8 days earlier SM, 4.7 more total eggs and 4.4 more settable eggs than SK. Uniformity was not affected by feeding regimen or L-carnitine. Carcass fat was reduced and carcass ash was increased by L-carnitine supplementation at 22 weeks. It was concluded that ED fed breeders are more productive than SK fed breeders primarily because of earlier SM. ED fed breeders are more efficient than SK breeder pullets because there are less nutrients wasted for tissue replenishment. Feeding breeder pullets ED with low energy density diets helped eliminate uniformity differences for pullets fed ED and SK feeding regimens. Breeders fed L-carnitine during 21 wk rearing period improved the FCR by 0.06 units for both Experiment 1 and 2. While, the effect of L-carnitine on total egg production was not significant, L-carnitine supplemented birds produced 3.9 and 2.7 more total eggs at 45 weeks than non-supplemented birds in Experiments 1 and 2 respectively. The consistency of the results and the associated p-values ($p = 0.12$; $p = 0.13$) for total egg production in the two experiments suggest that L-carnitine may have some beneficial effects on egg production. Breeders fed carnitine also showed significant increases in EW in Experiment 1 and near significant ($p = 0.13$) increases in EW for the second experiment. Carnitine was unable to attenuate the negative effects of SK feeding associated with the lengthy fasting periods. *(International Journal of Poultry Science 8 (5): 409-425, 2009; **doi:** 10.3923/ijps.2009.409.425)*

Ephrin Receptor Expression in the Embryonic Bursa of Fabricius

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Utilizing degenerate PCR primers complementary to conserved regions within the kinase domain of Receptor Tyrosine Kinase (RTK) genes, the goal was to compare the full complement of RTK expressed (mRNA level) between two developmental stages of bursal B-cells. We identified 21 different RTK cDNAs out of a total of 235 cDNAs sequenced between the two B-cell stages. The

dataset revealed the expression of RTK genes important in developmental processes, namely the ephrin receptors (Eph). The ephrin receptors and the ephrin ligands play critical roles in embryo development by controlling the organization of cells in tissues and by inducing cellular differentiation. *(International Journal of Poultry Science 8 (5): 426-431, 2009;* ***doi:*** *10.3923/ijps.2009.426.431)*

Effect of Some Water Supplements on the Performance and Immune System of Chronically Heat-Stressed Broiler Chicks

A.M. Hassan, H. May AbdelAzeem and P.G. Reddy

Effects of water supplements, sodium bicarbonate ($NaHCO_3$), potassium chloride (KCl) and acetic acid were evaluated on the performance and immune system of chronically heat-stressed broiler chicks. Two hundred day old broiler chicks were allotted to one of the four groups (n = 50); 1) control [no supplements], 2) $NaHC0_3$, 0.5%, 3) KCl, 0.15% and 4) acetic acid, 1.5 mL/Liter. All chicks were kept in a controlled environmental chamber maintained at 33±2°C from day one to 6 weeks (wks) of age. Significantly higher weight gains coincided with decreased feed conversion ratios for all the supplemented groups as compared to control group at 2, 4 and 6 wks of age. Bursal index, percentage weights of thymus and spleen in relation to body weight and natural agglutinin levels, an indicator of humoral immunity were higher but the heterophil:lymphocyte ratio, an indicator of stress was lower for the supplemented groups as compared to control group. Total aerobic spore formers and *Enterobactraecae* counts in the intestinal swab samples were higher in control group than supplemented groups. Intestinal pH was lower at 2, 4 and 6 weeks of age but water consumption at 5 and 6 wks of age tended to be higher in acetic acid treated group as compared to other groups. Overall, the results indicated significant improvement in the performance and immune response of chronically heat-stressed broiler chicks given the water supplements, acetic acid being slightly superior to $NaHCO_3$ and Kcl. *(International Journal of Poultry Science 8 (5): 432-436, 2009;* ***doi:*** *10.3923/ijps.2009.432.436)*

The Effects of Intra-Amnionic Feeding of Arginine And/or ß-Hyroxy-ß-Methylbutyrate on Jejunal Gene Expression in the Turkey Embryo and Hatchling

O.T. Foye, C. Ashwell, Z. Uni and P.R. Ferket

In-ovo Feeding (IOF), injecting nutrients into the amnion of the developing embryo may enhance post-hatch growth by enhancing intestinal expression and

function prior to hatch. This hypothesis was evaluated with IOF solutions of Arginine (ARG), HMB and Egg White Protein (EW) in turkeys. Four treatments were arranged as a factorial of 2 levels of ARG (0 and 0.7%) and HMB (0 and 0.1%). An IOF solution of EW (18%) was evaluated for contrast. At 23 d of incubation (23E) each IOF solution was injected into the amnion. Upon hatch all poults were fed *ad libitum*. Intestinal mRNA of the digestion/absorption related genes Sodium Glucose Transporter (SGLT), Peptide transporter (Pept), Sucrase-isomaltase (SI) and Aminopepdiase (AP) were determined at 25E, hatch, 3 and 7 d by real-time PCR analysis. The data was analyzed as a 2X2 factorial and 1-way ANOVA for contrast. There were significant ARG X HMB effects on Pept, SGLT, SI and AP mRNA levels at hatch. IOF HMB alone enhanced Pept, SGLT, SI and AP intestinal mRNA expression at hatch, whereas inclusion of ARG depressed expression. There were main and independent effects of HMB or ARG on mRNA expression of SI and AP at 25E, in which ARG alone depressed expression, while IOF HMB alone had no effect on SI or AP expression. These results suggest that IOF may enhance early growth by improving intestinal capacity to digest and absorb nutrients at hatch which may fuel more rapid post-hatch growth. *(International Journal of Poultry Science 8 (5): 437-445, 2009;* ***doi:*** *10.3923/ijps.2009.437.445)*

Reproductive Performance of the Ardennaise Chicken Breed under Traditional and Modern Breeding Management Systems

J-M. Larivière, C. Michaux, F. Farnir, J. Detilleux, V. Verleyen and P. Leroy

Enhancing the use of traditional chicken breeds is necessary to insure long-term conservation of global genetic diversity in poultry. A logical start in this process is to evaluate performance. The objective of this study was to estimate reproductive traits in the Ardennaise chicken breed under traditional and modern management systems. Reproductive performance indicated lighting programs [Natural (NAT) or Artificial (ART) day length] were highly significant for egg weight, hatchability ($p \leq 0.001$), early and mid-term embryonic mortality ($p \leq 0.01$). Feeding treatments [*ad libitum* (AL) or mild Feed-restriction (FR)] varied greatly with egg weight, hatchability, fertility ($p \leq 0.001$) and late embryonic mortality ($p \leq 0.05$). Most precocious age at first egg (23 weeks), longest duration of laying period (>27 weeks), utmost maximum production peak (56.67%), largest egg number (70.13 eggs/hen) and number of chicks hatched (24.10 chicks/hen) were performed under ART-AL. Heaviest egg weight (53.21g), highest fertility (70.20%), greatest hatchability (55.58%), highest liveability during rearing (95.74%) and lay (100%), lowest early (3.51%) and mid-term embryonic

mortality (1.17%) were achieved under NAT-AL. To summarize, most of traits studied in the Ardennaise chicken were moderate when compared to those expected by broiler breeders. *(International Journal of Poultry Science 8 (5): 446-451, 2009; **doi:** 10.3923/ijps.2009.446.451)*

Performance, Breast Morphological and Carcass Traits in the Ardennaise Chicken Breed

J.M. Larivière, F. Farnir, J. Detilleux, C. Michaux, V. Verleyen and P. Leroy

The aim of this study was to quantify performance, breast morphological and carcass traits in Belgium's most ancient chicken breed: the Ardennaise. Evaluation during growing showed at 84 days of age light as-hatched mean live Body Weights (BW) (1115g ± 221), fairly high Feed Conversion Ratio (FCR) (5.09 ± 0.4) and Liveability (LIV) (92.55% ± 4.6). At 85 days, male and female *in vivo* breast measurements such as Keel Angle (KA) (67.74-71.82°), Thoracic Circumference (TC) (25.61-28.05 cm), Keel Length (KL) (10.32-11.26 cm) and muscle thickness (TM) (10.70-12.11mm), with associated BW, were all greater in males and significantly different between sexes ($p<0.001$), except for Chest Width (CW) (4.62-5.35 cm). However, there was no sexual dimorphism for all yield traits. Yields of Eviscerated Carcass (EC) varied from 57.54-59.28%, Thighs and Drumsticks (TD) from 19.37-19.80%, Breast Meat (BM) from 11.02-11.62% and Wings (WI) from 8.67-8.82%. All *in vivo* measurements, carcass and portions data were lower than those reported mostly for broilers, except similar KA degrees and slightly higher WI. Finally, most of traits studied in the Ardennaise chicken were moderate when compared to those obtained by broilers. *(International Journal of Poultry Science 8 (5): 452-456, 2009; **doi:** 10.3923/ijps.2009.452.456)*

Effects of Ascorbic Acid on Rectal Temperature Fluctuations in Indigenous Turkeys During the Hot-Dry Season

A.Y. Adenkola and J.O. Ayo

Experiments were performed on 40 indigenous turkeys with the aim of investigating, fluctuations in their rectal temperature (RT) and the effect of ascorbic acid (AA) on during the hot-dry season. Twenty turkeys which served as experimental birds were administered AA orally at the dose of 52 mg kg^{-}, while the remaining 20 turkeys which served as control were given ordinary water. Measurements of RT were taken for 3 days, one week apart and every hour from

06:00-19:00 h. The results showed that RT values in both experimental and control turkeys significantly ($p<0.01$) fluctuated with the hours of the day ($r = 0.614, 0.612$, respectively) and the dry-bulb temperature ($r = 0.794, 0.928$, respectively). The RT value of 41.2±0.03°C recorded in experimental turkeys was significantly lower ($p<0.05$) than the corresponding value of 41.5±0.03°C obtained in control turkeys. The results demonstrated that AA significantly reduced RT values in experimental turkeys. In conclusion, AA administration may be of value in turkeys subjected to unavoidable stressful conditions during the hot-hours of the day. *(International Journal of Poultry Science 8 (5): 457-461, 2009; **doi**: 10.3923/ijps.2009.457.461)*

Assessment of Pathogenic Potential of Avian Influenza Viruses by MDCK Cell Culture

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The influenza viruses are sub-classified in to two pathotypes of Highly Pathogenic Avian Influenza (HPAI) and Low Pathogenic Avian Influenza (LPAI) viruses on the basis of the pathogenicity of AIV in domestic poultry. Samples of H5N1 (7966/06 and 7972/06) and the H9N1 (5844/05) viruses were also grown on MDCK cell. All these produced cytopathic effect within 72 h. Normally, the nonpathogenic AIV does not produce CPE in MDCK cells. However, CPE can be produced if trypsin is incorporated while, culturing the viruses. In the present study, without the addition of trypsin the viruses produced CPE. On FAT both cytoplasmic and nuclear florescence was observed. It is also known that the viruses which produce CPE in absence of trypsin are pathogenic. It proved beyond that the H5N1 and H9N1 viruses isolated in the present study were pathogenic based on cell culture study. *(International Journal of Poultry Science 8 (5): 462-464, 2009; **doi**: 10.3923/ijps.2009.462.464)*

Identification and Subtyping of Avian Influenza Viruses by Reverse Transcription Polymerase Chain Reaction (RT-PCR) and Agarose Gel Electrophoresis

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Avian Influenza (AI) is caused by type A influenza virus belonging to the family *orthomyxoviridae*, which is classified into 16 HA and 9 NA subtypes based on

two surface glycoprotein's haemagglutinin (HA) and neuraminidase (NA). In the present study we did identification and HA-subtyping of avian influenza virus by reverse transcription-PCR (RT-PCR) during the first outbreaks of AI in India during 2006. The avian influenza virus is identified by RT-PCR using a set of primers specific to the nucleoprotein (NP) gene of avian influenza virus. The HA-subtypes of avian influenza virus were determined by running with HA subtype specific primers for H5, H7 and H9 RT-PCR reactions, each using a set of primers specific to one HA-subtype. A total of 10,236 tissue / cloacal swab samples, received at the HSADL from various parts of the country, were processed for isolation of AI virus in embryonated chicken eggs. Out of these, 9 samples originating from poultry in Maharashtra (Navapur and Jalgaon) and Gujarat (Surat) states of India were found positive for H5 virus by RT-PCR. All samples received from outbreaks areas were tested by using all tree subtype specific primers(H5, H7 and H9) only H5 RT-PCR reactions was give the product of expected size, and thus the HA-subtype of the virus is determined. One sample gave the positive result with H9 subtype specific primers. The RT-PCR procedure is rapid and sensitive, and could be used for the identification and HA-subtyping of avian influenza virus in organ homogenates. *(International Journal of Poultry Science 8 (5): 465-469, 2009;* ***doi:*** *10.3923/ijps.2009.465.469)*

Long-Term Effects of Oxymetholone vs. Testosterone with or Without $ZnSO_4$ on Growth Performance of Turkey Chicks

J. Arshami, M. Heydar-Poor, H. Zarghi, M. Pilevar and M. Esmailzadeh

Oxymetholone at 0.6 mg/kg feed or mixed with $ZnSO_4$ (45mg/kg feed), testosterone at 10 mg/kg feed or mixed with $ZnSO_4$ (45 mg/kg feed) and 0 mg/kg of either one were given to 180 turkey chicks (n = 9; r = 4) from 6-18 weeks of age to determine their effects on growth performance. Body Weight (BW) was increased gradually in all treatments when compared to the control group with the highest level for oxymetholone and testosterone alone respectively. Feed Intake (FI) during 12 weeks of study decline slightly in all treatments with the lowest level for oxymetholone + $ZnSO_4$ and the highest level for control group. Feed Conversion Ratio (FCR) at the end of study was 4.77 for control group and 4.15, 4.32, 4.50 and 4.69 for different treatments, respectively. Growth Rate (GR) differed for each week and treatment. Overall, the treatment groups showed higher GR when compared to control group in every week. The percentage of Carcass Weight (%CW) was increased significantly ($p<0.05$) in all treatments in comparison with control group with highest level for testosterone + $ZnSO_4$. The

treatments did not influence significantly on the internal organs by the end of study. Oxymetholone induced BW and %CW ($p<0.05$) with less FI and FCR when compared to testosterone and control group in turkey chicks. *(International Journal of Poultry Science 8 (5): 470-474, 2009; **doi:** 10.3923/ijps.2009.470.474)*

Effect of Dietary Graded Levels of *Leucaena leucocephala* Seeds on Layers Performance, Egg Quality and Blood Parameters

Mohamed Elamin Ahmed and Khadiga Abbas Abdelati

The layers experiment was conducted to evaluate the effect of different levels of leucaena seed (0, 8, 16 and 24%) on 27 weeks of old laying hens. Parameters studied were egg production, external and internal quality characteristics of eggs, haematological indices and plasma constituents. Feed intake, hen-day egg production, FCR (kg feed/kg egg) and FCR (kg feed/dozens of egg) were depressed with the inclusion of leucaena seeds. Thereafter, birds were placed on control diet for two weeks, which revealed improvement of the performance except for FCR (kg feed/dozens of egg) for birds fed 24% leucaena seeds. Higher egg weight, maximum length and egg shell surface were recorded for birds fed 16% leucaena seeds compared to the others. Maximum width, shell weight and shell% were reduced for birds fed 24% leucaena seeds. Internal quality characteristics of eggs were not significantly affected by the dietary treatments except albumin weight, albumin%, yolk index and yolk color score. Yolk color score consistently increased with the inclusion of leucaena seeds. *(International Journal of Poultry Science 8 (5): 475-479, 2009; **doi:** 10.3923/ijps.2009.475.479)*

Comparison of Constraints to Poultry Producers in Delta State Nigeria

Bishop O. Ovwigho, F.U.C. Mmereole, I. Udeh and P.O. Akporhuarho

The study was an inter-disciplinary one designed to investigate the constraints relevant to different poultry production systems. The sample size was 241 poultry farmers made up of extensive (210), semi-intensive (5) and intensive (26). A four-point rating scale was used to measure the constraints. Mean, Analysis of variance and correlation matrix were used in data analysis. The constraints faced by the extensive poultry farmers were inability to diagnose sick birds (M = 3.45), lack of

market for eggs (M = 2.52), egg cracking (M = 2.98), lack of finance (M = 3.44) and loss of birds/eggs to thieves, predators and hazards (M = 3.17). The constraints faced by semi-intensive poultry producers were inability to diagnose sick birds (M = 4.00), lack of feeds (M = 3.00), transportation difficulties (M = 2.80), loss of birds and eggs to predators, thieves and hazards(M = 2.60), lack of finance(M = 3.80) and egg cracking (M = 3.40). The constraints to intensive poultry producers were mortality of adult bids (M = 2.85), diseases out-break (M = 2.58), lack of feeds (M = 2.88), transportation difficulties (M = 3.23), lack of finance (M = 2.65.), feather pecking/cannibalism (M = 3.00) and difficulties in sourcing for day-old chicks (M = 2.65). Lack of finance was a common constraint in the three systems of poultry production. There was a significant difference ($p<0.05$) in the responses of the extensive, semi-intensive and intensive poultry farmers to the constraints facing poultry production in the study area. Adequate finance is needed to boost poultry production in the study area. *(International Journal of Poultry Science 8 (5): 480-484, 2009; **doi:** 10.3923/ijps.2009.480.484)*

Growth and Haematological Response of Broiler Chicks Fed Graded Levels of Sweet Potato (*Ipomoea batata*) Meal as Replacement for Maize

E.A. Ayuk and A. Essien

The study was conducted to find out the performance and haematological response of broiler birds fed different levels of sweet potato meal (SPM). The levels of sweet potato meal in the different treatment rations were 0, 10, 20, 30, 40 and 50%, respectively. There was a curvilinear decline in growth rate (from 27.9 to 23.3 g/day) as the maize was replaced by sweet potato root meal with a pronounced reduction in performance overall of 17% when all the maize was replaced by sweet potato meal. All haematological parameters assessed only showed minor numerical ($P>0.05$) differences, falling within the ranges stated in literature. It is concluded that sweet potato root meal can replace maize meal in the diet of broilers over the weight range 50 to 1400 g, with only a slight reduction in growth rate (17% with complete substitution of maize), which may be compensated by the lower cost of the sweet potato meal. The substitution also did not have any deleterious effect on haematological and by extension, the health status of the birds. *(International Journal of Poultry Science 8 (5): 485-488, 2009; **doi:** 10.3923/ijps.2009.485.488)*

Weight Gain and Haematolgical Profile of Broiler Chicks Fed a Maize-Soyabean Diet Supplemented with Different Levels of Methionine, Sodium Sulphate and Sodium Sulphite

S.O. Akpet, A. Essien, E.E. Orok, S.C. Etop and B.A. Ukorebi

An experiment was carried out to investigate the effect of substituting synthetic methionine with sodium sulphate and sodium sulphite in maize-soyabean diets fed to broiler chicks on weight and haematological profile. Two hundred and forty (240) unsexed Hubbard day old broiler chicks were fed iso-caloric and iso-nitrogenous maize-soyabean diets (3,000 cal/kg and 22% crude protein) for four weeks. There were eight treatment groups, T1-T8, each replicated three times. T1 had no methionine, T2 had 3% methionine, T3 had 3% sodium sulphate, T4 had 3% sodium sulphite, T5 had 1.5% methionine and 1.5% sodium sulphate, T6 had 1.5% methionine and 1.5% sodium sulphate T7 had 1.5% methionine and 1.5% sodium sulphite while T8 had 1.5% methionine and 1% sodium sulphite. Chicks in T6 had the highest average weekly weight gain of 106.58 g while birds in T8 had the lowest average weekly weight gain (79.94 g). The average weekly weight gain of birds in T1, T2 and T5 did not differ significantly ($p>0.05$) from one another. Likewise the average weekly weight gain of birds in T1, T2, T3 T4 and T5 did not differ significantly ($p>0.05$) from one another. The average weekly weight gain of chicks in T7 and T8 which had the lowest weight gains, also did not differ significantly ($p>0.05$). All haematological parameters evaluated fell within safe precincts as stipulated in literature. Treatment 6 is therefore recommended for broiler starter rations alongside T2 and T5 because they did not differ significantly ($p>0.05$) from one another. *(International Journal of Poultry Science 8 (5): 489-492, 2009; **doi**: 10.3923/ijps.2009.489.492)*

Nucleocapsid Gene Sequence Analysis and Characterization of an Indian Isolate of Avian Infectious bronchitis virus

Monika Kaul, Megha Kadam, Yashpal Malik, Ashok Kumar Tiwari, Jawaharlal Vegad and Bikash Chandra Sarkhel

Avian Infectious bronchitis virus belongs to the family *Coronaviridae*. It is an enveloped virus with large positive stranded RNA genome. In the present study RNA was isolated from viral suspension and transcribed into cDNA. Poultry postmortem cases showing lesions of visceral gout were collected and infectious bronchitis virus were isolated. About 1.2 kb Nucleocapsid gene of virus was amplified by RT-PCR from four clinical samples. The amplified product was cloned and the nucleotide sequence of the N gene of an Indian field isolate was

determined. The Indian IBV isolate exhibited 95% homology with Korean isolates and Chinese vaccine strains indicated conserved nature of N gene. Haemagglutination assay and chicken embryo inoculation was carried out for antigenic studies of the virus. The virus titre was confirmed using haemagglutination assay and IBVN2 showed the 1:2048+ titre. Propagation of virus was done by chorioallantoic method of inoculation of virus suspension in embryonated eggs. Characteristic curling and dwarfing of embryos was noticed in CAM inoculated embryonated eggs. Inoculated eggs showed teratogenic changes and deposition of urates as indication of naphropathogenic nature of virus. *(International Journal of Poultry Science 8 (5): 493-499, 2009; **doi:** 10.3923/ijps.2009.493.499)*

Adoption of Vaccination Against Newcastle Disease by Rural Poultry Women Farmers in the North Central Zone of Nigeria

O.J. Saliu, M.E. Sanda and S.I. Audu

Newcastle disease is now claimed to be responsible for 70-80% of annual death in village chickens. Losses in hundreds of poultry birds of various ages and sexes in Ijumu local government area in the north central zone of Nigeria is attributed to the disease. The prevalence is always at its peak during the dry season (Hamattan) of every year in the last decade. Live Newcastle vaccines such as intra ocular, B1 strain, LaSota and Komorov have been produced by National Veterinary Research Institute (NVRI) vom to prevent the occurrence of the disease. Structured questionnaire was designed to quest for adoption of the Newcastle vaccination from 107 poultry women farmers in the study area. The level of awareness of the vaccination was about 70% while, only 11.21% adopted the vaccination alone and 34.58% adopted both the vaccination and ethnoveterinary treatments. Age contributed positively (14.9%) but not significantly to the adoption of the vaccination. This implies that the adoption of the vaccination still need much extension service effort for improvement. This study recommends that both private and public extension outfit should make complementary effort to improve the adoption of the vaccination by the rural women. *(International Journal of Poultry Science 8 (5): 500-503, 2009; **doi:** 10.3923/ijps.2009.500.503)*

Genotype by Diet Interaction on Body Weight of the Local Chicken and its Crosses with Barred Plymouth Rock

F.U.C. Mmereole and I. Udeh

In a 2x4 factorial arrangement, the effect of genotype, diet and their interaction on body weight and weight gain of the F_1 crosses between the local chicken and

Barred Plymouth Rock were investigated. Birds of each genotype were separated into two dietary groups at day old. One group was placed on layer type diets and other on broiler type diet. The body weights and weight gains of the two diet groups were monitored up to 12 weeks of age. The effect of genotype by diet interaction on body weight and weight gain was not significant ($p>0.05$) throughout the period. Birds on broiler diet regime were significantly ($p<0.01$) heavier at 8 and 12 weeks of age compared with those on layer type diets. The effect of genotype on bodyweight was significant throughout the 12 week period and significant in weight gain at the periods of 0-4 weeks and 4-8 weeks of age only. During these periods, the F_1 reciprocal crossbred groups (G_2 and G_3) compared favourably with the exotic (G_4) in weight gain indicating that the local chicken could be used in crosses with the exotic birds for the production of table birds, which are adapted to the local harsh environmental conditions and which are resistant to most of the endemic diseases. *(International Journal of Poultry Science 8 (5): 504-507, 2009;* ***doi:*** *10.3923/ijps.2009.504.507)*

Effects of Dietary Energy and Protein on Growth Performance and Carcass Quality of Broilers during Starter Phase

Zhuye Niu, Jingsong Shi, Fuzhu Liu, Xianhui Wang, Chunqi Gao and Likai Yao

A 3x4 factorial arrangement with three Metabolizable Energy (ME) levels (12.13, 12.55, 12.97 MJ/kg) and four Crude Protein (CP) levels (20.0, 21.0, 22.0 and 23.0%), respectively, was undertaken to investigate the influence of varying levels of dietary energy and protein on broiler performance and carcass quality from 1-21 d aysof age. Six hundred 1 day old broiler chicks were randomly divided into 12 treatments, each of which had five replicates of 10 birds. BW of 21 days of age was significantly increased with an increase in dietary ME ($p<0.05$), while not influenced by dietary CP ($p>0.05$). Both ME and CP significantly improved feed efficiency ($P<0.05$). ME significantly affected on feed intake, while CP not affected. However, there were no significant interaction in BW, average daily gain, feed intake and feed efficiency between dietary ME and CP. Higher level of dietary ME (12.97 MJ/kg) significantly increased abdominal fat percentage when compared with lower ME (12.13MJ/kg or 12.55 MJ/kg). L* of leg meat was decreased by dietary ME, while *L** of breast meat was not affected. *a** of both breast meat and leg meat was increased with increasing dietary ME and CP. *b** of leg meat was decreased by ME while b* of breast meat was not affected. Water-holding capacity (WHC) of breast meat was decreased by dietary ME, while increased by dietary CP. The results of present research indicated that the optimal dietary ME requirement of broilers from 1-21 days of age is 12.97 MJ/kg

and the CP requirement is 21-22%. *(International Journal of Poultry Science 8 (5): 508-511, 2009; **doi:** 10.3923/ijps.2009.508.511)*

Evaluation of Experimental Vaccination in Chinese Goose (*Anser cygnoides*) Against Newcastle Disease: Investigation of the State of Virus Carrier

Josie Maria Campioni, Antonio Carlos Paulillo, Elizabeth Moreira dos Santos Schmidt, Marcia Nishizawa, Alan Jonathan Pereira Testi, Janine Denadai and Adriano de Oliveira Torres Carrasco

This study aimed the characterization of the importance of vaccination against Newcastle disease in Chinese geese (*Anser cygnoides)* and to investigate the state of carrier of the virus in this species. There were used 120 Chinese geese, distributed at random into 4 groups, vaccinated or not. At 60 days of age, all groups were challenged with a pathogenic virus (NDV) suspension, $EID_{50} = 10^{8.15}$/0.1 mL and a group of Specific Pathogen Free (SPF) chickens were used as control of the virus. Cloacal and tracheal swabs were collected after 6, 10 and 20 days post-challenge for genome viral excretion by RT-PCR (reverse transcription-polymerase chain reaction). Chinese goose of all groups did not demonstrate any signs of Newcastle disease. They were refractory to the clinical disease with the NDV. In Chinese geese from control group, NDV genome was detected 20 days after challenge. It was demonstrated therefore the state of carrier of NDV by Chinese goose. In geese, from the vaccinated groups, genome viral excretion was not detected by RT-PCR. It was also demonstrated the importance of the vaccination in the suppression of the state of carrier of NDV in Chinese geese. *(International Journal of Poultry Science 8 (5): 512-514, 2009; **doi:** 10.3923/ijps.2009.512.514)*

Evaluation of Nupro® Yeast Product in Diets for Broilers[1]

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Two trials with identical experimental design were conducted approximately 20 months apart to evaluate the response of broiler chickens to the addition of NuPro®, a yeast product rich in nucleotides. In both trials, four dietary treatments were compared. The first treatment contained no NuPro®. For the second treatment, the diet with 2% NuPro® was fed only the first 7 days of life while for the third treatment, 2% NuPro® was fed for the first 14 d. For the fourth

treatment, 2% NuPro® was fed for the first 7 days and also during the finisher period of 35-42 d of age. In both studies, each treatment was fed to six replicate groups of 60 male broilers of a commercial strain. Response to the addition of NuPro® varied between the two experiments. In the first study, addition of 2% NuPro® to the diet resulted in improvement in feed conversion. Response varied by age of bird and time during which the NuPro® was fed. At 7 d of age, there were no significant differences between birds that had been fed NuPro® and those fed the negative control diet. At 14 d of age, there were no significant differences in feed conversion among birds fed the various treatments, but feed conversion was numerically better for those birds that had been fed NuPro® for the first 7 or 14 d. At 35 d, birds that had been fed NuPro® for the first 7 d had significantly better feed conversion than those fed the control diet with birds fed NuPro® for the first 14 d being intermediate between these two groups. At 42 d, birds fed diets with 2% NuPro® for the first 7 d or for the first 7 d followed by feeding from 35-42 d had significantly lower feed conversion than those fed the control, with those fed NuPro® for the first 14 d being intermediate between these groups. However, in the second trial there was no significant effect of inclusion of NuPro on any of the parameters evaluated. There may be nutritional differences between batches of the product that influence the response of chicks. *(International Journal of Poultry Science 8 (6): 515-520, 2009;* ***doi:*** *10.3923/ijps.2009.515.520)*

Nipple Drinkers for Brooding Commercial Large White Turkeys[1]

S.M. Russell, J.L. Grimes and A.G. Gernat

The objective of this research was to determine the effect of using nipple drinkers during brooding on the performance of Large White turkeys. There were 6 different drinkers tested: the control and 5 nipple drinker systems. The control was the Plasson Drinker and the nipple systems tested were the Plasson Easy Start (PES), Val-Co Turkey Drinker (VC), Lubing Traditional Nipple (LTN), Lubing EasyLine™ (LEL) and Ziggity Big-Z Activator (BZ). Three experiments were conducted with turkeys brooded using the 6 drinker types. Some nipple drinker treatments were used in the rearing periods. At 20 wk, Body Weight (BW) was reduced for toms brooded to 6 wk on the LTN and brooded and reared on the VC. The use of LEL and LTN (during brooding) resulted in improved Feed Conversion (FC) at 20 wk. Trial 2-experiment 1 with hens of two strains was terminated at 3 wk because of excessive mortality from dehydration with some

drinker types. In trial 2 -experiment 2, there were no poult hydration issues. The BW of hens at 6 wk brooded on the Plasson Drinker and the VC were higher compared to the BW of hens brooded on the PES and the BZ with the BW of hens on the LELbeing intermediate. The use of the LTN resulted in significantly lower hen BW compared with all other drinkers through 10 wk. By 16 wk, there were no longer differences in hen BW due to drinker type. Drinker type did not have an effect on hen FC. Nipple drinkers can be used effectively to brood turkeys with some types also being useful during the rearing period. However, poor quality, inactive, or diseased poults may be at risk for dehydration on some nipple drinker systems. *(International Journal of Poultry Science 8 (6): 521-528, 2009; **doi:** 10.3923/ijps.2009.521.528)*

Influence of Post-Peak Feed Withdrawal Rate on Egg Production by Broiler Breeders of Different Weights

R.J. Lien and J.B. Hess

Broiler breeder hens are subjected to feed withdrawal as production declines after about 30 weeks of age. This study investigated effects of fast and slow feed withdrawal rates in both high and low weight hens, since body weight influences energy needs and nutrient stores. Daily allotments accounted for weight differences between high and low weight groups while decreasing 20.2 g per hen (12.8%) from peak production to 60 weeks in the slow withdrawal treatment, and 40.4 g per hen (25.6%) in the fast withdrawal treatment. From 31-60 weeks, weight gain was greatest in slow (702 g), intermediate in high-fast (351 g), and least in the low-fast treatment (219 g). Egg production began earlier and was greater in the high than low weight treatment from 23-30 weeks, was unaffected by treatments from 31-40 weeks, was greater in the slow than fast withdrawal treatment from 41-50 weeks and was greater in the low than high weight treatment from 51-60 weeks. Total production was unaffected by weight but 4.6 eggs per hen less in the fast relative to slow withdrawal treatment. The egg weight increase from 30-60 weeks was 1.4 g less in the fast relative to slow withdrawal treatment. Feed efficiency was better in the low than high weight treatment, but only marginally reduced by the fast relative to slow withdrawal treatment. These results indicate low weight breeder hens produce similar egg numbers with greater efficiency than high weight hens. In addition, doubling the typical feed withdrawal rate limits body and egg weight increases, but since it reduces egg production it only minimally improves feed efficiency. *(International Journal of Poultry Science 8 (6): 529-535, 2009; **doi:** 10.3923/ijps.2009.529.535)*

Genetic Improvement of Local Chickens by Crossing with the Label Rouge (T55XSA51): Growth Performances and Heterosis Effects

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The study of Genetic improvement of local chickens by crossing with the Label Rouge was carried out on the Experimentation Farm of the Polytechnic School of Abomey-Calavi, from August 2007 to may 2008. At the hatching, 6 lots of chicks were made up: the lot MnFl, composed of 47 chicks resulting from the crossing between females Label Rouge and males of North ecotype; the lot MlFn, composed of 58 chicks resulting from the crossing between North females and males Label Rouge; the lot MsFl, composed of 36 chicks resulting from the crossing between Label Rouge females and males of the South ecotype; the lot of north local chickens composed of 112 chicks; the lot of South local chickens composed of 128 chicks and the lot of Label Rouge composed of 204 chicks. Label Rouge have an age-type weight significantly higher than the cross ones ($p<0.05$) and those have also an age-type weight more significant than the local chickens ($p<0.01$). The Label Rouge had more important feed intake than the local chickens and the crossbreeds had a feed intake intermediate between the ones of the Label Rouge and the local chickens. Among the chickens resulting from a parent of North ecotype, the hens resulting from a cock of North ecotype had a weak feed efficiency compared to the one resulting from females of North ecotype. The weight average heterosis was 21.95, 14.47 and 27.69%, respectively for the cross MnFl, MlFn and MsFl. Those of the female were 1.17; 23.2 and 4.62%, respectively for the cross MnFl, MlFn and MsFl. A negative heterosis effect was obtained for the feed intake and the feed efficiency of the various crossbreeds. *(International Journal of Poultry Science 8 (6): 536-544, 2009; **doi:** 10.3923/ijps.2009.536.544)*

Novel Method for Improving the Utilization of Corn Dried Distillers Grains with Solubles in Broiler Diets

S.M.M. Shalash, M.N. Ali, M.A.M. Sayed, Hoda E. El-Gabry and M. Shabaan

An experiment was conducted with broiler chicks to study the possibility of improving the utilization of Dried Distillers Grains with Solubles (DDGS) in broiler diets. A total number of 150 day-old broiler chicks were randomly assigned to five groups received, diet containing 12% corn Dried Distillers Grains with Solubles

(DDGS diet) without or with enzyme preparation (E), radish root extract (RRE, as source of peroxidase enzyme) or E plus RRE, in addition to the control diet. The addition of RRE improved numerically Body Weight (BW) at 28 days and significantly at 42 days by 3.42 and 3.11%, respectively compared to birds fed DDGS diet alone. Enzyme preparation failed to improve performance for broiler fed DDGS diet. While using DDGS diet significantly decreased plasma antioxidants capacity by 56.11% compared to control birds, addition of RRE significantly increased it by 515% compared to the birds fed DDGS diet alone. There were insignificant differences between experimental treatments in plasma cholesterol, lipids or creatinine content. The addition of RRE increased plasma phosphorus by 65.93% compared to the birds fed DDGS diet alone while the later decreased it by 6.22% compared to control diet. The control birds recorded significantly higher values of plasma uric acid compared to other treatments. It was concluded that using RRE as a source of peroxidase enzyme is a suitable feed additive for improving the utilization of DDGS. *(International Journal of Poultry Science 8 (6): 545-552, 2009;* ***doi:*** *10.3923/ijps.2009.545.552)*

Evaluation of Some Phenotypic, Physiological and Egg Quality Traits of African Black Neck Ostrich under Arid Desert Conditions of Libya

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Twenty birds of African Black Neck Ostrich (10 of both males and females) were used in the present study in a completely randomized design to verify and evaluate the differences between males and females of ostrich in some phenotypic and physiological traits, likewise the egg quality traits were estimated under the poor desert conditions of south Libya. The main results of the present study showed that males of ostrich were taller ($p \leq 0.01$) than females (240.9 vs. 218.0 cm) and had significantly ($p \leq 0.05$) lower feather length than those of females either in tail or wing feathers. Serum albumin level was higher ($p \leq 0.05$ and 0.01) in males than females, while the reverse occurred with each of globulin, calcium and magnesium. The poor desert situations of the current study had a pronounced effect on the measurements of both internal and external egg quality. Where, all values of egg quality traits were less than those found by many investigators. Correlation coefficients among the traits that have been studied were significant ($p \leq 0.05$ and 0.01) varied between negative and positive values in some cases. The highly negative correlation was observed between male height trait and serum albumen, while the converse result was realized with serum globulin trait. *(International Journal of Poultry Science 8 (6): 553-558, 2009;* ***doi:*** *10.3923/ijps.2009.553.558)*

Simulation Models for Estimating Optimal Vaccination Timing for Infectious Bursal Disease in Broiler Chickens in Paraguay

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This study shows the results of estimating optimal vaccination timing for infectious bursal disease in broiler chickens in Paraguay, using spreadsheet simulation models. Fourteen flocks of broiler chicks were kept under observation. Sera were collected from randomly-selected 20 chicks per flock at 1, 4 and 8 days of age, and assayed by a commercial Enzyme-linked Immunosorbent Assay (ELISA) to evaluate Maternally Derived Antibody (MDA) titres. Deterministic (an age-based estimation method called the Deventer formula) and stochastic (through inclusion of uncertainty in the parameters) models were developed with the data. In the deterministic models, all the estimated optimal vaccination timings of each flock at the three sampling time points were between 16 and 24 days of age. In the stochastic models, each of the median optimal vaccination timings was estimated later than the corresponding point-estimate timing, generated by the deterministic version. Uniformity of the MDA titre distribution in the flocks was considered in relation to the number of vaccinations required. The ELISA results provide only a rough indication, in the case of deterministic model in particular. A stochastic version of the same model, in conjunction with the use of a concept of uniformity might give a solution to the problem. *(International Journal of Poultry Science 8 (6): 559-564, 2009;* ***doi:*** *10.3923/ijps.2009.559.564)*

Probability Mapping for *Mycoplasma gallisepticum* Risk in Backyard Chickens in Paraguay

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Poultry production is a growing industry in Paraguay, South America. The insufficient farm management methods commonly used in backyard chickens make them a potential reservoir for economically important diseases such as *Mycoplasma gallisepticum* that can influence commercial poultry operations. There are no previous studies on a survey of *Mycoplasma gallisepticum* among backyard chicken population in Paraguay. The objectives of this study were: (a) to determine the seroprevalence of *Mycoplasma gallisepticum* in backyard chickens in Paraguay and (b) to generate choropleth maps for the Standardized

Risk Ratio (SRR) for *Mycoplasma gallisepticum* in the study chickens and Poison probabilities for the SRR, in place of using the raw seroprevalence. Paraguay is divided into 17 departments. A department-stratified random sampling was planned and conducted. The required total sample size of 1291 from a chicken population of 17 million was sufficient to produce a 95% confidence interval with a desired precision of ±2.5% when the estimated antibody seroprevalence was 30%. Sera were analyzed using a commercial indirect ELISA. The observed overall seroprevalence was 26%. The resulting maps for the SRR for *Mycoplasma gallisepticum* in the study chickens at department level and Poison probabilities for the SRR were depicted. Departments with significantly high or low disease risks were confirmed. Different types of epidemiological parameters can be calculated to take account of potential risk factors. Therefore, further detailed investigations into those risk factors associated with *Mycoplasma gallisepticum* occurrence with respect to spatially epidemiological differences would be of interest. *(International Journal of Poultry Science 8 (6): 565-569, 2009; **doi:** 10.3923/ijps.2009.565.569)*

Effects of Microbial Phytase Supplementation on Mineral Composition of Tibia and Mineral Utilization in Broiler Fed Maize - Based Diets

O.A. Adebiyi, A.D. Ologhobo and A.S. Agboola

An experiment was conducted to determine effect of supplementing maize - based diet with different levels of microbial phytase on apparent nutrient bioavailability and tibia bone mineral of broilers. Eighty, day-old broiler were randomly allotted to five dietary treatments. The control diet contained 0 FTU/kg microbial phytase which was replaced by 200, 400, 600 and 800 FTU/kg microbial phytase of the basal feed combinations. Phytase supplementation of diet increased P, Ca, Zn, Cu and Phytate - P bioavailability significantly with 800 FTU/kg microbial phytase inclusion. No significant ($p>0.05$) difference was observed in the calcium content ($r = 0.94$) of the tibia bone of birds fed diets 400 (38.90%), 600 (38.91%) and 800 (39.08%) FTU/kg microbial phytase. Although, the phosphorus contents of birds fed diets containing 200 FTU/kg, 400 FTU/kg and 600 FTU/kg were not significantly ($p>0.05$) different, the copper and iron levels were however vary significantly. The result also showed a significant correlation ($r = 0.98$) between the phytase level and phytate phosphorus. *(International Journal of Poultry Science 8 (6): 570-573, 2009; **doi:** 10.3923/ijps.2009.570.573)*

Prevalence of Newcastle Disease Viruses in Wild and Captive Birds in Central Nigeria

O.J. Ibu, J.O.A. Okoye, E.P. Adulugba, K.F. Chah, S.V.O. Shoyinka, E. Salihu, A.A. Chukwuedo and S.S. Baba

Newcastle disease (ND) is an acute rapidly spreading, contagious, nervous and respiratory disease of domestic and wild birds caused by the Avian Paramxyovirus 1, the Newcastle disease (ND) virus. ND is endemic in Nigeria. The reservoir status of wild and captive birds for ND virus in central Nigeria is assessed in this study. Cloacal swabs were taken from one hundred and sixty three birds caught from five Local Government Council areas of Plateau, Benue and Kaduna States in central Nigeria. A total of thirteen ND Viruses were isolated from the three States. Viz: 8 isolates from Plateau, 4 from Benue and 1 from Kaduna State. One hundred and fifty three of the birds sampled belonged to 30 avian species in 10 Orders while ten birds were unidentified. Only 7% of the species in three Orders yielded ND viruses. The 13 isolates were characterized using the Mean death time of the Minimum lethal dose (MTD/MLD); Intracerebral Pathogenicity index (ICPI) Intravenous Pathogenicity index (IVPI) and the Reverse transcriptase polymerase chain reaction (RT/PCR). The results show that 12 of the isolates were of the lento genic strain while 1 isolate belonged to the Merogenic strain. The implication of these findings on the poultry industry in the country is discussed. *(International Journal of Poultry Science 8 (6): 574-578, 2009;* ***doi:*** *10.3923/ijps.2009.574.578)*

Relation Between the *SpvC* and *InvA* Virulence Genes and Resistance of *Salmonella enterica* Serotype Enteritidis Isolated from Avian Material

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Pathogenic bacteria possess genes responsible for virulence, that when expressed, determine not only bacterial invasion and persistence and destruction of host cells but also survival capacity under inappropriate culture conditions. This study utilized 100 samples of *Salmonella enterica* subspecies *enterica* Serotype Enteritidis (SE) isolated from avian material, detected the virulence genes *InvA* and *SpvC* by medium of Polymerase Chain Reaction (PCR) and compared them for possible expression of virulence factors for survival in hostile conditions of temperature, pH and reduced concentration of nutrients necessary for SE multiplication. Of all the samples analyzed, two presented the genes *SpvC* and *InvA*, simultaneously, with

one probable expression of them being verified in growth with pH 10.0 or temperature of 25°C. But in relation to nutrient concentration, neither sample obtained growth when seeded in medium containing 0.5% nutrient. *(International Journal of Poultry Science 8 (6): 579-582, 2009; **doi:** 10.3923/ijps.2009.579.582)*

Effects of Different Sources and Levels of Selenium on Performance, Thyroid Function and Antioxidant Status in Stressed Broiler Chickens

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The effects of adding different sources and levels of selenium on performance, thyroid function and antioxidant status in stressed broiler chickens were evaluated. Stress was induced by supplementation with 20 mg/kg Corticosterone (CORT) in basal diet. Total 144 Avian broilers were used for 2 weeks from 14 days of age, which were randomly distributed to 6 groups. One of these groups was fed with basal diets and the remaining with basal diet supplemented with CORT. Meanwhile, diets used in CORT groups were supplemented with 0, 0.1 or 0.4 mg/kg sodium selenite or yeast selenium, respectively. The results showed that dietary CORT resulted in significant suppression of growth and thyroid function, increase in creatine kinase activity and uric acid concentration in serum, indicating that CORT induced stress of broilers. In addition, the balance between pro-oxidants and antioxidants was disturbed by CORT administration, resulting in oxidative injury in the body. Supplementation of dietary selenium improved feed efficiency, promoted conversion of thyroxine (T4) to triiodothyronine (T3), minimized the changes of blood biochemical parameters; furthermore, it elevated antioxidases activities and decreased lipid peroxidation products in stressed broilers. The effects of adding 0.4 mg/kg selenium were better than 0.1 mg/kg. Although there was no significant difference between two selenium sources, it was conclude that high level of inorganic or organic selenium was able to attenuate stress and oxidative injury due to exogenous CORT administration, especially organic yeast selenium. *(International Journal of Poultry Science 8 (6): 583-587, 2009; **doi:** 10.3923/ijps.2009.583.587)*

Methionine Supplementation Options in Poultry

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Methionine is essential or limiting amino acid for poultry. An experiment was conducted to determine the comparative efficacy of DL-methionine and herbal

methionine supplement on growth and performance of broiler chickens. Three hundred commercial broiler (VenCobb) chicks were procured and randomly divided into three groups (n = 100), one control (T_0) and two treatments (T_1 and T_2). All the groups were offered standard maize-soyabean meal based ration. T_1 was offered herbal sources of methionine (Methiorep®, supplied by Ayurvet Ltd., India) @1kg/tonne of feed and $T_2$was administered DL- methionine@ 1 kg/tonne of feed from 0-42 days. A significant improvement in overall growth and performance was observed in birds supplemented with methionine. This study demonstrates that herbal methionine can replace DL-methionine very efficiently when used at the rate 1 g/kg diet of commercial broiler chicken. *(International Journal of Poultry Science 8 (6): 588-591, 2009;* ***doi:*** *10.3923/ijps.2009.588.591)*

Performance of Finisher Broilers Fed Wet Mash with or Without Drinking Water During Wet Season in the Tropics

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Finisher broilers were fed conventional dry and wet mash with varying amounts of water addition (1.0, 1.5, 2.0 parts of water to 1 part of feed) with and without drinking water. Feed intake was higher ($P<0.05$) in all wet-fed groups but one than birds that received the conventional dry mash. Live weight gain and carcass yield was better ($P<0.05$) in all wet-fed groups than dry mash feeding. However, feed conversion efficiency (FCE) was highest in birds that received 1 part of water to 1 part of feed with drinking water, their result is comparable to those on conventional dry mash feeding and significantly ($P<0.05$) better than other wet-fed groups. No significant ($P>0.05$) differences were observed in weights of the liver, spleen, intestine, abdominal fat, proventriculus, full-gizzard and caeca. This study recommends 1 part of water to 1 part of feed with drinking water for finisher broilers when raised on wet mash during wet season in the tropics. *(International Journal of Poultry Science 8 (6): 592-594, 2009;* ***doi:*** *10.3923/ijps.2009.592.594)*

Susceptibility of Guinea Fowl (Numida Meleagris Galeata) to Infectious Bursal Disease Virus (IBDV)

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The experiment was carried out to determine whether the guinea fowls are susceptible to Infectious Bursal Disease Virus (IBDV). A total of 60 guinea fowl

keets were used for the study. They were administered the inoculum through the intraocular route. 30 guinea fowl keets served as the control group (A) while, the other 30 served as the experimentally infected group (B). The only clinical signs observed in about 10 keets were mild depression and transient loss of appetite that did not last more that 24 h. The morphometric observations also indicated that the relative weights in the two groups (A and B) showed no Significant difference ($p>0.05$) in both the Control (group A) and Infected (group B) keets. It was concluded that guinea fowls are not susceptible to IBDV but they could severe as carriers, which would spread the virus to other poultry species if reared together with them. *(International Journal of Poultry Science 8 (6): 595-597, 2009;* ***doi:*** *10.3923/ijps.2009.595.597)*

Developmental Stability in Chickens Local to Warm Climate 1. Variation in Internal Organs and Bilateral Traits of Lines Selected Short-Term for Growth

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This study aimed at adopting the developmental changes in the internal organs and bilateral traits of growing chickens selected five generations for increased 6-week body weight and genotyping for normal feathering (line F) or naked-necks (line N), compared to their corresponding genetic controls (lines CF and CN). Line N had the smallest weight percentages of total lungs and liver (0.54 and 2.38%) and biggest weight percentages of right and left shanks (2.46 and 2.48%). Line F had the smallest spleen weight percentage (0.20%) and tallest right and left shanks (8.50 and 8.57 cm) and widest right and left shanks (3.74 and 3.75 cm). Gizzard weight percentages of lines N and CN (3.37 and 3.55%) were significantly more than those of lines F and CF (2.74 and 3.00%). The results indicated that neither short-term selection nor *Na* allele have influenced the development of heart. *Na* allele showed variable pleiotropic effects, where the weight percentages of lungs and liver were decreased and the weight percentages of gizzard and spleen were increased. A reduction in lung and liver weight percentages characterized the naked-neck selected line, revealing an interaction between selection and *Na* allele. The pressure of short-term selection for body weight was early noticeable on the development of liver and spleen that could initiate possible metabolic disorders or susceptibility to disease infection later with the continuity of selection scheme. Short-term selection albeit boosted the bilateral shank measurements, but did not influence the bilateral developmental stability. The developmental stability characterized the bilateral characters in chickens carrying *Na* allele, suggesting a role of *Na* allele in the developmental stability of the birds pertaining the

natural heating waves. The results of correlation coefficients indicated that the bilateral asymmetries of different characters are not significantly associated. *(International Journal of Poultry Science 8 (6): 598-602, 2009; **doi:** 10.3923/ijps.2009.598.602)*

Efficiency of PUFAs Incorporation from Marine Sources in Yolk Egg's Laying Hens

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Two hundred eighty-eight 32-wk-old Hisex White laying hens were used in this research during a 10 week period, arranged in a 2 x 5 completely randomized factorial design, with three replicates of eight birds per treatment. Two groups: fish oil (OP) and Marine Algae (AM) with five DHA levels (120, 180, 240, 300 and 360 mg/100 g diet) were assigned including two control groups, birds fed corn and soybean basal diet (CON) and a diet supplemented with AM (AM420) to study the efficiency of egg yolk fatty acid enrichment. The Arachidonic Acid (AA), Linoleic (LA) and PUFAs n-6 mean values ranged, respectively, 98.71 mg, 987.70 mg and 1108.92 mg/yolk for the hens fed the CON diet and 38.87 mg, 734.22 mg and 802.79 mg/yolk for the OP360 group. The percentage of AA incorporation (% INC) in egg yolk decreased linearly with the increase of DHA levels in the diets supplemented with OP and AM, from 4.81% (CON) to 2.57% (OP360) and 3.51% (AM420). The efficiency (%) of DHA incorporation into the yolk decreased linearly with increasing of DHA levels in the diet supplemented with OP and AM, from 85.11% (OP120) and 65.28% (AM120) to 49.45% (OP360) and 34.06% (AM420). The levels of DHA in the egg yolk of birds supplemented with OP had significant increase from 22.64 mg/yolk (CON) to 187.91 mg/yolk in OP360 group. PUFAs n-3 means into the eggs were significantly ($p<0.05$) increased when the groups CON (62.16 mg/yolk) and OP360 (218.62 mg/yolk) were compared. *(International Journal of Poultry Science 8 (6): 603-614, 2009; **doi:** 10.3923/ijps.2009.603.614)*