Asian Journal of Poultry Science

ISSN 1819-3609

Academic Journals Inc.

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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

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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

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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)*

Exogenous Estradiol: Blood Profile, Productive and Reproductive Performance of Female Japanese Quails at Different Stages of Production

O.A.H. El-Ghalid

One hundred and eight, 3 weeks old female quails were distributed among 3 treatments to study the effect of estradiol administration, on their productive and

reproductive performance. Birds of the first group were intramuscularly injected at 3 weeks of age daily with 100 μg E_2/bird/day for 7 consecutive days. Birds of the second group were treated in a like manner starting from 5 weeks of age and the third group served as control. Birds injected with E_2 either at 3 or 5 weeks of age had a significantly higher body weight at sexual maturity and females injected at 3 weeks of age matured significantly earlier compared to control. Egg number egg weight and egg mass had significantly increased due to E_2 injection at both ages with females injected at 3 weeks of age having the highest values. Estrogen-progesterone ratio fluctuated with reverse relation to egg production. Tibia relative weight, length and calcium content were significantly increased by estrogen injection with birds injected at 5 weeks of age having the highest values. It can be concluded that treating immature Japanese quails with E_2 can enhance their reproductive and productive functions and that applying the treatment earlier (3 weeks of age) has better results when compared to applying it at 5 weeks of age regarding egg production, feed conversion and calcium metabolism. *(Asian Journal of Poultry Science 3 (1): 1-8, 2009; **doi:** 10.3923/ajpsaj.2009.1.8)*

Supplementing Laying Hen Diet with Gum Arabic (*Acacia senegal*): Effect on Egg Production, Shell Thickness and Yolk Content of Cholesterol, Calcium and Phosphorus

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This study was aimed to assess the effect of supplementing gum Arabic in the basal diet of the laying hens (Historic strain of single comb white leghorn) on egg production and quality. Seventy two White Leghorn laying hens (20 weeks of age) were randomly divided into four groups (A, B, C and D), 18 birds in each. Group A received the basal diet and group B to D received the basal diet supplemented with 5, 10 and 15% (w/w) *Acacia senegal* gum, respectively. Birds were allowed free access to feed and water and the feeding trial lasted for 8 weeks. Gum Arabic (15%) increased ($p<0.05$) feed intake and egg shell thickness by 5.98 and 31.58%, respectively as compared to the control. The significant ($p\leq0.05$) increase in albumin, Ca and P was also noticed in blood serum and egg yolk. Increasing the ratio of the gum Arabic (from 5-15%) in the basal laying hen diet significantly ($p\leq0.05$) reduced serum cholesterol in a gradual manner and consequently eggs with lowered yolk cholesterol were obtained. *(Asian Journal of Poultry Science 3 (1): 9-14, 2009; **doi:** 10.3923/ajpsaj.2009.9.14)*

An Outbreak of Concurrent *Histomonas meleagridis* and *Enteroccocus fecalis* Infection in Ducks

A.N. Alkhalaf and O.M. Mahmoud

Seventy four young ducks in a flock of about 300 birds, died of acute hemorrhagic enteritis within 15 days of appearance of the disease. Clinical signs were severe bloody diarrhea, weakness and dehydration. Fecal smears stained with Giemsa's stain showed presence *Enteroccocus* spp. and red blood cells. Gram stain showed the *Enteroccocus* spp. occurred singly, in pairs and in short chains and were Gram positive. Postmortem examination showed patchy hemorrhages and ulceration in the small and large intestines as well as the caeca. No worms were seen in the caeca. The liver was enlarged and dark in colour. Histopathological examination showed haemorrhages and mucosal erosion and ulceration in the small and large intestines as well as liver cell necrosis. The intestine mucosa and submucosa contained *Histomonas meleagridis*. The liver also contained *Histomonas meleagridis*, occurring singly or in clusters, with its characteristic (double-eyed) structure. It was concluded that the severity of infection of this outbreak was attributed to the concurrent effect of both Enteroccocus and Histomonas infections. *(Asian Journal of Poultry Science 3 (1): 15-18, 2009;* ***doi:*** *10.3923/ajpsaj.2009.15.18)*

New Suggested Schemes for Incubation Temperature and Their Effect on Embryonic Development and Hatching Power

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The present study was to investigate two suggested schemes of incubation temperatures and their effect on hatching power and embryonic development of two local Egyptian chicken strains. Twelve hundred fertile egg (600 from each strain) were used in this experiment that distributed on the control and two suggested schemes. The traditional incubation scheme (program 1) was used as a control and fixed during incubation period (0-18 days) with 37.5°C and the suggested schemes incubation temperature (program 2 and 3) was 37.5°C from 0-14 days and then raised up to 39.5 or 40.7°C for 3 h daily till the 18th day (15th-17th day) for the first program and the second suggested schemes (programs 2 and 3) respectively. During the hatching period (19-21 days), the hatching temperature was 37°C for all three programs. Relative humidity was 55% during the incubator period for all three programs and 65% for the hatching

period. Suggested programs (2 and 3) resulted in a significant increase embryo weight at 18th day of incubation and chick weight at pull out ($p \leq 0.05$) and the two programs produced chicks with a higher body weight than the program 1. There was a significant decrease in yolk sac weight in the programs 2 and 3 that associated with a significant increase in plasma total lipid ($p \leq 0.01$). Relative liver weight was decreased significantly ($p \leq 0.05$) with increase incubation temperature at both study periods and the hepatic glycogen was taken the same trend. Plasma calcium level was increased significantly ($p \leq 0.01$) at hatching time in the two suggested programs (2 and 3) compared to the program 1 that reflected on increase tibia relative weight. A gradual and significant increase in serum T_3 concentration ($p \leq 0.05$) was found in the programs 2 and 3 compared to the control program. Increasing incubation temperature in the programs 2 and 3 caused a decrease hatching period compared to the program A, as well as the hatchability percentage (%) was increased significantly ($p \leq 0.01$) and this increase was noticed in both the two strains. *(Asian Journal of Poultry Science, 3 (1): 19-29, 2009;* ***doi****: 10.3923/ajpsaj.2009.19.29)*

The Effects of Feed Restrictions in Rearing Period on Growing and Laying Performances of White and Brown Layer Hybrids in Different Adult Body Weights

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This study was conducted to determine the effects of feed restriction in the rearing period on growth and laying performances of layers. Three egg type local commercial lines differing in body size (heavy brown, heavy medium brown and light white layer) were used in the experiment. Chicks were reared on litter pens for 17 weeks and than transferred to laying battery cages. All birds were fed a standard starter diet 1 to 8 weeks of age and 9 to 12 weeks of age were fed a growing diet and 13 to 17 weeks of age were fed a developer diet. Chicks were fed *ad libitum* in the first 8 weeks, than *ad libitum*, one day and two days feed restriction in a week applied to three each replicates of genotype. Birds were fed *ad libitum* a standard laying diets in the laying period. Two days feed restriction groups consumed less feed ($p<0.05$) in the rearing period, but there was no significant differences among the body weights and chick uniformity. Also, two days feed restricted groups had lower viability in all genotypes ($p<0.01$). The effect of feed restriction in the rearing period on egg production was found significant, but sexual maturity ages were delayed by the feed restriction ($p<001$). Feed consumption of laying period were found significantly different ($p<0.01$) and

restricted groups consumed more feed than the control groups. Shell thickness is the only egg quality trait which was affected from feed restriction ($p<0.01$). Also, feather score was affected by feed restriction ($p<0.01$). *(Asian Journal of Poultry Science 3 (2): 30-41, 2009; **doi**: 10.3923/ajpsaj.2009.30.41)*

Performance and Histological Changes of the Intestinal Villi in Chickens Fed Dietary Natural Zeolite Including Plant Extract

T. Incharoen, O. Khambualai and K. Yamauchi

To investigate the effects of dietary combinations of zeolite, plant extract and vermiculite (ZEM®) on growth performance and histological intestinal changes, male Sanuki Cochin chickens were allotted to 3 groups of 12 birds each. They were fed *ad libitum* on a basal commercial mash diet with 0 (control), 1 and 2 g kg^{-1} dietary ZEM®. A starter diet (CP, 21%; ME, 3,000 kcal kg^{-1}) was fed to chickens until 28 day of age, at which point a grower diet (CP, 18%; ME, 2,850 kcal kg^{-1}) was fed until 70 day of age. Feed intake and body weight gain tended to increase with increasing levels of dietary ZEM® and feed efficiency tended to be highest in the 1 g kg^{-1} ZEM® group. Most intestinal villus height, villus area, cell area and cell mitosis numbers were better than those of the control group and the duodenal cell areas and cell mitosis numbers of all intestinal parts were greater ($p<0.05$) in the ZEM® groups than in the control group. Protuberated cells were observed on the villus tip of the ZEM® groups. These histological changes indicate that the intestinal villi and epithelial cells were hypertrophied by ZEM®. The present results suggest that chicken growth performance would be improved due to hypertrophied intestinal villi and epithelial cells after feeding ZEM® and that ZEM® is effective alimentation for chicken diets. *(Asian Journal of Poultry Science 3 (2): 42-50, 2009; **doi**: 10.3923/ajpsaj.2009.42.50)*

Effects of Genotype X Sex Interaction on Growth and Some Development Characteristics of Ross and Anak Broiler Strains in the High Rainforest Zone of Nigeria

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A total number of two hundred broilers of mixed sexes comprising of one hundred Ross and one hundred Anak broiler strains was assessed for body weight (BWT), body girth (BDG), keel length (KLL) and shank length (SHL) from day-old to 9 weeks of age. Differences in BWT, BDG, KLL and SHL between the two genotypes were significant ($p<0.05$) at all ages except BWT at 3 weeks, BDG

at 6 weeks and SHL at 9 weeks of age. Significant sexual dimorphism existed between both sexes and genotypes. Male broilers were also superior to the females in all growth traits in the Ross genotype whereas Anak genotype only exhibited superiority of the males over the females in BWT at 9 weeks, BDG at 6 and 9 weeks and SHL at 9 weeks of age. The Ross broiler strain was significantly ($p<0.05$) heavier than the Anak broiler at 6 and 9 weeks of age. This difference in weight is an indication, therefore that genetic difference existed in growth rates between the two commercial strains studied. This could form reliable bases for further studies and effective selection for meat yield between Ross and Anak broiler for further improvement. *(Asian Journal of Poultry Science 3 (2): 51-56, 2009; **doi:** 10.3923/ajpsaj.2009.51.56)*

Comparative Efficacy of Supplementation of Natural (*Citrous limon* Juice), Herbal and Synthetic Vitamin C on the Immune Response of Broiler Chicken During Summer Stress

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The hematological and immunological study was undertaken on 488 Ven- cobb straight run commercial broiler chicks for period of one week divided into four treatments viz., T_0, T_1, T_2 and T_3 on the onset of fifth week of age. The treatment T_0 was the control without supplementation of vitamin C. The birds in treatment T_1, T_2 and T_3 were supplemented with 5 mL *Citrus limon* juice, 2 mL herbal vitamin C and 1 g synthetic vitamin C per 100 birds, respectively through drinking water. The results of the study indicated that Heterophill percentage was significantly ($p\leq0.05$) decreased in treatment T_1, T_2 and T_3 as compared to control T_0. Similarly, the Lymphocyte percentage was significantly ($p\leq0.05$) increased in treatment T_1, T_2 and T_3 than the control T_0. The Heterophil: Lymphocyte ratio was significantly ($p\leq0.05$) lower in treatment T_1 followed by T_3, T_2 and T_0. The weight of bursa of fabricious and spleen was significantly ($p\leq0.05$) higher in T_1 followed by T_3, T_2 and T_0. The rectal temperature of birds was decreased significantly ($p\leq0.05$) T_1, T_2 and T_3 as compared to control group. Carcass traits did not differ significantly among the different groups except the percent giblet weight was significantly higher in T_1. The overall study conclude that, the *Citrus limon* juice, herbal vitamin C and synthetic vitamin C has beneficial significant effect in alleviating the Summer stress in broiler chicken. However, the better results were found with *Citrus limon* juice as compared to herbal and synthetic vitamin C. *(Asian Journal of Poultry Science 3 (3): 57-62, 2009; **doi:** 10.3923/ajpsaj.2009.57.62)*

Growth, Feed Consumption and Carcass Composition of *Coturnix japonica*, *Coturnix ypsilophorus* and their Reciprocal Crosses

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A study was conducted to compare Body Weight (BW), feed intake, feed efficiency up to 49 days of age and carcass characteristics of two quail strains namely, (Co: Japanese quail (*Coturnix japonica*), Ra: Range quail (*Coturnix ypsilophorus*) and their reciprocal crosses H1: Hybrid 1(Ra♂×Co♀) and H2: Hybrid 2 (Co♂×Ra♀) in four hatches. Body weights of four groups (Co, Ra, H1 and H2) at 1, 7, 14, 21, 28, 35, 42, 49, 56 and 63 days of ages between of four groups were significantly different ($p<0.1$). Body weight of female at 49, 56 and 63 days of age were significantly higher than males, but there was no significant difference between male and females at the other recorded BW ($p>0.05$). Feed intake of H2 group was also significantly larger than that other groups ($p<0.01$), while feed efficiency of four groups were not different ($p>0.05$). At 49 days of age, Carcass percentages, breast percents, wing weights and giblet weights of four groups were significantly different ($p<0.01$), while there was no significant difference for carcass weights (eviscerated), breast weights, carcass rests (thigh, leg and back) among them ($p>0.05$). Carcass weights, carcass percents, breast weights were significantly affected by sex ($p<0.01$), while sex for breast percents was not effective ($p>0.05$). Heterosis percents for the BW at 1 to 63 days of ages were estimated. Heterosis was positive for BW at 1, 14, 21, 28, 49, 56 and 63 days of ages, while other of ages was negative. *(Asian Journal of Poultry Science 3 (4): 132-137, 2009;* ***doi:*** *10.3923/ajpsaj.2009.132.137)*