

SEROPREVALENCE AND RISK FACTORS ASSOCIATED WITH NEWCASTLE DISEASE AND AVIAN INFLUENZA IN LOCAL CHICKENS AND GUINEA FOWLS IN NORTHERN BENIN

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AVIAN MEDICINE

Poultry farming in northern Benin faces significant threats from Newcastle disease (ND) and avian influenza (AI), which adversely affect poultry health and economic stability. The present research was executed to detect the seroprevalence of ND and AI in local chickens and guinea fowl from the Atacora and Donga regions and the factors responsible for the spread of these diseases. Data were collected from 118 farmers, of which 52 were men and 66 were women, and 300 blood samples were collected from 191 chickens and 109 guinea fowl. Serological tests for NDV and AIV (H9N2, H5) antibodies were conducted via hemagglutination inhibition tests. In addition, chi-square tests and logistic regression were used to compare the differences in seroprevalence rates and associated factors. The results revealed that women were the major owners of small-scale farms, accounting for 60.10% of the total. A total of 49.15% of the farmers reported ND symptoms such as torticollis (43.10%) and greenish diarrhea (37.93%), whereas 30.76% reported AI symptoms, which included hemorrhagic comb wattles (34.29%) and sudden death (25.71%). Although 51.69% of the farmers were vaccinated against ND, none reported vaccinating against AI. Importantly, significant associations were observed, especially between gender and farm size ($p < 0.001$), biosecurity and ND experience ($p = 0.027$), wild bird contact and AI experience ($p < 0.001$), and quarantine and AI experience ($p = 0.006$). Regional differences in the NDV seroprevalence were 59.22% for chickens in Atacora and 46.59% for those in Donga ($\chi^2 = 12.901$; $p = 0.024$). Among guinea fowl, the seroprevalence recorded for Atacora was 63.53%, while that recorded for Donga constituting 62.50% ($\chi^2 = 1.102$; $p = 0.954$). The H9N2 seroprevalence was 41%, whereas in a subset of 40 individuals, H5 was found at 17.5%. Remarkably, antibodies to H5 were found only among guinea fowl, and the rate in the Atacora samples reached 46.66%. Compared with farm with chickens only, those with mixed poultry species were more likely to be positive for H9N2, with an OR = 4.25, $p < 0.001$. This finding highlights the epidemiological role of guinea fowl in the transmission of these diseases.

Key Words: Biosecurity, Newcastle Disease (ND), Avian Influenza (H9N2 and H5); Mixed Species Poultry Farming; Northern Benin

MARKET CHARACTERISTICS, TRADING, AND BIOSECURITY PRACTICES OF SOME SELECTED BORDER RURAL LIVE BIRD MARKETS IN GHANA- IMPLICATIONS FOR DETECTION OF AVIAN INFLUENZA H5 AND H9 IN POULTRY

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AVIAN MEDICINE

With frequent outbreaks of HPAI in Ghana and neighbouring countries in West Africa, Avian Influenza viruses have become endemic in poultry in Ghana. However, there is a dearth of information on the role of cross-border trade of live poultry and poultry products in the transmission of these viruses to rural poultry across countries. This study investigated the market characteristics, trading, biosecurity practices and detected Avian Influenza virus subtypes (H5 and H9) of some selected border rural live-bird markets in Ghana. A cross-sectional semi-quantitative study was conducted using semi-structured questionnaire and observations. The study lasted from May to July 2024. The study included a total of 180 rural poultry traders. The questionnaire assessed the demographic information, sources of birds, volume of poultry trades, means of transportation of birds, and handling and biosecurity practices of rural poultry traders in the markets. Tracheal and Cloacal swab samples were also obtained from 385 birds (local chicken, guinea fowl, and duck). A total of 770 swab samples from local chicken, guinea fowl, and duck across four border live bird markets were screened for Influenza A virus M gene ($Ct < 35$). The prevalence of Influenza A by sample type, location, and species was calculated at 95% confidence (CI) using an exact binomial interval. The study revealed that, all (100%) traders in Northern Ghana were male, while (73.7%) of traders in Southern Ghana were female. In Northern Ghana, 44.0% of traders purchased birds from less than 5 identified sources including Burkina Faso. Conversely, in Southern Ghana, 67.5% of traders purchased birds from more than 5 identified sources including Togo. Trading activities involved movement from one market to another on a designated market day; every two to four days by 48.0% and 48.7% of traders respectively in Northern Ghana and Southern Ghana. The most common mode of transportation of birds in both locations is motorcycle/tricycle (89.0%) Northern Ghana and (35%) Southern Ghana. The overall biosecurity practices were poor in both locations, (64.0%) Northern Ghana and (58.7%) Southern Ghana and traders have not attended any training or workshop on biosecurity. The overall prevalence of influenza A was 6.4% (CI: 4.7, 8.3). Tracheal swabs recorded 8.8% (CI: 6.2, 12.1), and cloacal swabs, 3.9% (CI: 2.2, 6.3). The prevalence was higher in Southern Ghana, 11.2% (CI: 7.4, 16.0), than in Northern Ghana, 4.4% (CI: 2.8, 6.5) ($p < 0.05$). Further subtyping of the M-gene-positive samples confirms the circulation of H5 [4.4% (CI: 2.6, 7.0)] and H9 [2.9% (CI: 1.4, 5.1)] in all four live bird markets from the two locations. The study suggests that the rural poultry trading practices has significant influence on the risk of infectious diseases in local poultry across the border areas. There is also the presence of H5 and H9 avian influenza viruses in border live bird markets in Ghana. These viruses can cause economic losses in poultry and have zoonotic potential. The study highlights the need for transboundary surveillance of H5 and H9 viruses in Ghana and suggests more efforts to promote biosecurity practices in border LBMs to reduce maintenance and transmission of AIVs in Ghana.

Key Words: Avian Influenza, Rural Poultry, Live Bird Markets, Rural Poultry traders

MERCURY CHLORIDE INDUCED TOXICITY IN COCKEREL CHICKENS: AMELIORATIVE EFFECT OF GALLIC ACID

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AVIAN MEDICINE

Mercury is a highly toxic heavy metal with a strong affinity for sulfhydryl groups, disrupting cellular functions, immune responses, and organ integrity. Sources of mercury from both natural and industrial sources such as residues from fertilizer production plants and poor waste management result in chronic accumulation in different organs of the body with a resulting in structural, functional and metabolic disorders in both humans and animals. Gallic acid, a natural polyphenolic compound found in many food crops and trees with potent antioxidant, antitumour and anti-inflammatory properties was used against mercury chloride (HgCl_2)-induced toxicity in cockerel chickens in this study. Sixty -one-day- old cockerel chickens were randomly divided into six groups and reared for 6-weeks with all necessary veterinary attention provided; Group A (control), Group B were administered 4 mg/kg mercury chloride only while Groups C and D received 50 mg/kg and 100 mg/kg gallic acid alone, Groups E and F received 4 mg/kg HgCl_2 in addition to 50 mg/kg and 100 mg/kg of gallic acid respectively for 15 days. Body weight, electrocardiogram, blood and serum samples were taken before the chickens were euthanized. Tissue samples from the heart, kidney, liver and brain were harvested for biochemical assays, histopathology and immunohistochemistry. One-way ANOVA was used to analyse the results with the level of significance set at $p < 0.05$ via Graphpad prism 5.0. The results revealed that the hemoglobin concentration in the gallic acid treated groups was significantly greater than that in the control and HgCl_2 treated groups. Serum biochemistry indicated significant improvements in sodium, bicarbonate, and aspartate aminotransferase (AST) levels in the treated groups. Histopathological findings revealed extensive renal, hepatic, cardiac, and neuronal damage in the mercury-treated groups, characterized by vascular congestion, cellular necrosis, and inflammation, compared with those in the treated and control groups. There was an increase in markers of oxidative stress, H_2O_2 and MDA generation in the cerebrum and kidney, which was significantly ameliorated in the treated group, as was a significant increase in the activities of pro-oxidants such as GSH, SOD and GST in the cerebellum, cerebrum, heart, kidney and liver. Immunohistochemical assays revealed increased immunoreactivity of renal podocin, angiotensin-converting enzyme (ACE), cardiac troponin, and tumor necrosis factor-alpha ($\text{TNF-}\alpha$) antibodies in the tissues of the HgCl_2 exposed group which was significantly downregulated in the gallic acid treated groups. These results suggest that gallic acid, owing to its anti-inflammatory, antioxidant, and tissue protective properties, may effectively mitigate the deleterious effects of mercury-induced toxicity in a range of body systems. Therefore, gallic acid inclusion in the diet of commercial chickens may serve as an alternative method for treating heavy metal toxicity such as mercury in poultry production.

Key Words: Mercury chloride, Gallic acid, Oxidative stress, Tissue damage, Immunohistochemistry.

SEROLOGICAL AND MOLECULAR DETECTION OF NEWCASTLE DISEASE IN GONDAR CITY, AMHARA REGIONAL STATE, ETHIOPIA

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Newcastle disease is an extremely transmissible and serious infectious disease of poultry caused by avian paramyxovirus-1 and has a significant economic impact in developing countries including Ethiopia. A cross-sectional study was carried out in Gondar city between May and December 2024 to evaluate the serological and molecular detection of Newcastle disease and examine its associated risk factors. Three hundred eighty-four serum samples were collected from apparently healthy and non-vaccinated chickens via random sampling technique. The serum samples were analysed with a competitive enzyme-linked immunosorbent assay, and an overall seroprevalence of 59.9% was recorded. Putative risk factors for the disease were collected simultaneously with serum samples by interviewing the chicken owners and assessed via the chi-square test and logistic regression analysis. A statistically significant difference was found in breeds of chickens, with a higher prevalence in exotic chickens (63.3%) than in local chickens (54 (50.9%), Seropositivity based on management system revealed higher positivity in chickens under extensive system (68.1%), followed by semi-intensive (54.5%) and intensive management with least positivity of (53.3%) and in flocks with a history of introduction of new chickens (151 (67.7%)) than in flocks with no history of introduction of new chickens (79 (49%) ($p < 0.05$)). A higher seroprevalence was detected in female chickens (172, 63.7%) than in male chickens (58, 50.8%), in adults (63.4%) than in young (55.3%), and in laying chickens (63.8%) than in broilers (51.6%), but the difference was not statistically significant. Eighteen swab samples were collected and merged into nine pooled samples for molecular detection of the virus via conventional RT-PCR. Among the total samples analysed, 5 (27.8%) tested positive for Newcastle disease virus. The results of the present study indicate that Newcastle disease is highly prevalent in Gondar. Therefore, strict prevention and control measures are essential to mitigate its impact. Additionally, further identification and characterization of NDV are necessary to determine the circulating strain in the study area.

Key Words: Competitive ELISA, Gondar city, Newcastle disease, Seroprevalence

PREVALENCE, CLINICOPATHOLOGICAL AND MOLECULAR INVESTIGATION OF *EIMERIA* SPECIES INFECTING BROILER AND LAYER CHICKENS IN MOROGORO MUNICIPAL, TANZANIA

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AVIAN MEDICINE

Coccidiosis is known for its great economic losses in the poultry industry due to the destruction of the intestinal tract epithelial cells, leading to anorexia and reduced feed intake, mal-digestion, mal-absorption, dehydration, blood loss, and anaemia. The disease is caused by seven protozoan parasite species of the genus *Eimeria* in chickens, namely, *E. tenella*, *E. acervulina*, *E. maxima*, *E. necatrix*, *E. bruneti*, *E. praecox*, and *E. mitis*. However, the status of the disease has not been intensively explored in Tanzania. This study investigated the prevalence of coccidiosis in Morogoro, Tanzania, and identified the prevalent species at the molecular level. The study also studied the clinicopathological characteristics in broiler, sasso and layer chickens. Faecal samples collected from chicken farms were examined by the flotation technique for unsporulated oocysts. The oocysts were sporulated and used to infect chicks for the clinicopathological studies. For species identification, DNA was extracted from fresh faecal samples followed by PCR using species-specific ITS-1 primers. PCR products positive for *E. tenella* and *E. acervulina* were sent for sequencing, and the resulting sequences analyzed for homology with those published in public GenBank. The clinicopathological study reproduced the already published characteristics of the disease, which are reduced feed intake, dullness, bloody diarrhea, and mucoid and haemorrhagic enteritis. Histological changes included the presence of parasites in enterocytes, disruption of epithelial lining, erosion of the villi, necrosis and infiltration of inflammatory cells, and haemorrhages. A 31% prevalence was reported in the current study, with all seven *Eimeria* species amplified by PCR. *E. tenella* and *E. acervulina* were the most prevalent species. The sequences were homologous to sequences from other countries by 94% to 98%. It was recommended and concluded that coccidiosis is highly prevalent in both broiler and layer chickens in Morogoro, Tanzania, and that mixed infection is common. More studies focusing on the specific circulating species and possible ways to control and manage the disease, especially through vaccination, are recommended.

Key Words: Clinicopathological, coccidiosis, *Eimeria*, Morogoro Tanzania, PCR

OCCURRENCE AND MOLECULAR CHARACTERISATION OF NEWCASTLE DISEASE VIRUS FROM CHICKEN FLOCKS IN IBADAN, NIGERIA, AND COMPARISON WITH AVAILABLE VACCINE VIRUSES STRAINS

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AVIAN MEDICINE

Newcastle Disease (ND) is a highly contagious viral disease affecting chickens, with significant economic and food security implications globally. In Nigeria, where poultry farming contributes substantially to the economy, ND outbreaks disrupt farmers' livelihoods and threaten food security. Caused by avian paramyxovirus type 1, the virus exhibits genetic diversity, complicating vaccine efficacy and disease control. Despite widespread vaccination efforts, outbreaks of ND persist. This study investigates the occurrence, genetic diversity, and molecular characteristics of ND virus in Ibadan, Nigeria, and evaluates the genetic compatibility of circulating strains with vaccine strains in use. A total of 297 tracheal and cloacal swab samples were collected from suspected ND cases across various poultry farms and submitted to CHI Farm Diagnostic Laboratory (281 samples) and the Poultry Disease Unit at the University of Ibadan (16 samples). Necropsy was performed on dead chickens to identify organ-specific lesions consistent with ND. Haemagglutination (HA) test and haemagglutination inhibition (HI) test (using virus specific antiserum) were carried out on the tracheal and cloacal swabs. RT-PCR and sequencing were carried out to detect and characterize the F-gene of NDV from the samples that were NDV positive and to compare with available vaccine strains. Post-mortem findings of petechial to ecchymotic haemorrhages on the proventriculus, intestine and caecal tonsils, and congested trachea all indicative of ND were observed in 26 out of the 297 cases presented (8.8%). All tracheal and cloacal swabs from all 26 cases showed haemagglutinating activity while only 12 (4.04%) cases were positive for HI test using ND-specific antiserum. Out of the 12 ND-positive cases, RT-PCR detected F-gene from 11 (3.7%) samples. Phylogenetic comparative analysis highlighted discrepancies between circulating strains and vaccine strains. In order to safeguard the health and livelihoods of poultry, this study emphasizes the persistence of Newcastle disease in Nigerian poultry farms and the necessity of region-specific vaccinations, molecular surveillance, and enhanced disease management techniques.

Key Words: Newcastle Disease Virus, molecular characterization, poultry health, incidence, genetic diversity, biosecurity, vaccination, Nigeria, food security.

POST-VACCINATION SEROMONITORING OF NEWCASTLE DISEASE ANTIBODIES IN RURAL CHICKEN FLOCKS IN NORTH CENTRAL BURKINA FASO

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AVIAN MEDICINE

Newcastle disease (ND) is one of the most common diseases in poultry production, causing high mortalities and significant economic losses. Since the 1950s, vaccines have been formulated to fight this disease. In rural poultry flocks in low- and middle-income countries, controlling this enzootic disease has been challenging, especially in countries like Burkina Faso. Solutions have been sought for years to find an effective and sustainable way to prevent this infection through vaccination. This study aimed to assess the antibody response to the inactivated Lasota NDV vaccine. A haemagglutination inhibition (HI) test was performed on 629 chicken serum samples collected in the area, including 394 from vaccinated chickens and 235 from non-vaccinated birds, following the WOAHA guidelines. The results revealed that after vaccination, 81.2% of the vaccinated chickens had a protective antibody titre against ND. Linear regression highlighted that rural poultry seroconverted the vaccine antigen over time, starting to produce antibodies by day 7 post-vaccination, with antibody levels increasing significantly by day 14 post-vaccination and beyond. Over half (54.46%) of samples from non-vaccinated chickens were negative (HI titre $\leq 3 \log_2$) for protective NDV antibodies while 45.54% were positive (HI titre $> 3 \log_2$). A Student t-test revealed a statistical difference in NDV antibody levels between chickens vaccinated at least 7 days before sampling and the non-vaccinated chickens. The mean HI titre for vaccinated birds was 7.4 $\log_2$ while it was 3.8 $\log_2$ for non-vaccinated birds. Although mean HI titre for non-vaccinated chickens suggested protective immunity, the median HI titre for non-vaccinated chickens revealed a HI titre of 2 $\log_2$ while the median HI titre for chickens vaccinated was 8 $\log_2$. The non-vaccinated chickens do not have a protective median HI titre while that of the vaccinated chickens is highly protective. This highlights the importance of vaccination in enhancing the health status of rural poultry. The study also revealed variations in mean HI titres in vaccinated chickens across the villages, suggesting that there are other parameters to be considered when assessing the effectiveness of vaccination in rural areas.

Key Words: Chickens, Newcastle disease virus, vaccines, vaccine hesitancy, rural conditions, Burkina Faso

**RADIOGRAPHIC, GROSS AND COMPARATIVE HISTOMORPHOMETRY OF
GASTROINTESTINAL TRACT OF *FRANCOLINUS BICALCARATUS*:
IMPLICATIONS FOR DOMESTIC PROPAGATION AND CONSERVATION**

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AVIAN MEDICINE

Francolinus bicalcaratus, also known as African bush fowl, is an avian species that thrives in West Africa's rainforest and savannah regions. Its high crude protein content and white meat classification may be due to its rising demand for its meat. However, this highly valued game bird is approaching endangered status due to growing hunting pressure, increased urbanization, and the construction of access highways. This study aimed to elucidate the gastrointestinal tract using radiography, gross evaluation, and comparative histomorphometry. Ten birds of both sexes were acquired, of average weight 241 ± 42 g, acclimatized for two weeks, sedated using low-dose ketamine at 5mg/kg body weight and dorsoventral and lateral radiographic views were acquired using an Allengers 525 Fluo machine, and their respective digestive organs were examined postmortem. Linear measurements of the digestive organs were taken using a digital caliper, and tissues were fixed in 10% neutral buffered formalin, processed using routine histological techniques, and stained with haematoxylin and eosin for microscopic examination. Histological sections were examined under a light microscope, and images captured for comparison were captured for comparison. The study found no correlation between carcass weights and linear dimensions and organosomatic indices of the digestive tube in *F. bicalcaratus*. The regional histology of the gastrointestinal tract of *F. bicalcaratus* is not very different in structural descriptors with that of domestic fowls, but there are slight variations that reveal adaptations aligned with dietary habits. Key differences in *F. bicalcaratus* include increased mucus gland density in the oesophagus, higher goblet cell density in the small intestine, and structural variations in the gizzard, suggesting adaptability to a more varied diet that includes seeds and invertebrates.

Key Words: Male African bush fowl; *Francolinus bicalcaratus*; Anatomy; Digestive system; Domestication; Propagation; Conservation.