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Research Article

Serological Evidence of Avian Mycoplasmosis and Salmonellosis in Different Poultry Birds at the Live Bird Market and Free Range Management System in Taraba State, Nigeria

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Received: June 27, 2020; **Published:** July 09, 2020

Abstract

Both avian mycoplasmosis due to *Mycoplasma gallisepticum* and *Mycoplasma synoviae* and salmonellosis due to *Salmonella pullorum* are responsible for economic losses to the poultry industry worldwide. This study was conducted between April to July, 2017, to determine the Seroprevalence of *Mycoplasma gallisepticum* (MG), *Mycoplasma synoviae* (MS) and *Salmonella Pullorum* (SP) in broiler chickens, layer chickens, indigenous chickens, guinea fowl, indigenous cross - breed chickens (Lacroilers) sampled at the Jalingo live bird market and indigenous chickens on free range. Out of the total of 792 serum samples tested, 60.22% were positive to MG. Also, out of the 275 sera samples tested for MS, 66.18% were positive for MS. *Salmonella pullorum* antibodies were detected in 53.9% of the 920 whole blood samples tested. Highest seropositive rates were detected in the indigenous chickens for both MG and MS with 71.93% and 90% seropositive rates, respectively. The highest antibody presence for SP were found in the layer chickens. The study found that all bird types had detectable antibodies for MG, MS and SP leading to the conclusion that MG, MS and SP antibodies are prevalent in chickens of different types as well as guinea fowl in the study area. The significance of these findings are discussed.

Keywords: *Avian Mycoplasmosis; Salmonellosis; Mycoplasma gallisepticum; Mycoplasma synoviae; Salmonella pullorum; Serology; Poultry*

Abbreviations

MG: *Mycoplasma gallisepticum*; MS: *Mycoplasma synoviae*; SP: *Salmonella pullorum*

Introduction

Both avian mycoplasmosis caused by *Mycoplasma gallisepticum (MG) and Mycoplasma synoviae (MS)* and salmonellosis due to *Salmonella pullorum (SP)* are responsible for economic losses to the poultry industry especially in chickens and turkeys worldwide [1,2]. Avian mycoplasmosis due to *Mycoplasma gallisepticum* and *Mycoplasma synoviae* are the species responsible for greater losses in the poultry industry. Infections are characterized by obstinate hacking cough, sneezing, tracheal rales, decreased feed efficacy, poor carcass quality, and suboptimal egg production in laying birds and reduced quality of day old chicks [3-6].

Salmonella gallinarum and *Salmonella pullorum* remain a serious economic problem in countries where measures of control are not efficient and in those where climatic conditions favour the spread of these microorganisms [7]. *Salmonella pullorum* causes pullorum disease which is a severe septicaemic disease that causes high morbidity and mortality in young birds, especially newly hatched chicks, causing high losses to poultry producers [2]. Clinical signs in chicks includes; anorexia, diarrhoea, dehydration, weakness and high mortality while in adult birds decreased egg production, fertility, hatchability and anorexia and increased mortality are observed [6].

In Nigeria, disease remains a major setback to the poultry industry. Live bird markets could be a major source for the spread of poultry diseases as well as the type of management system. Though serological evidence of *Avian mycoplasma* infection has been established in some regions of Nigeria there is no such study in the live bird market where there is a convergence of birds brought from different villages and localities in Taraba state and indigenous chickens on free range. This calls for concern and that is why the study was undertaken to assess the antibody status of MG, MS and S.P to enable stakeholders to wake up to their responsibilities for strategic control measures.

Materials and Methods

The study was conducted in Jalingo metropolis the capital of Taraba state which is sub-sudan type of climate located between Latitude $8^{0}54'$N and Longitude $11^{0}22'$E in the North-eastern part of Nigeria. A total of 792 blood samples from broiler chickens, layer chickens, indigenous chickens, a cross-breed (lacroilers) of indigenous and exotic chickens and guinea fowl were collected from the slaughter and dressing section of the Jalingo live bird market (LBM) and from indigenous chickens on free range and the serum extracted and tested for MG antibodies using the MG antigen obtained from Charles River Laboratories, Inc. to perform the serum plate agglutination(SPA) test. Out of the 792 serum samples obtained, only 275 were tested for MS antibodies using *Mycoplasma synoviae* antigen from Charles River Laboratories, Inc. The whole blood test was deployed to test another 920 blood samples also obtained from the slaughter and dressing section of the Jalingo live bird market and indigenous chickens on free range using the *Salmonella pullorum* polyvalent antigen manufactured by Lohmann Animal Health Int., Winslow, Maine 04901 and distributed by Charles River Laboratories, Inc.

All prevalence results and 95% confidence intervals were estimated by the estimated true prevalence with an imperfect test [8]. The apparent prevalence was chosen for this study [9,10].

The analysis of variance (2 factor without replication) was used to determine significant differences in seroprevalence among different bird types.

Results and Discussion

In this study, 792 serum samples were tested for *Mycoplasma gallisepticum* antibodies. Out of the number 477 representing 60.22% were positive. Out of the 374 indigenous chickens tested for MG antibodies at the live bird market (LBM), 269 representing 71.93% were positive and was the highest prevalence. This was followed by the Indigenous chickens on free range (59.09%).

Broiler chickens were next with a Seroprevalence rate of 55.13%. Broilers, layer chickens, indigenous chickens and guinea fowl were all positive for MG antibodies. Details of results are presented in table 1.

	No of positives/no. sampled	Percentages		
		Apparent prevalence	Estimated true prevalence	95% Confidence interval
Broiler chicken (LBM)	129/234	55.13	60.82	54 - 69
Layer Chickens (LBM)	54/113	47.79	52.57	42 - 63
Indigenous chicken (LBM)	269/374	71.93	79.69	74 - 85
Guinea fowl (LBM)	8/19	50.00	55.06	29 - 81
Indigenous (Crossbreed)	3/13	9.68	9.75	2 - 27
Indigenous chicken (FR)	13/22	59.09	65.27	42 - 86
Total	477/792	60.22	66.55	62 - 70

Table 1: *Seroprevalence of Mycoplasma gallisepticum in various bird types in Jalingo live bird market and free range indigenous chickens.*
LBM: Live Bird Market; FR: Free Range.

The results for Seroprevalence of MS antibodies showed that highest Seroprevalence rates were found in indigenous chickens and broilers at the live bird market (LBM) with Seroprevalence rate of 90% each. This was followed by layer chickens (LBM) with 71.68% Seroprevalence and the guinea fowl with 33.33%. The least Seroprevalence rates was recorded in Lacroilers a cross - breed between indigenous and exotic chickens with 6.45% Seroprevalence. Details of the results are as presented in table 2.

	No of positives/no. sampled	Percentages		
		Apparent prevalence	Estimated true prevalence	95% Confidence interval
Broiler chicken (LBM)	45/50	90.00	1.00	87 - 100
Layer Chickens (LBM)	81/113	71.68	79.42	69 - 88
Indigenous chicken (LBM)	45/50	90.00	1.00	87 - 100
Guinea fowl (LBM)	3/9	33.33	36.33	09 - 74
Indigenous - exotic crossbreed (crossbreed)	2/31	6.45	6.13	0.18 - 22
Indigenous chicken (FR)	6/22	27.27	29.52	13 - 55
Total	182/275	66.18	73.24	66 - 80

Table 2: *Seroprevalence of Mycoplasma synoviae in various bird types in Jalingo live bird market and free range indigenous chickens.*
LBM: Live Bird Market; FR: Free Range.

Salmonella pullorum antibodies were detected in all types of birds with Layer chickens (LBM) having the highest Seroprevalence (66.37%), followed by guinea fowl (61.11%); Lacroilers (58.62%), Indigenous birds on free scavenging (54.54%), and the least rate (48.71%) recorded in broilers (LBM). Details of the results are as presented in table 3.

	No of positives/no. sampled	Percentages		
		Apparent prevalence	Estimated true prevalence	95% Confidence interval
Broiler chicken (LBM)	114/234	48.72	53.62	46 - 60
Layer Chickens (LBM)	75/113	66.37	73.45	63 - 83
Indigenous chicken (LBM)	264/504	52.38	57.73	53 - 64
Guinea fowl (LBM)	11/18	61.11	67.54	41 - 90
Indigenous - exotic cross breed (LBM)	17/29	58.62	64.74	43 - 84
Indigenous chicken (FR)	12/22	54.55	60.16	37 - 82
Total	493/920	53.59	59.09	55 - 63

Table 3: *Seroprevalence of Salmonella pullorum in different bird types in Jalingo live bird market and free range indigenous chickens. LBM: Live Bird Market; FR: Free Range.*
There were no significant differences (P > 0.05) in Seroprevalence rates among the different bird types for MG, MS and SP.

In the present study the highest (71.93%) MG sero-prevalence which was observed in the indigenous chicken sampled at the live bird market and those indigenous chickens on free range (59.09) is similar to the findings by Abdu., *et al.* [11] who reported Seroprevalence in indigenous chicken of 66.3%. The researchers reported MG Seroprevalence of 38.0 and 38.1 in backyard and intensively managed

chickens, respectively; figures that are lower than our study. Ahmed., *et al.* [12] however reported higher MG and MS Seroprevalence in indigenous chickens on free range in Niger state, Nigeria. Both MG and MS have been reported in indigenous and exotic chickens elsewhere in Nigeria Orajaka., *et al* [13]. The Seroprevalence of MG antibodies in guinea fowl which was 50.00% is lower to the figure reportedly by Adesiyun and Abdu, [14]. The Seroprevalence of SP which was higher in all bird types is similar to other studies in Nigeria [15,16] and elsewhere in Africa [17-19].

Conclusion

The present study has confirmed that antibodies to MG, MS and SP are prevalent in all types of chickens and guinea fowl in Taraba state, north-eastern Nigeria. It also concluded that the live birds market and birds on free range pose a great danger to the epidemiology of MG, MS and SP in Taraba State, North-eastern, Nigeria.

Conflict of Interest Statement

The authors do not have any conflict of interest.

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Volume 5 Issue 8 July 2020