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Review Article

Current Status of *Mycoplasma Gallisepticum* in Chickens and Associated Risk Factors in Pakistan

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Abstract

Avian species are suffered with many infectious and non-infectious diseases in which *Mycoplasma gallisepticum* is one of vital importance. Infected chickens can be diagnosed on the basis of clinical signs including coughing, sneezing, nasal discharge, foamy secretions in the eye, open mouth breathing, tracheal rales, reduced feed intake, drop in egg production in layers and decrease in weight gain. It is transmitted by both ways that is horizontal and vertical. Its prevalence is different in several regions of the country and current status is described in this paper. Diagnosis of Mycoplasma can be done by different serological tests including Serum plate agglutination test, Hemagglutination inhibition test and Enzyme linked Immunosorbent assay, whereas molecular detection can be done by Polymerase chain reaction. Serological tests are used for initial screening of flocks while confirmatory diagnosis can be done by molecular methods. Infection can be controlled by screening the breeder flock, vaccination of layer chicks and culling of infected flocks because if flock is infected, it remains for full life, so whole flock should be destroyed to avoid the further transmission from parent flock to offspring.

Keywords: *Mycoplasma gallisepticum*; Current Status; Poultry; Mycoplasmosis; Pakistan

Abbreviations

BCPP: Bovine Contagious Pleuropneumonia; PPLO: Pleuropneumonia; CRD: Chronic Respiratory Disease; MG: Mycoplasma gallisepticum; MS: Mycoplasma synoviae; MM: Mycoplasma meleagridis; MI: Mycoplasma iowae; SPAT: Serum Plate Agglutination; HI: Haemagglutination Inhibition; ELISA: Enzyme Linked-Immunosorbant Assay; GIT: Growth Inhibition Test.

Introduction

Poultry business is of vital importance in the developing countries. The total investment in poultry sector in Pakistan is almost one billion US dollars. The cheapest source of animal protein is the broiler meat and egg production is increasing 4% per annual. Almost every family in rural area and every 5th family in urban areas is linked with poultry sector in one or the other way [1].

Mycoplasma was first recognized in 1898 as the causative agent of the bovine contagious pleuropneumonia (BCPP) and after that, all similar agents were termed as pleuropneumonia-like (PPLO-like) organisms [2]. Avian mycoplasmosis was first defined in turkeys in 1926 and later in chickens in 1936 [3]. MG is also known as chronic respiratory disease (CRD) of poultry [4]. Causative agent of CRD is linked to the pathogen responsible for the infectious sinusitis of turkeys [5]. It was regarded as a member of the PPLO group and later named as *Mycoplasma gallisepticum* (MG) [6]. Mycoplasma pathogens are gram negative and belong to class Mollicutes,

order-I Mycoplasmatales, family-I Mycoplasmataceae and genus Mycoplasma, and over 100 species in different birds are identified. The genome size of various mycoplasma species varies from 600 - 1350 kbp. There are many specific nutritional requirements for the growth of mycoplasma pathogen. Mycoplasmas are pleomorphic and small size bacteria, without cell wall and bounded by a triple layer plasma membrane. Infected birds show different types of respiratory signs i.e. sneezing, coughing, tracheal rales nasal discharge, conjunctivitis etc. it is transmitted either horizontal (direct or indirect contact) vertical (from parents to offspring) [7].

Mycoplasma species

Amongst the bacterial diseases, Mycoplasmosis includes four major infectious, highly prevalent species including *Mycoplasma gallisepticum* (MG), *Mycoplasma synoviae* (MS), *Mycoplasma meleagridis* (MM) and *Mycoplasma iowae* (MI). MG and MS mostly effect the chickens but MM and MI are considered negligible for chickens and produce disease in turkeys [8]. Mycoplasma colonies have a typical fried egg appearance on culture media [9].

Source of infection

Spread of MG from infected chickens at hatchery, is a key source of infection. Sometimes, infection spreads from the domestic poultry located in the surroundings, domestic birds did not show the MG signs, but these birds act as MG carriers. In some cases, MG has been reported in some game birds with marked signs. MG has been reported in ducks with no clinical signs. The source of infection was infected chickens, raised with the ducks. In some cases, distance from the source of infection was identified as the main risk factor for infection. As the proximity of susceptible animals to the source of infection increases, risk of infection increases, and as the density of the animal population in the area increases [10].

Diagnosis

There are different techniques to detect MG. Most common technique which is used for early diagnosis or initial screening of MG is Serum plate agglutination (SPA) test [11]. Other serological methods are Haemagglutination inhibition (HI) test [12] and Enzyme linked-Immunosorbant assay (ELISA) [13].

Various PCR techniques are described by different researchers to diagnose and screening of different samples [14]. Molecular techniques are good alternatives for conventional diagnostic methods. Real time PCR is regarded as fast and sensitive test to detect MG infected flocks [15].

Risk factors

Age, sex, flock size and season are some associated risk factors. It was observed that MG infection was more in young chicks as compared to old ones. Higher infection in the young chickens might be due to the vertical transmission of pathogen from parent flock or lesser immunity level and it can be speculated that, until and unless parent flocks are not free from mycoplasmosis, the disease cannot be control from commercial flocks. Female birds are more susceptible to infection than males. This might be due to the weak immunity level in females as compared to males. The flock size may also affect the MG prevalence by promoting Mycoplasma circulation between birds. Large flocks are more susceptible to MG. Highest infection rate in larger flocks might be correlated with poor management and bio-security measures in addition to horizontal transmission of the organisms. Infection is more severe in winter season as compared to summer. This seasonal variation in infection might be due to sudden change in temperature. Cold weather depress the natural resistance of birds, leading to more susceptibility to infection due to cold stress on the birds. In the same way, the infection is slightly higher in the Foothills than in coastal area, in which humidity is greater [16,17-24].

Prevalence in Pakistan

MG status was different in various districts, even at different regions in same district, table 1.

City/State/Region	Bird's Type	Samples Collected	Diagnostic Tests	Mg Prevalence or Incidence (%)	Paper References
Lahore district	Broiler breeding stock	2777 serum samples	Indirect ELISA	74.60 in young and 33.17 in adult birds	18
Faisalabad district	Layer flocks	640 sera samples	SPAT	54.84 in pullets, 46.34 in adult and 44.44 in old laying flocks. 45.13 in winter and 36.30 in summer season. 48.11 and 27.27 in higher and lower density flocks respectively	19
3-districts of Balochistan	Broiler and layer flocks	600	SPAT and ELISA	MG in broilers by SPA and ELISA were 10.47 and 19.76 while in layers 19.44 and 31.66 by SPAT and ELISA respectively.	20

Pakistan	Poultry farms	100 field and 250 experimental samples	Duplex PCR	92% MG in field and 100% in experimental samples	21
Lahore district	White leghorn laying bird	380 (154 trachea, 113 lungs and 113 air sac)	MG conventional cultivation method, Growth inhibition test (GIT), PCR	Overall 27.6% (104/380) by conventional cultivation method. Out of 104, 83 samples (79.8%) while 68.94% by PCR.	22
Faisalabad	Layer flocks	92 samples	SPAT and PCR	20.65% and 15.21% MG was detected by SPAT and PCR respectively.	23
Punjab	Broiler breeder farms	103 serum samples	iELISA	53.40%	24
Five Districts of Khyber Pakhtunkhwa-Pakistan	Broilers and backyard poultry	648 serum samples	SPAT	35.03%	25

Table 1: MG prevalence in Pakistan.

Conclusions

MG is prevalent in many regions of Pakistan time to time. It causes huge economic losses to the poultry industry of Pakistan. It is transmitted either horizontal or vertical, if there is disease in parent flock whole flock should be culled to control the further transmission to young chicks but if horizontal, diseased birds should be removed from the flocks to avoid disease transmission in healthy birds. It should be controlled at hatchery level and on other hand horizontal transmission can be controlled by good management and sanitary measures. Secondly, screening of whole flock should be done to know the disease status to control or cure the disease in birds. Serological screening is very quick and reliable method to check the MG in any flock. Proper vaccination in layer flocks and timely detection is helpful to control the disease at early stages.

Conflict of Interests

The authors have no conflict of interests to declare.

Author's contribution

MFQ conceived the study, prepared the manuscript draft and contributed crucial components to the manuscript. All authors critically reviewed the manuscript and approved the final draft.

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