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Antibiotic sensitivity pattern of isolated bacterial pathogens in commercial layers

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Abstract
Resistance against frequently used antibiotics has become a serious cause of concern in poultry management and disease control. Hence a study was carried out to know the antibiotic sensitivity pattern using the commercially available antibiotics for 341 isolates from 252 samples isolated from birds exhibiting signs of bacterial infection. The results revealed that bacterial isolates had maximum sensitivity for Ampicillin, Ciprofloxacin and Gentamicin followed by Amoxicillin. Kanamycin and Sulphamethaxazole were found to be the most intermediately sensitive antibiotics. Erythromycin and Tetracycline were the most resistant antibiotics.

Keywords: birds, bacterial infection, antibiogram, antibiotic resistance

Introduction
Commercial poultry industry (broiler and layers) plays a major role in the economy of India. Poultry rearing is considered superior to the others in agricultural sector because of an assured income in a relatively short period of time. The poultry production chain has strengthened over the years due to advancement in genetics, nutrition and technology. However, the intensification of production has also resulted with an undesirable increase in pathological load and health problems in birds.

Antibiotics are extensively used as growth promoters in poultry production or to control infectious disease [1] and exorbitant use of such antibiotics is considered to be the most vital selecting force to antimicrobial resistance of bacteria [2]. Due to enormous use of antibiotics in the field of veterinary medicine, an increased number of resistant bacterial strains have developed in recent years. The rise in antibiotic resistance has been reported in the past two decade in many countries including India[3]. It might be due to indiscriminate use of antimicrobial agents [4].

Of the various bacterial isolates from poultry, *E.coli* strain were resistant to penicillin, ciprofloxacin, erythromycin, ampicillin and sensitive to gentamicin, chloromphenicol and neomycin [1a]. Shuchimita *et al.* (2007) [5] reported that most of the isolates from poultry were sensitive to gentamicin, chloromphenicol and streptomycin but resistant to ampicillin and trimethoprim. Highest antibiotic resistance of Salmonella in poultry was observed towards erythromycin (100%) and then to streptomycin (22.2%) and tetracycline and chloromphenicol (16.7%) [6]. The highest rate of resistance in *P.multocida* isolates was recorded against streptomycin (59%) and nalidixic acid (43%). 11% of these isolates were sensitive to all antimicrobials tested whereas 24 per cent of isolates were resistant to one, 48 per cent to two to four and 17 per cent to five to seven antimicrobials [7].

In India, the economic aspect of poultry disease and their mortality and morbidity due to bacterial infection is thus a matter of great concern to the poultry farm owners. The antibiotic resistance pattern increases the incidence of diseases in poultry and subsequently affects the economy of India. Therefore, this study was designed to identify the antibiotic resistance against bacteria in layer birds.

Materials and Methods
Study population
The present research work was carried out in commercial layer farms of West Godavari district in Andhra Pradesh. The farms maintained under intensive system of rearing with uniform

managemental practices were included for the study.

Collection of samples

A total of 279 samples including tracheal swab, conjunctival swab etc. were collected aseptically from infected chicken which showed the clinical symptoms of common bacterial diseases such as serous or mucoid discharge, lacrymation, sneezing, conjunctivitis, diarrhoea, facial swelling.

Antibiotic sensitivity test

The collected samples were cultured on differential and selective medium for the development of bacterial colonies. Antibiogram was then performed for the bacterial colonies isolated to study their sensitivity and resistance pattern against the available and mostly used antibiotics commercially. In vitro antibiotic sensitivity was done by the disc diffusion method in Mueller Hinton Agar (Fig.1). The antimicrobial discs were placed individually with sterile forceps by gently pressed down on the surface of the agar (Fig.2). The zone of inhibition was interpreted in diameter according to the guidelines suggested by Clinical and Laboratory Standard Institute (2007) [8].

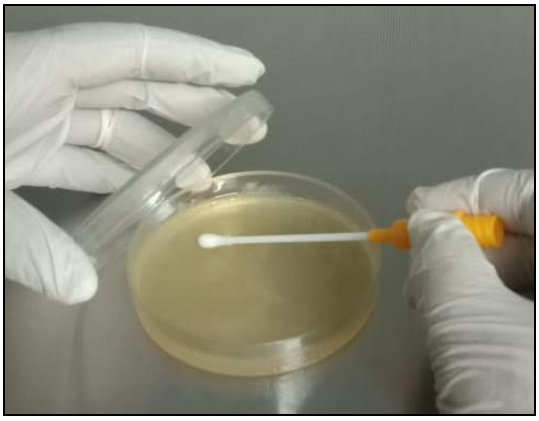

Fig 1: Streaking of isolates on Mueller Hinton Agar

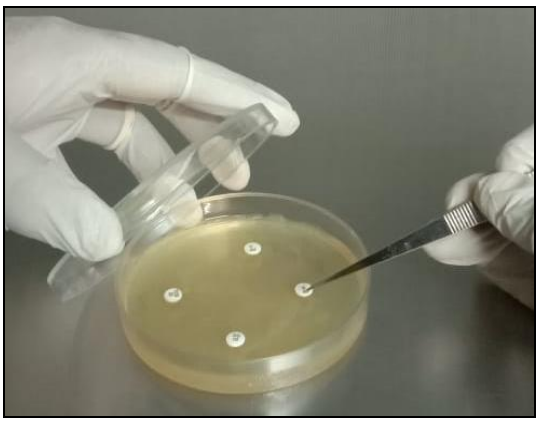

Fig 2: Placement of Antibiotic discs on Mueller Hinton Agar

Results and Discussion

Antimicrobial resistance is a global problem and has become a public health fact worldwide [9]. A variety of foods and environmental sources harbour bacteria that are resistant to one or more antimicrobial drugs used in human or veterinary medicine and in food–animal production[10].Though many bacteria recovered from poultry or poultry–related samples have been monitored, few published studies have reported on antimicrobial resistance in bacteria, particularly Salmonella and *E. coli* [11].

In the present study, a total of 279 samples subjected to bacterial culture showed bacterial growth in 252 samples. Antibiogram was performed for 341 isolates from 252 samples. Antibiogram profile of various antibiotics against different number of isolates was found to be most sensitive towards Ampicillin (AMP), Ciprofloxacin (CIP) and Gentamicin (GN) followed by Amoxicillin (AMY). Kanamycin (K) and Sulphamethaxazole (SXT) were found to be the most intermediately sensitive antibiotics and Erythromycin (E) and Tetracycline (TE) were the most resistant antibiotics.

Sensitivity pattern of bacterial genera to various antibiotics

On analysing the susceptibility pattern of a particular bacterial genera against various antibiotics, *E.coli* were found to be sensitive to Ampicillin, Ciprofloxacin, Gentamicin, Kanamycin, Sulphamethaxazole and Tetracycline. But they were intermediately sensitive to Amoxycillin and resistant to Erythromycin. These findings were similar with the findings of AlGhamdi *et al.* (2001) [12]; Nazir *et al.* (2005) [4a]; Akond *et al.* (2009) [1a]; Huang *et al.*(2009) [13] and Jeyasanta *et al.* (2012) [14]. Salmonella spp were sensitive to Amoxycillin, Ciprofloxacin followed by Kanamycin and Gentamicin. They were intermediately sensitive to Sulphamethaxazole and resistant to Erythromycin and Tetracycline. The results were supported by Khan *et al.* (2005) [15] and Hyeon *et al.* (2011) [6a]. *Pasteurella* spp., were sensitive to Amoxycillin, Ampicillin, Gentamicin, Erythromycin followed by Sulphaethaxazole and Tetracycline. They were intermediately sensitive to Kanamycin and resistant to Ciprofloxacin. The results were in concordance with Sellyei *et al.* (2009) [16]. *Staphylococcus* spp were sensitive to Ampicillin, Amoxycillin, Ciprofloxacin, Erythromycin and Gentamicin; intermediately sensitive to Kanamycin and resistant to Sulphamethoxazole and Tetracycline. White *et al.* (2003) [17] and Farzana *et al.* (2004) [18] have earlier reported similar pattern of sensitivity to the same antibiotics.

Indiscriminative use of antibiotics as feed additives and for treatment purposes in layer results in variation of antibiogram profile which might be due to enzymatic degradation, mutation at binding sites, down regulation of outer membrane proteins, efflux pumps and transduction of genes in bacterial isolates. As the result, enzymatic degradation, mutation and transduction of genes do not occur which could be a reason for the resistance of bacterial isolates to most of the antibiotics. Hence indiscriminate use of antibiotics to poultry should be restricted.

Conclusion

The present study to understand the susceptibility pattern of bacterial colonies isolated from birds in a commercial farm to a panel of commonly used antibiotics revealed the built up of resistance to the antibiotics Tetracycline and Erythromycin which caution against the indiscriminate and irrational use of antibiotics in the poultry industry.

Acknowledgement

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