Open Journal of Medical Microbiology, 2015, 5, 113-117
Published Online September 2015 in SciRes. http://www.scirp.org/journal/ojmm
http://dx.doi.org/10.4236/ojmm.2015.53014

Prevalence and Antibiotic Resistance of *Salmonella* spp. in Turkey

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Received 18 July 2015; accepted 28 August 2015; published 31 August 2015

Abstract

The current study was conducted to investigate the prevalence of *Salmonella* spp. in turkey and to determine the antimicrobial resistance pattern of the isolated *Salmonellae*. Two hundred and fifty turkeys were randomly selected for cloacal soab samples preparation, and the samples were investigated for *Salmonella* isolation. Identification of the isolated *Salmonella* was performed using standard bacteriological and biochemical procedures. The prevalence of *Salmonella* in turkey was about 14.8%. Disc diffusion tests on Muller-Hinton agar were used to determine the sensitivity to antibacterial agents. Ten antibiotics were studied: lincospectin, colistin, cephalexin, ciprofloxacin, chloramphenicol, gentamycin, furazolidone, streptomycin, co-trimoxazole (trimethoprim-sulfamethoxazole) and tetracycline. The highest resistant was observed against cephalexin (89.2%), tetracycline (86.5%), colistin (83.8%), and furazolidone (73%). The Highest sensitivity was found to gentamycin (86.5%), ciprofloxacin (83.8%), chloramphenicol (51.4%) and streptomycin (40.6%). The results showed high prevalence of *Salmonella* spp. in turkey and high levels of antimicrobial resistance pattern of the isolated *Salmonellae* were observed.

Keywords

Antibiotic Resistance, Prevalence, *Salmonella*, Turkey

1. Introduction

Salmonellosis is one of the common diseases in all places. Unhygienic farm condition is major predisposing factor for cause of this disease. Some of the diseases of *Salmonella* are transmissible from man to birds. In the

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How to cite this paper: Jahantigh, M., Jafari, S.M., Rashki, A. and Salari, S. (2015) Prevalence and Antibiotic Resistance of *Salmonella* spp. in Turkey. *Open Journal of Medical Microbiology*, **5**, 113-117. http://dx.doi.org/10.4236/ojmm.2015.53014

Salmonellosis, transmission of diseases to human beings is an important criteria rather than drop in production in the farm [1]. Infections with bacteria of the genus *Salmonella* are responsible for a variety of acute and chronic diseases in poultry. Infected poultry flocks are also among the most important reservoirs of *Salmonellae* that can be transmitted through the food chain to humans [2]. *Salmonella* is a genus of bacterium that is a major cause of foodborne illness throughout the world. The main reservoirs of *Salmonella* are considered to be domestic animals, poultry and pigs in particular and *Salmonella* organisms are easily isolated from faeces [3]. These carrier animals likely play a significant role in the spread of infection between herds and flocks and consequently serve as sources of food contamination and human infection [4]. *Salmonella* spp. is routinely detected in clinical, food and environmental samples using microbiological culture after an enrichment step [5]. Resistance to antibacterial drugs is an increasingly important problem in both humans and animals. The widespread, sometimes indiscriminate, use of these drugs results in the selection of bacteria which are inherently resistant. Not only may these resistant bacteria become the predominant species in a population but they may also transfer genetic material to susceptible bacteria which then acquire resistance [6]. The spread of antibiotic resistances through the food chain remains a relevant question for both researchers and public health operators.

In Iran there are no reports regarding the prevalence of *Salmonellae* in turkey flocks and its antibacterial resistance. The objectives of the present study were to investigate the prevalence of *Salmonella* spp. in turkey flocks and to characterize the antimicrobial resistance of the isolated *Salmonella*.

2. Methodology

2.1. Sample Collection

Cloacal soab samples were prepared from 250 randomly selected turkeys and the soabs were transferred to the laboratory of microbiology of Zabol University and were investigated for the presence of *Salmonella*.

2.2. Culture and Isolation

For *Salmonella* isolation, the primary enrichment of samples in Selenite—F at 37˚C for 24 hours was followed by subculture on *Salmonella-Shigella* agar and the plates were incubated at 37˚C for 24 hours. The plates were observed for colony formation after 24 - 48 hours of incubation. Pure cultures were prepared from *Salmonella* like colonies and were used for identification of the organisms by bacteriological methods as described previously by Quinn *et al.* (2002) and Swayne *et al.* (1998) [7] [8].

2.3. Antimicrobial Susceptibility Testing

For determination of susceptibility to antibacterial agents, the disc diffusion method on Muller-Hinton agar was used. The following antimicrobial agents were tested: co-trimoxazole (trimethoprim-sulfamethoxazole) (1.25/23.75 μg), colistin (10 μg), cephalexin (30 μg), ciprofloxacin (5 μg), chloramphenicol (30 μg), gentamycin (10 μg), furazolidone (100 μg), streptomycin (10 μg), lincospectin (15/200 μg) and tetracycline (30 μg). All antibacterial disks were provided from Padtan Teb Company (Tehran, Iran). Following the application of antimicrobial discs, the plates were incubated at 37˚C for 24 hours. The diameters of the zones of inhibition were measured (millimetres) and were compared to internationally accepted measurements to determine the susceptibility or resistance of the isolate [9]. Drug resistance patterns of the organisms were determined at three levels: Susceptible (S), Intermediate (I) and Resistant (R). The numbers of isolates of *Salmonella* which showed S, I and R patterns were determined. The percentages of antimicrobial resistance of each pattern (S, I and R) of isolates were calculated and reported as the results.

3. Results

Bacteriological studies showed the prevalence of *Salmonella* in turkey flocks about 14.8%. The results showed high levels of antimicrobial resistance pattern of the isolated *Salmonellae*. The highest resistance to cephalexin (89.2%) and followed resistance to tetracycline (86.5%), colistin (83.8%), furazolidone (73%), co-trimoxazole (67.6%), lincospectin (59.6%), streptomycin (43.2%), chloramphenicol (40.5%), gentamycin (5.4%) and ciprofloxacin (2.7%) were observed. The rates of susceptibility were against gentamycin (86.5%), ciprofloxacin (83.8%), chloramphenicol (51.4%), streptomycin (40.6%), lincospectin (29.7%), furazolidone and co-trimoxa-

zole (13.5%), cephalexin (10.8%), tetracycline (5.4%) and colistin (0%). Antibacterial resistances pattern of isolated *Salmonellae* are shown in **Table 1** and **Table 2**.

4. Discussion

In the present study, 14.8% of turkeys were *Salmonella* positive, but another study in Iran reported that prevalence of *Salmonella* in sample of turkeys' liver and heart was 8.6% and in turkeys' meat was 6.7% [10] [11]. In one study conducted in Austria, only one *Salmonella* isolate was recovered from 262 turkey meat samples [12]. Since Salmonellosis is transmitted primarily through food, particularly food of animal origin, therefore, we recommend more restrictions on the irrational use of antibiotics and public awareness activities should be undertaken to alert the public to the risks of the unnecessary use of antibiotics [10].

Among antibiotics used in this study, the highest resistant was observed against cephalexin (89.2%), tetracycline (86.5%), colistin (83.8%), and furazolidone (73%). High prevalence of resistance could be related to uncontrolled use of these antimicrobial agents in the treatment of bacterial infection. Besides, the highest sensitivity was found to gentamycin (86.5%), ciprofloxacin (83.8%), chloramphenicol (51.4%) and streptomycin (40.6%). The high sensitivity of the isolated *Salmonella* to the mentioned antibiotics could be related to less frequent usage of these drugs for therapeutic purposes, therefore reducing the chance for resistance to develop.

Jahantigh and Nili (2010) investigated drug resistance to *Salmonella* spp. isolated from pigeon eggs in Iran. Resistance to antibacterial drugs were tetracycline (50%), ampicillin, cephalexin and furazolidone (25%). No resistance was observed against colistin, ciprofloxacin, chloramphenicol, gentamycin, nalidixic acid and norfloxacin [13]. Antibiotic resistance pattern of *S. typhimurium* isolated from dead-in-shell chicken embryo in Iran was 10% for tetracycine, chloramphenicol, furazolidone and cephalexin [14]. Drug resistance of *Salmonella* spp. from human and different animal sources has been a matter of concern and investigated by numerous authors [15]-[19].

5. Conclusion

As animals are a main reservoir of *Salmonella* and the use of antimicrobials in food animals for therapy, prophylaxis and growth promotion accelerate the emergence of antimicrobial resistant pathogens, it is not surprising that an increased number of human Salmonellosis cases are caused by foodborne antimicrobial resistant *Salmonella*

Table 1. The numbers of antibacterial resistance patterns of *Salmonella* spp. isolated from turkey.

	Antibacterial agent									
Results	S10	CL30	CL10	CP	C	GM	FR	SXT	LP	TE
S (n)	15	4	0	31	19	32	5	5	11	2
I (n)	6	0	6	5	3	3	5	7	4	3
R (n)	16	33	31	1	15	2	27	25	22	32
Total (n)	37	37	37	37	37	37	37	37	37	37

S10: streptomycin, CL30: cephalexin, CL10: colistin, CP: ciprofloxacin, C: chloramphenicol, GM: gentamycin, FR: furazolidone, SXT: co-trimoxazole, LP: lincospectin, TE: tetracycline, S: Susceptible, I: Intermediate, R: Resistant.

Table 2. The percent of antibacterial resistance patterns of *Salmonella* spp. isolated from turkey.

	Antibacterial agent									
Results	S10	CL30	CL10	CP	C	GM	FR	SXT	LP	TE
S (%)	40.6	10.8	0	83.8	51.4	86.5	13.5	13.5	29.7	5.4
I (%)	16.2	0	16.2	13.5	8.1	8.1	13.5	18.9	10.8	8.1
R (%)	43.2	89.2	83.8	2.7	40.5	5.4	73	67.6	59.5	86.5
Total (%)	100	100	100	100	100	100	100	100	100	100

S10: streptomycin, CL30: cephalexin, CL10: colistin, CP: ciprofloxacin, C: chloramphenicol, GM: gentamycin, FR: furazolidone, SXT: co-trimoxazole, LP: lincospectin, TE: tetracycline, S: Susceptible, I: Intermediate, R: Resistant.

[20]. According to the results of this study turkeys may have an important role to dispread *Salmonella* in the environment. Due to high incidence of drug resistance among *Salmonella* spp. isolated from turkeys, it could conclude that antibiotic resistance can be resulted from unusual use of antibiotics.

6. Recommendations

Effort is need to control Salmonellosis in poultry flocks to reduce the threat of this organism for public health. Besides, care must be taken in the use of antibiotics to reduce drug resistant strains of *Salmonella*. Antibiotic resistance could be prevented with antibiogram test before drug administration or by avoiding incorrect use of antibiotics in food animals.

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