RESEARCH ARTICLE

Isolation, Prevalence and Antimicrobial Resistance of *Salmonella* Strains in Albania from Carcasses in Layers, Turkeys and Ducks

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Abstract

Salmonellosis is a frontrunner in food-borne diseases with emerging public health concerns. Specific species of *Salmonella* genius present an important poultry and human pathogen. The present study was undertaken in the aim of prevalence detection and antibiogram results estimation in relation to clinical findings in two poultry and one waterfowl species. *Salmonella* spp. were isolated from 15 (19.4%) of 77 examined poultry carcasses samples. High prevalence of Salmonellosis infection was encountered in turkeys (53,33%), followed by ducks (26, 67%) and layers (20%). All *Salmonella* isolates were tested for their susceptibility to 8 selected antimicrobial agents Neomycin (N 30 mcg), Florfenicol (FFC 30 mcg), Amoxicillin (AX 30 mcg), Oxytetracycline (OTC 30 mcg), Norfloxacin (NOR 30 mcg), Enrofloxacin (ENR 10 mcg), Doxycycline (DO 30 mcg) and Trimethoprim-Sulfamethoxazole (SXT 25 mcg) by the agar diffusion method. The overall resistance level was valued as 81, 67%. Out of 15 *Salmonella* isolates, 4 (26, 67%) showed multiple resistance to three or more different tested antimicrobials. Resistance levels in ducks were emerging (100%) toward all of the tested molecules. Emerging high levels of antibiotic-resistance in *Salmonella* isolates ranged from 100% to 46,67% (respectively: Neomycin 100%, Doxycycline 100%, Amoxycillin 100%, Oxytetracycline 100%, Trimethoprim – Sulfamethoxazole 100%, Neomycin 80%, Florfenicol 80%, Enrofloxacin 46, 67% and Norfloxacin 46,67%). The results of the conducted research presented higher prevalence of Salmonellosis in free-range breaded poultry (turkeys and ducks) and high antimicrobial rates in ducks. On the other hand, the prevalence of Salmonellosis in layers still remains a concern of food-borne pathogens in food safety chain. Consequently, this study is vital to reveal infection persistence and drug resistance characteristics of *Salmonella* spp. from all of the poultry species which will lay the foundation for follow-up studies of infection persistence and drug resistance mechanisms spread in farm and off-farm environment level.

Keywords: Keywords: Salmonella spp.; antibiotic-resistance; poultry; ducks; Albania.

1. Introduction

Salmonellosis is one of the most important bacterial zoonotic diseases, where more than than 21 million cases of human Salmonellosis are reported globally in one year. Salmonellae live in the gastrointestinal tracts of domestic and wild animals [3] and they are widely distributed in the environment. Cases of Salmonellosis outbreaks are often related to the consumption of food of animal origin, mainly poultry products, such as eggs and raw chicken [6]. Twenty percent of world poultry products are contaminated with *Salmonella*,

and they can resist for a long time in the animal and human environment [7].

Antimicrobial substances and their resistance has become a problem due to the misuse or overuse of antibiotics, both in human medicine and animal production. This worldwide concern of drug resistance is increased by the fact that a wide variety of antibiotics are not only used for medical and veterinary purposes but also to promote the growth of livestock [2]. Many studies has shown the implication of *Salmonella* in drug resistance and a recent report has shown that tetra and penta-resistance are found in *Salmonella* [8].

This antibiotic-resistant *Salmonella* is a great concern because through the consumption of contaminated food of animal origin will result in health risk to humans [1], [4].

The present study was undertaken in the aim of prevalence detection and antibiogram results estimation in relation to clinical findings in 77 carcasses presented at The Food Safety and Veterinary Institute. The samples analysed were collected from layers, turkeys and ducks.

cut into small pieces and blended for 2 min in sterile stomacher bags containing 225 ml of buffered peptone water (0.1%) as a pre-enrichment broth and incubated at 37°C for 24 h. After incubation, 0.1 ml of pre-enrichment culture was transferred into sterile tubes containing 10 ml of Rappaport Vassiliadis broth and the tubes were then incubated at 43°C for 24 h. Thereafter, a loopful of each incubated tube was cultured on Xylose Lysine Desoxycholate agar plates and incubated for 24 h at 35°C. Typical colony of Salmonella appears as pink colonies with or without black centers.

After the identification by microscopial examination with Gram stain was carried out the the biochemical test with API 20 E.

All *Salmonella* isolates were tested for their susceptibility to 8 selected antimicrobial agents Neomycin (N 30 mcg), Florfenicol (FFC 30 mcg), Amoxicillin (AX 30 mcg), Oxytetracycline (OTC 30 mcg), Norfloxacin (NOR 30 mcg), Enrofloxacin (ENR 10 mcg), Doxycycline (DO 30 mcg) and Trimethoprim-Sulfamethoxazole (SXT 25 mcg) by the agar diffusion method.

2. Material and Methods

This study was conducted in Albania, on 77 poultry carcasses during the period of time 2021-2022. After presented at the laboratory, they were examined for post-mortem findings. The most common signs were bronzed enlarged liver with small necrotic foci, anemia and also engorgement of kidneys and spleen.

For the isolation of *Salmonella* spp., 25 g of sample (thigh, breast, wings and liver) from each carcass was

3. Results and Discussion

During this study, from 77 different poultry carcasses tested, 15 cases of *Salmonella* spp. in total were isolated. Eight strains of *Salmonella* spp. were isolated in turkeys, with a high prevalence of 53,33 %, three strains in layers (20%) and four strains in ducks (26,67%).

Table 1. Isolated cases of *Salmonella* spp. from different poultry species

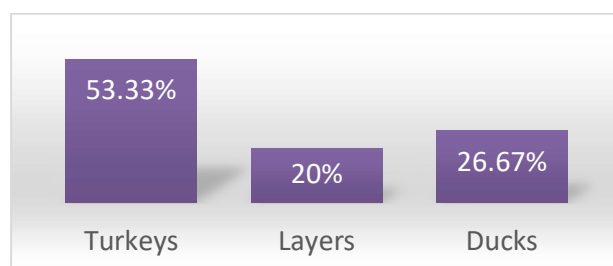| Poultry species	Salmonella spp. positive	Prevalence of Salmonella spp.
Turkeys	8 strains	53.33%
Layers	3 strains	20%
Ducks	4 starains	26.67%

Figure 1. Prevalence of *Salmonella* spp. for each poultry species

All Salmonella isolates were tested for their susceptibility to 8 selected antimicrobial agents: Neomycin (N 30 mcg), Florfenicol (FFC 30 mcg), Amoxicillin (AX 30 mcg), Oxytetracycline (OTC 30 mcg), Norfloxacin (NOR 30 mcg), Enrofloxacin (ENR 10 mcg), Doxycycline (DO 30 mcg) and Trimethoprim-Sulfamethoxazole (SXT 25 mcg) by the agar diffusion method.

The overall resistance level was valued as 81, 67%. Out of 15 *Salmonella* isolates, 4 (26, 67%) showed multiple resistance to three or more different tested antimicrobials. Resistance levels in ducks were emerging (100%) toward all of the tested molecules.

Table 2. Total antimicrobial resistance for 15 *Salmonella* spp. tested strains

Tested antibiotic	Percentage of stains resistance
Neomycin	80%
Flofenicol	80%
Amoxicillin	100%
Oxytetracycline	100%
Norfloxacin	46,67%
Enrofloxacine	46,67%
Doxycycline	100%
TMPX	100%

Emerging high levels of antibiotic-resistance in *Salmonella* isolates ranged from 100% to 46,67% (respectively: Neomycin 100%, Doxycycline 100%, Amoxycillin 100%, Oxytetracycline 100%, Trimethoprim – Sulfamethoxazole 100%, Neomycin 80%, Florfenicol 80%, Enrofloxacin 46, 67% and Norfloxacin 46,67%).
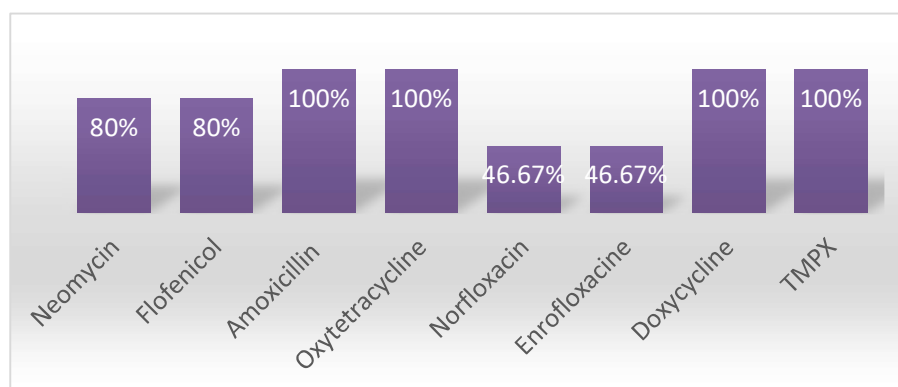

Figure 2. Total AMR for 15 *Salmonella* spp. tested strains

The results obtained coincide with other studies conducted in this field. Increased prevalence of antimicrobial-resistant *Salmonella* presents a severe risk to human health.Transmission of antimicrobial resistance genes (ARGs) to the environment and eventually humans further aggravates the situation [5].

4. Conclusions

Salmonella spp. were isolated from 15 (19.4%) of 77 examined poultry carcasses samples. High prevalence of Salmonellosis infection was encountered in turkeys (53,33%), followed by ducks (26, 67%) and layers (20%), where Salmonellosis in layers still remains a concern of food-borne pathogens in food safety chain

The results of the conducted research presented higher prevalence of Salmonellosis in free-range breaded poultry (turkeys and ducks) and high antimicrobial rates in ducks (100 %). Out of 15 Salmonella isolates, 4 (26, 67%) showed multiple resistance to three or more different tested antimicrobials. The overall resistance level was valued as 81, 67%.

These findings highlight the necessity to reduce the pathogen prevalence through continuous control of its presence in animals and environment and also the need for government entities, researchers and poultry producers to find ways to reduce the impact of antibiotic use in poultry, focusing especially on active

surveillance of multi drug resistance strains and finding alternatives to substitute antibiotics.

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