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***Research Article***

# Antimicrobial resistance of *Salmonella spp*. isolated from ground beef in Tirana market

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***Abstract –*** *Salmonella* is a pathogen bacterium that can cause foodborne disease in humans. One of the common sources of *Salmonella* is contaminated meat, including ground beef. Raw or undercooked meat, infected with multidrug-resistant *Salmonella* remains a pertinent public health risk The bacteria can be spread by food handlers who do not maintain proper hygiene when manipulating with their hands and/or do not clean the surfaces and tools they use between food preparation steps. This study was conducted to investigate the resistant strains of *Salmonella spp*. in ground beef of Tirana market. A total of 30 samples were evaluated; 7 samples resulted *Salmonella spp*. positive (23,3%) and moreover these strains were resistant to two or more antibiotics. The resistance levels of the isolates, against 8 different antimicrobial agents were tested and showed a high resistance rate. The results showed the possible significance of ground beef as a source of multiple antimicrobial-resistant *Salmonella* for human infections and suggest the need for detailed epidemiological study.

*Keywords – Salmonella Spp., Minced Meat, Antimicrobial Resistance, Market.*

## I. INTRODUCTION

Foodborne pathogens are biological agents that can cause foodborne illness in humans [2]. These pathogens can be viruses, bacteria, or parasites that are present in contaminated food or water. Foodborne illness can cause a range of symptoms, from mild gastrointestinal discomfort to severe illness and even death. [1][3]. Reports revealed that about 85.6% were estimated to be food borne and infection was associated with many different food types, including beef and beef products [7]. *Salmonella* is one of the most isolated foodborne pathogens, which remains a public health concern worldwide [9]. The emergence of antibiotic-resistant foodborne pathogens has raised the concern of the public as these pathogens are more virulent, causing an increase in the mortality rate of infected patients [4]. Studies [13] reveals that contaminated feeds, transportation of animals to the abattoir, the slaughtering operation, and edible organs being contaminated by fecal storage, distribution, and preparation for consumption may contribute to *Salmonella* contamination of raw meat. Uncleanness of equipment, utensils, and personal hygiene of food handlers aid in the spread of this pathogen [1]. In Albania there is an absence of studies and data's related to *Salmonella* detection and antimicrobial resistance isolated from ground beef. Ground beef is commonly fabricated at retail establishments, such as supermarkets and butcher's

shops, where cross-contamination of the product from other raw meats or improperly sanitized equipment and utensils is common. An additional concern related to the presence of *Salmonella* in food is the isolation of antimicrobial resistant strains [12]. These strains have been responsible for foodborne illnesses linked to the consumption of ground beef [5], and some of the isolates recovered from foodborne outbreaks were resistant to one or more antibiotics. The main objectives of this study was to evaluate the presence of *Salmonella* and the resistance of the strains isolated from ground beef sampled from supermarkets and butcher's shops of Tirana market.

## II. Materials and Method

### A. Sample collection

This study was focused in Tirana market, collecting 30 samples of ground beef (20 samples from supermarkets and 10 samples from butcher shops), during the period of time April-May 2023. The samples were transported to the laboratory (at the Faculty of Veterinary Medicine of Tirana) after being collected in a portable cooler container and microbiological analysis was carried out immediately.

### B. Isolation and Identification

Detection of *Salmonella* spp. in ground beef samples was performed according to the international standard method ISO-6579-1:2017, Amd 1:2020. A 25-g sample was aseptically added to 225 ml of buffered peptone water for the pre-enrichment stage and homogenized for 2 min by a stomacher. The homogenized sample was incubated at 37°C for 24 h. For the selective enrichment stage, Rappaport-Vassiliadis medium with soya (RVS broth) and Muller-Kauffmann tetrathionate-novobiocin broth (MKTTn broth) were inoculated with the culture. The RVS broth was incubated at 41,5 °C for 24 h and the MKTTn broth at 37 °C for 24 h. After incubation, a loopful of the enriched cultures was streaked onto Xylose Lysine Deoxycholate agar (XLD agar) and Hektoen agar. These plates were incubated at 37°C for 24 h. Suspicious Salmonella colonies were picked out and sub cultured for biochemical tests, using API 20 E [3].

### C. Antimicrobial susceptibility test

Susceptibility to antimicrobial agents was tested using the disk diffusion method on Mueller-Hinton agar plates according to the National Committee for Clinical Laboratory Standards Guidelines [7]. Antimicrobial disks used in this study were: ampicillin (AMP 10mcg), ciprofloxacin (CIP 5mcg), norfloxacillin (NOR 30mcg), neomycin (NEO 30mcg), gentamicin (GEN 10 mcg), streptomycin (STR 10mcg), tetracycline (TE 30 mcg) and Trimethoprim-Sulfamethoxazole (SXT 25 mcg).

## III. Results

In this study 7 (23.3%) out of 30 of ground beef samples analysed, resulted positive with *Salmonella spp*. Five *Salmonella* strains (71.4%) were isolated in the samples collected from butcher shops and 2 strains (28.6 %) were isolated from ground beef of Tirana supermarkets.

Meanwhile, antimicrobial resistance patterns of 7 Salmonella isolates recovered from ground beef, tested against 8 antimicrobials, resulted resistant to two or more antibiotics. Among of 7 isolates, 2 of them, were resistant against streptomycin and tetracycline, four strains were resistant to ampicillin, streptomycin, neomycin and tetracycline and one strain resulted resistant against six antibiotics tested (Tetracycline, Trimethoprim, Ampicillin, Ciprofloxacin, Streptomycin, Neomycin).

Table 1. Antimicrobial resistance of *Salmonella* strains isolated from ground beef

| **No. of antibiotics** | **Antimicrobial resistance of *Salmonella* strains** | **No. of isolates (%)** |
|---|---|---|
| 2 | STR/TE | 2 (28.5%) |
| 4 | AMP/STR/NEO/TE | 4 (57.2%) |
| 6 | TE/STX/AMP/CIP/STR/NEO | 1 (14.3%) |

## IV. DISCUSSION

The possible emergence and spread of *Salmonella* strains resistant to antibiotics commonly used as treatment are concerns, because these infections can be invasive [10]. From our study the

presence of multidrug resistance *Salmonella* in ground beef market of Albania was evaluated. *Salmonella spp*. was recovered from 7 samples out of 30 (23,3%). The occurrence of multidrug-resistant Salmonella isolates in the butcher's shops and supermarkets sample was observed in this study and a higher frequency of the isolates were recovered from both. All *Salmonella* isolates were resistant against two or more antibiotics. These findings highlight the need for constant monitoring and further investigations.

## V. CONCLUSION

Contamination of ground beef with *Salmonella* may occur anywhere along the farm-to-table process including production, processing, distribution, retail marketing, and handling or preparation [10]. The increased use of antimicrobial agents in food animal production as a means of preventing, treating diseases and promoting growth, is a significant factor in the emergence of antibiotic-resistant bacteria. Therefore, the antibiotic resistance can be transferred to humans through the food chain and contamination of food with antibiotic-resistant bacteria can be a major threat to public health [3] . The presence of single and multiple antimicrobial resistance of the strains isolated in our study, suggests the need for more prudent use of antibiotics by farmers and veterinarians. Further detailed epidemiological are essential on the frequency, sources of acquisition of resistant genes and distribution of antimicrobial resistant *Salmonella* among food products in Tirana markets.

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