Journal of Positive Sciences (JPS) **eISSN: 2582-9351, https://positive-sciences.com** **JPS. 2021 Nov; 1(8): 1-5**

Article info **Research Article**
Received on: 26.10.2021
Accepted on: 29.11.2021
Published on: 31.11.2021
doi: https://doi.org/10.52688/ASP86431

Detection of salmonella SPP bacteria in food and study of their resistance in vitro

Mohammed Mosa Jafaar [1, *], Al-Rubai Haider K. [2], Khetam H. Rasool [3], Mustafa Hasan Zainel [4]

[1] Agricultural Research Directorate, Ministry of Science and Technology, Baghdad, Iraq
[2] AL-Nahrain University Forensic DNA Research and Training center, Baghdad, Iraq
[3, 4] Department of Biology, College of Science, Mustansiriyah University, Baghdad, Iraq

[*] mohammedmosa1@yahoo.com

ABSTRACT

The study aims to isolate and diagnose salmonella SPP transmitted through food. A total of 45 samples (red meat, poultry meat, and Raw milk) were collected from different areas of Baghdad for the period from 1/4/2018 until 1/8/2018 the isolates were identified by pharmacological, biological, and serological tests, eight isolates of salmonella bacteria were obtaining. Eight isolates of the type (Four S. typhi, Two S. typhimurium, and 2 S. Entereca) from red meat in the rate of 1.8% and tow isolates of poultry meat (S. typhi and S. thyphimurium) in the rate of 0.9% and two isolates of dairy products (S. typhi and S. enterica) in the rate of 0.9%. Six types of antibiotics used, such as cefixime, cefotaxime, and ceftazidime, cephalexin, ciprofloxacin, cefazolin, all isolates have tested the susceptibility of antibiotic that used in this study while ciprofloxacin and cefalozidim it was resisting.

Keywords: Salmonella serovar, foods, antibiotic resistance

INTRODUCTION

Salmonellosis (enteric fever, paratyphoid) is the most prevalent foodborne bacterial infection on a global scale. It is an infectious illness that affects both people and animals and is caused by two Salmonella species, S. enterica and S. bongori. Clinically, it manifests as one or more of three syndromes: septicaemias, acute enteritis, or chronic enteritis (Pal M.India 2007). On the other side, gastroenteritis is responsible for about 93 million cases. Salmonella causes the death of 155,000 individuals per year. Foodborne illness was projected to be responsible for 80.3 million of these cases (Majowic et al., 2010) Salmonella bacteria are found in every area of the global food chain. Raw meat, eggs, dairy products, vegetable sprouts, fresh fruits, and fruit juices remain infected since they are the principal vectors of human salmonellosis transmission. As a consequence, managing and controlling sectoral operations inside any food-related organisation creates substantial hurdles (Radosttis et al. ,2007). Salmonellosis is exacerbated by the movement, continuous, and unattended control of foodstuffs through international trade, the disparity in national standards for food production and aquaculture, and the absence of uniform safety controls for government and industrial food products during processing, distribution, and marketing of fresh and modern foodstuffs manufactured food products (MolIa et al., 2003). According to a 2007 (WHO) research, Salmonella bacteria are essential for diarrhoea, infections, eggs, and milk. Alternatively, secondary pollution may contaminate fertilised fruits and vegetables. Around 30% of individuals in developed nations suffer from foodborne disease (Pal, 2013) In humans. Salmonella is very contagious and has a devastating effect on both children and adults. HIV-positive individuals are likely to be more susceptible to Salmonella illness than healthy adults, although getting a lower gastrointestinal dose. This is particularly important in poor countries; for example, in Ethiopia, where HIV/AIDS is highly prevalent, Salmonella is a frequent opportunistic infection among HIV/AIDS patients (Misgano Williams, 2013). Salmonellosis is a disease that is associated with high morbidity and mortality, as well as economic and health effects. While the majority of injuries result in moderate to severe illness, fatal injuries do occur sometimes (Jordan et al., 2009). The present article emphasises salmonellosis' rising global importance as a highly contagious foodborne infection.

METHODS

To isolate Salmonella spp., we weighted the samples to 25 gm and introduced them to pre-enriched buffered peptone water at 1%, which we incubated at 37°C for 24 hours. Following incubation, 1 ml was transferred to 10 ml of Selenite-Cystine broth (Oxoid, England) and Rappaport Vassiliadis broth (Oxoid, England) supplemented with 4 percent Novobiocine (SIGMA, USA), which

***Corresponding author**
Mohammed Mosa Jafaar,
Agricultural Research Directorate, Ministry of Science and Technology, Baghdad, Iraq
e-mail: mohammedmosa1@yahoo.com

was incubated at 37°C for 24 hours. Overnight, samples were grown in Xylose Lysine Deoxycholate Agar (XLD) (Oxoid, England) and Brilliant Green agar (Oxoid, England) medium at 37°C for 24 hours. Suspect colonies were grown on Triple Sugar Iron agar (TSI) (Oxoid, England), Lysine-Iron agar (LIA) (Oxoid, England), and urea broth (Oxoid, England) biochemical proof media (Costa & Hofer 1972) and incubated at 37°C/24h. Following probable identification, suspect samples are sent to the public health laboratory in Oxoid, England, for serotype gyrification and gene identification (Le minor & Popoff 1987). Markets for consumer goods.

CONFIRMATION OF SALMONELLA SPP

Salmonella isolates were confirmed in accordance with the International Standard Method (ISO 6579:2002/Amd 1:2007). Biochemical assays were performed on all suspected Salmonella colonies, including growth on Triple Sugar Iron agar (TSI), Lysine Decarboxylase (LIA), urease, indole production, methyl red, and Voges-Proskauer reaction, citrate utilization, and Simmons citrate. The presumed positive colonies identified during the biochemical test were documented and analyzed using the ISO Standard Method.

MINIMUM INHIBITORY CONCENTRATION

The Kirby Bauer approach was used to determine the colony's antibiotic sensitivity. The colony was submerged in (0.85 Nacl) until the bacterial suspension resembled that of normal bacteria (0.5 mcf). Antibiotic tablets were distributed and the plates were incubated after detecting the area of inhibition (Baron and Finegold 1990; Al-Ouqaili, et al., 2018). The results of this method are given in Table 5.

DISCUSSION

Eight isolates of salmonella spp. were isolated from different samples.

Table 2: Number of samples used in the experiments.

NO.	Type of bacteria
4	*Salmonella.typhi*
2	*Salmonella. Enteritidis*
2	*Salmonella typhimurium*

The team collected 45 food samples from different locations around Baghdad. Several types of salmonella bacteria were detected during biological analyses of food samples. Three primary strains were isolated, including (S.enterica, S.typhian, and S.typhimurium,) from eight samples of 45 food samples taken from different locations around Baghdad. These bacteria have been found as being capable of generating toxins on a variety of levels, including internal, external, and cellular. There are around 2300 Salmonella strains. The vast majority of them are under investigation in Iraq. In March 2008, a strain of S. enterica serotype Typhimurium was isolated from the faeces of 45 attendees at an Errachidia wedding ceremony. Diarrhea, vomiting, and abdominal discomfort developed 24–72 hours after these patients had a chicken tagine prepared with raw broiler chicken meat. Five people were hospitalized for three days, but no deaths were recorded. S. enterica serotype Typhimurium was isolated from chicken carcass leftovers stored in the refrigerator. Results are given in Table 3 through 5.

Between 2000 and 2009, 204 cases of non-typhoidal salmonellosis were studied in New Zealand. Although the data revealed that non-typhoidal salmonellosis was primarily a foodborne disease in New Zealand, previous research suggests that the mode of transmission was weak or absent in 107 (63 percent) of the 169 outbreaks having a documented mode of transmission. Additionally, non-typhoidal salmonellosis has been related to great sources such as watermelon and peanut butter (Mc Callum et al. 2010). Rodents are probably under-recognized as a source of human Salmonella infection (Swanson et al., 2007). In 2002, FoodNet conducted a case-control study on Salmonella Enteritidis (SE) and Salmonella Newport infections. SE infections were associated with eating chicken prepared outside the home and undercooked eggs cooked inside the home among persons who had never travelled abroad before. SE infections have also been linked to contact with birds and reptiles. Salmonella serotype strains resistant to third-generation cephalosporins (cefixime, cefotaxime, ceftazidime, cefazolin, ciprofloxacin, cephalexin) The minimal inhibitory concentration was determined for each bacteria that was resistant to the antibiotics ciprofloxacin and ceftazidime but susceptible to another antibiotic used in the research (Al-Ouqaili, et al., 2018).

*Corresponding author
Mohammed Mosa Jafaar,
Agricultural Research Directorate, Ministry of Science and Technology, Baghdad, Iraq
e-mail: mohammedmosa1@yahoo.com

Table 3. Kirby-Bauer disc diffusion method antibiotic standard according to the guidelines of Clinical and Laboratory Standards Institute American Academy of Microbiology

Antibiotic disc	Resistant	Moderate resist	Sensitive
Cefazoline	≤ 14	15- 17 mm	≥ 18
Ciprofloxacin	≤ 14	15- 20 mm	≥ 21
Cefixime	≤ 5	16 -18 mm	≥ 19
Cefotaxime	≤ 14	15 – 22 mm	≥ 23
Ceftazidime	≤ 14	15 -17 mm	≥ 18
Cephalexin	≤ 14	15 -17 mm	≥ 18

Table 4. The minimum inhibitory concentration was tested salmonella

Type of antibiotic	*S. typhi*	*S. typhimurium*	*S. Enteritidis*
cefixime	17 mm	15 mm	15 mm
ciprofloxacin	16 mm	35 mm	17 mm
ceftazidime	15 mm	16 mm	15 mm
cefotaxime	14 mm	15 mm	14 mm
cephalexin	15 mm	17 mm	16 mm
cefazolin	18 mm	13 mm	12 mm

A prior study estimated the number of culture-confirmed salmonellosis cases reported to the Illinois Department of Public Health, which is located in the United States Department of Public Health's Midwestern and Great Lakes Regions (Geimba et al., 2004). Salmonella typhimurium was isolated from unopened containers of two batches of milk: Bluebrook 2% milk that expires on March 29th and was manufactured on March 20th, and Hill Farm 2% milk that expires on April 8th and was created on March 30th. Both lots come from the same dairy factory in Illinois. Salmonella infection rates were much greater than previously reported in retail chicken and beef. in the majority of prosperous countries, for example (Switzerland, Australia, Ireland, Germany). According to Van et al. (2007) and Donado-Godoy et al. (2012), 23 to 29 percent of poultry samples in the United Kingdom were contaminated with Salmonella, 2.8 to 26.4 percent in Ireland, 13.2 percent in The Netherlands, 35.8 percent in Spain, 36.5 percent in Belgium, 43.3 percent in Australia, 20 percent in Argentina, 42 percent in Brazil, 52.2 percent in China, and 36 percent in Korea, with Korea reporting the highest contamination rate. In general, climate and storage. Temperature has an influence on the rate of contamination, and tropical nations such as Malaysia may result in the expansion of Salmonella spp. On carcasses more rapidly, leading in a higher average This experiment discovered regional differences in antibiotic sensitivity against S. typhi. The majority of isolates were resistant to nalidixic acid, ciprofloxacin, cefixime, and azithromycin. While nalidixic acid was shown to be the most resistant medication against S. typhi in all three sites, the prevalence of ciprofloxacin and levofloxacin resistant strains was much greater. Although previous studies revealed an increase in ciprofloxacin resistance (Ahmed D 2006) (Akter L 2012), we detected both resistant and susceptible ciprofloxacin samples. This might be because the rate of ciprofloxacin resistance is lower in Rajshahi. Approximately 16% of the samples evaluated were ciprofloxacin susceptible. On the other hand, 8% of sampled individuals tested positive for it. Salmonella bacteria resistant to ceftriaxone were first isolated from the faeces of a youngster suffering from mild gastroenteritis. In 1999, two isolates were discovered, and thirteen in 2000. (Yan, J. J., and C. H. Chiu 2002). J. J. Yan and W. C. Ko, 2003). Cephalexin resistance was shown to be the most prevalent in the study (89.2 percent). Resistance is expected to be widespread as a consequence of unrestricted use of these antimicrobial medications to treat bacterial infection. Additionally, the highest sensitivity to ciprofloxacin (83.8 percent) was detected. The high sensitivity of the identified Salmonella to the indicated antibiotics may be related to their less frequent therapeutic usage (Jahantigh, M. and Nili, H. (2010). In Iran, resistance to Salmonella SPP was isolated from pigeon eggs. There was evidence of cephalexin resistance (25 percent). There was no indication of ciprofloxacin resistance (Geimba et al., 2004).

*Corresponding author
Mohammed Mosa Jafaar,
Agricultural Research Directorate, Ministry of Science and Technology, Baghdad, Iraq
e-mail: mohammedmosa1@yahoo.com

Table 5. The minimum inhibitory concentration was tested salmonella

REFERENCES

[1] Ahmed D, D'Costa LT, Alam K, Nair GB, Hossain MA. Multidrug-resistant Salmonella enterica serovar typhi isolates with high-level resistance to ciprofloxacin in Dhaka, Bangladesh. Antimicrob Agents Chemother. 2006;50:3516–3517.(21)

[2] Akter L, Hassan M, Ahmed Z. Present status and antibiotic sensitivity pattern of Salmonella typhi and S. paratyphi in different age group hospitalized patients in Dhaka city, Bangladesh. IOSR J Pharm Biol Sci. 2012;4:27–30. (23)

[3] Al-Ouqaili M.T.S, Al-Kubaisy S.H.M, Al-Ani, N.F. (2018). Biofilm antimicrobial susceptibility pattern for selected antimicrobial agents against planktonic and sessile cells of clinical isolates of staphylococci using MICs, BICs and MBECs. Asian Journal of Pharmaceutics. 2018 (Suppl) • 12 (4) . S1375-1383.

[4] Al-Ouqaili M.T.S, Al-Taei S.A., Al-Najjar A. Molecular Detection of Medically Important Carbapenemases Genes Expressed by Metallo-β-lactamase Producer Isolates of Pseudomonas aeruginosa and Klebsiella pneumoniae. Asian Journal of Pharmaceutics 2018 (Suppl) • 12 (3). S991-1001.

[5] Baron, E.J. and Finegold, S.M. 1990. Bailey and Scott's Diagnostic Microbiology, 8Th Ed. Baltimore, Philadelphia, USA; The CV Mosby Company. p. 253-261.

[6] Costa G.A. & Hofer E. 1972. Isolamento e identificação de Enterobactérias. Monografia, Instituto Osvaldo Cruz, Rio de Janeiro. 120p.

***Corresponding author**
Mohammed Mosa Jafaar,
Agricultural Research Directorate, Ministry of Science and Technology, Baghdad, Iraq
e-mail: mohammedmosa1@yahoo.com

[7] Donado Godoy, I. Gardner, B. A. Byrne, M. Leon, E. Perez-Gutierrez, M. V. Ovalle, M. A. Tafur And W. Miller (2012) Prevalence, Risk Factors, and Antimicrobial Resistance Profiles of Salmonella from Commercial Broiler Farms in Two Important Poultry-Producing Regions of Colombia. Journal of Food Protection: May 2012, Vol. 75, No. 5, pp. 874-883.
[8] Geimba, M., Tondo, E., Oliveira, F. and Canal, C. 2004. Serological characterization and prevalence of spvR genes in Salmonella isolated from foods involved in outbreaks in Brazil. Journal of Food Protection 67: 1229-1233
[9] ISO 6579:2002, Microbiology of food and animal feeding stuffs — Horizontal method for the detection of Salmonella spp.
[10] Jahantigh, M. and Nili, H. (2010) Drug Resistance of Salmonella sp. Isolated from Pigeon Eggs. Comparative Clinical Pathology, 19, 437-439.
[11] Jordan, Van Henderson, E., Hugo, C., and Piater, L. 2009). Using current molecular techniques uses for the rapid differentiation of Salmonella typhi and Salmonella typhimurim.
[12] Le Minor L. & Popoff M.Y. 1987. Designation of Salmonella enterica sp. Nov. as the type and only species of the genus Salmonella. Int. J. Syst. Evol. Microbiol.
[13] Majowic 2, S.E., Musto, J., Scallan, E., Angulo, F.j., Kirk, M., O'Brien, S. J. Jones, T.F., Fazil, A. and Hoekstra, R.M.(2010). The global burden of nontyphoidal salmonella gastroenteritis. Clinical infection disease, SO:882-889.
[14] McCallum L., Torok M., Dufour M.T., Hall A., Cramp G. An outbreak of Salmonella typhimurium phage type 1 associated with watermelon in Gisborne, January 2009. N Z Med J. 2010, Sep 10;123(1322):39–45.
[15] Misganaw Birhanes Lassie, David Williams (2013) A study of Salmonella carriage among asymptomatic food – handlers in southern Ethiopia. International Journal of nutrition and food sciences. 2(5) : 243- 245 .
[16] Molla, B., Alemayehu, D., and Salah, W.2003. Sources and distribution of Salmonella serotypes isolated from food animals, slaughterhouse personnel, and retail meat products in Ethiopia: 1997-2002. Ethiopian Journal of Health Development 17: 63-70
[17] Pal M. Zoonoses. 2nd edition. Satyam Publishers, Jaipur, India,2007.
[18] Pal, M.2013..Food safety is becoming a global public health concern. The Ethiopian Herald, February 01, 2013. P.8.
[19] Radostits, O.M., Gay, C.C., Hinchcliff, K.W., and Constable, P.O. 2007. Veterinary Medicine.10th ed. Saunders Elsevier, London. Pp.896 - 921.
[20] Swanson Stephen J., Snider Cynthia, Braden Christopher R. Multidrug-resistant Salmonella enterica Serotype typhimurium associated with pet rodents. N Eng J Med. 2007;356:21–28.
[21] WHO. 2007. Laboratory Protocol: Isolation of Salmonella. 5th Edition. Geneva, Switzerland; Pp. 96-111.
[22] Van, T. T., G. Moutafis, T. Istivan, L. T. Tran, and P. J. Coloe. 2007. Detection of Salmonella spp. in retail raw food samples from Vietnam and characterization of their antibiotic resistance. Appl. Environ. Microbiol. 73:6885,6890.
[23] Yan, J. J., C. H. Chiu, W. C. Ko, C. L. Chuang, and J. J. Wu. 2002. Ceftriaxone-resistant Salmonella enterica serovar Hadar: evidence for the interspecies transfer of blaCMY-2 in a Taiwanese university hospital. J. Formos, Med. Assoc. 101:665-668.]37.
[24] Yan, J. J., W. C. Ko, C. H. Chiu, S. H. Tsai, H. M. Wu, and J. J. Wu. 2003. The emergence of ceftriaxone-resistant Salmonella isolates and the rapid spread of plasmid-encoded CMY-2-like cephalosporins, Taiwan. Emerg. Infect. Dis. 9:323-328 (38).

*Corresponding author
Mohammed Mosa Jafaar,
Agricultural Research Directorate, Ministry of Science and Technology, Baghdad, Iraq
e-mail: mohammedmosa1@yahoo.com