



Risk factors assessment and antimicrobial resistance of *Salmonella* isolates from apparently healthy and diarrheal dogs in Baghdad, Iraq

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Abstract

The dog was an essential source of *Salmonella* (*S.*) transmission. One hundred sixty-five rectal swabs were taken from apparently healthy dogs 90 and diarrheal dogs 75 in Baghdad province, Iraq. The *Salmonella* species was found using standard bacterial culture, biochemical tests, an analytical profile index API-20, the VITEK2 compact system, and serotyping. *Salmonella* isolates were screened using the disc diffusion technique for susceptibility to ten antimicrobials. Findings indicated that the *Salmonella* species prevalence rate was 6.06% from dogs' fecal samples, with three species identified; the most common serovar was *S. Typhimurium*, *S. Enteritidis*, and *S. Muenchen*, which was isolated for the first time from dogs in Iraq. Statistically significant risk factors concerning the diarrheal state, breed, feeding, and body condition were found. High occurrences were in diarrheal dogs 10.66% compared to non-diarrheic dogs 2.22%; the large dog breed had a higher isolate rate of *Salmonella* than the small breed. Thin body condition dogs were more at risk than fatty dogs, and the dogs consuming uncooked feed had a higher percentage of *Salmonella* isolates and were more at risk than those consuming mixed food. Non-significant differences were found according to the gender, age, and educational status of dog owners. *Salmonella* isolates exhibited high resistance to cefotaxime, ampicillin, azithromycin, gentamycin, and tetracycline but were sensitive to norfloxacin. All the isolates were multidrug-resistant (MDR) except *S. Muenchen*. In conclusion, diarrheal and apparently healthy dogs carry and shed resistant *Salmonella* spp., a potential public health risk.

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Introduction

Salmonellosis is a critical disease-causing high morbidity and mortality, leading to major global economic problems (1). The dog is one of the pet animals that humans are increasingly breeding and purchasing globally, and due to the contact between these animals and humans, they have been considered a possible source of many zoonotic diseases such as Salmonellosis (2-5). Dogs may be asymptomatic carriers of *Salmonella* spp. and harbour it in their gastrointestinal tract and mesenteric lymph nodes, where they may shed the *Salmonella* intermittently for more than six weeks (3,6). The clinical signs appear after 3-5 days of

infection and include anorexia, fever, diarrhea or bloody diarrhea, abdominal pain, septicemia, and abortion (7-9). *Salmonella* infections in dogs can be influenced by variable factors, such as feeding, geographic area, the socioeconomic status of the owners, age, gender, breed, and public awareness of canine zoonosis (6,10). These pathogens in animals that live near populations of humans require strategies for monitoring and controlling them to protect both animal and human populations (11). Antimicrobial drugs are commonly used in both humans and animals. Antimicrobial resistance and Multidrug Resistance (MDR) among *Salmonella* spp. have increased globally, especially for clinically significant antibiotics such as cephalosporins and

fluoroquinolones, now an increasingly significant issue. Antimicrobial resistance in *Salmonella* isolates from people and animals (including dogs) has been the subject of several publications (6-13). *Salmonella* has been isolated in Iraq from food samples (12,14), milk (15), animals (15,16), and humans (13,17).

There is an absence of adequate studies in Iraq evaluating *Salmonella* prevalence in dogs, the risk factors influencing the prevalence rate, or *Salmonella* antimicrobial resistance to antibiotics. Determining *Salmonella* prevalence in dogs with diarrhea and otherwise healthy dogs was the goal of the present experiment, as was identifying the risk factors associated with the *Salmonella* prevalence and determining the antimicrobial resistance profiles of *Salmonella* species isolates.

Materials and methods

Ethical approve

This Study was approved by Animal Care and Use Committee of College of Veterinary Medicine, Baghdad university No. 2190/PG in 10-10-2022.

Sample and data collection

Between October 2022 and February 2023, 165 rectal swabs were collected from apparently healthy 90 and diarrheal 75 dogs when they visited the Baghdad veterinary teaching hospital, clinical veterinary clinic, and market sale. The diarrheal dogs were selected based on history and clinical signs suspected of *Salmonella* infections. The information from each dog was collected by questionnaire to assess the possible risk factors connected to *Salmonella* infection occurrences, such as gender, breed, age, bodily condition, feeding, and educational status of owners. The breeds of dogs were classified according to the classification used in the Fédération Sinologue International (FCI) as small, including Terrier 30, French Bulldog 13, Poodle 12, Pomeranian 15, Poo 25, Lolo Fox 10, and large, including pointers 6, Belgian Malinois 10, Hasky 15, Fox 1, German Shepherd 24, and Giant Schnauzer 4. According to age, dogs are divided into young (1 year) and adults (>1 year). Transport media transported samples to the Baghdad Veterinary College (Zoonotic Diseases Unit) in a box containing ice packs.

***Salmonella* isolation and characterization**

Salmonella species isolation and identification from fecal swabs were done according to the International Standard Organization (ISO) (18). The samples were transferred into buffered peptone water (Hi Media/India) at 42°C for 24 hours of incubation. Then, the pre-enriched sample was transferred (1 ml) from its container to tetrathionate broth and incubated for 24 hours at 42 °C. Following this, ten µl of tetrathionate broth was streaked onto *Salmonella-Shigella* (SS) agar (Hi Media/India) and xylose lysine deoxycholate

(XLD) agar and then incubated for 24 hours at 37°C for further analysis. Colonies that had pink coloration with or without black cores on the XLD agar were picked up and sub-cultured on Hi Crome™ *Salmonella* agar (Hi Media/India), followed by incubation for 24 hours at 37°C. The mauve colonies observed on Hi Crome™ agar were transferred onto nutrient agar (Oxoid/UK) and incubated at 37°C for 24 hours to facilitate further identification. Colonies from nutrient agar were picked and examined for oxidase, catalase, and Gram stain. In addition, the following biochemical test agars: Klingler's Iron agar, urea agar, and Simmon's citrate agar (Hi Media in India), were inoculated and then incubated for 24 hours at a temperature of 37°C. The *Salmonella* colonies exhibited an alkaline slant and acid bottom formation on Klingler's Iron agar, along with hydrogen sulfide production. Additionally, these colonies demonstrated positive results for citrate utilization and negative results for the Indole test and the urease test were more identified using the Analytical Profile Index 20E (API 20E) identification Kits (bio Merieux, France), VITEK 2 system compact (bio Merieux, France), and serotyped were performed by slide and tube agglutination tests in the Central Health Laboratory in Baghdad, Iraq, using identification kits (bio Merieux, l'Etoile, France).

Antimicrobial resistance testing, multidrug resistance (MDR), and multidrug antibiotic resistance index (MARI)

Salmonella isolates were evaluated for resistance to 10 antimicrobial drugs, including cefotaxime (30mg), amoxicillin (20 mg)/ clavulanic acid (10mg) (AUG30C), ciprofloxacin (5 mg), norfloxacin (10mg), trimethoprim/sulfamethoxazole (1.25/23.75mg), tetracycline (30mg), azithromycin (15mg), gentamycin (10mg), ampicillin (10), and chloramphenicol (30mg) using the antibiotic disc diffusion method according to the Clinical and Laboratory Standards Institute guideline (CLSI) (19). Bacterial suspensions (1.5×10^5 CFU/ml) were prepared by selecting 4-5 colonies of each bacterium from nutrient agar and suspending them in a sterile test tube containing 4 ml of normal saline using a McFarland 0.5 tube. A sterile cotton swab was carefully dipped into the bacterial suspension and then evenly spread over Mueller-Hinton agar. It was left for 10 minutes to absorb the bacterial suspension. The antimicrobial discs were then put on the agar using sterile forceps and firmly pressed against the medium to confirm contact with the medium's surface. Subsequently, the plates were inverted and incubated at 37 °C for 24 hours. The measurement of the inhibitory zones surrounding the antimicrobial discs was conducted using a metric ruler, with the values recorded in millimeters and the characteristics of *Salmonella* spp. as resistant (R) and susceptible (S), according to CLSI (19). The phenomenon of multidrug resistance (MDR) was identified by observing that the isolates exhibited resistance to two or more classes of

antimicrobial agents. The Multidrug Antibiotic Resistance Index (MARI) was computed for all *Salmonella* isolates using the formula A / B , where "A" represents the count of antimicrobials to which an isolate exhibited resistance, and "B" denotes the total number of antimicrobials to which the isolate was exposed (20,21).

Statistical analysis

The Static Analysis System (SAS, 2018) was used to compute the data to assess the impact of various factors on the research parameters. A chi-squared test (X^2) was employed to significantly compare percentages (0.01 and 0.05 probability).

Results

Prevalence rate of *Salmonella* in dogs

Of the 165 dogs examined, ten (6.06%) were positive for *Salmonella*; in diarrheal dogs, it was 8/75 (10.6%); and in apparently healthy dogs, it was 2/90 (2.22%). Three *Salmonella* serovars were identified: *S. Typhimurium* was the most isolated at 6/10 (60%), followed by *S. Enteritidis* at 3/10 (30%) and *S. Muenchen* at 1/10 (10%).

Risk factors linked to *Salmonella* in dogs

The analysis of factors associated with dog fecal shedding of *Salmonella* included gender, breed, age, body

condition, diarrhea problem occurrence, feeding, and educational status of owners recorded in Table 1. *Salmonella* isolates were higher in diarrheal dogs 10.66% than in non-diarrheic dogs 2.22%, with significant differences. The odds ratio (OR) of *Salmonella* shedding in sick dogs was 5.25 times higher than in apparently healthy dogs (OR = 5.25, 95% CI: 1.08–25.55, P-Value = 0.04). According to the breed, the *Salmonella* prevalence rate in large breeds was 13.3% higher than in small breeds 1.9%, with significant differences, and the OR was 7.92 times higher in large dogs (OR = 7.92, 95% CI: 1.62–38.65, P-value = 0.01) as compared with small animals. Concerning body condition, thin-body dogs were high isolates at 16.98% compared to fat-body animals at 1.25%. In contrast, medium-body dogs were not isolated. Moreover, there was a significant difference between thin and fat body conditions in dogs. The OR in thin dogs was 13.87 times and 16.15 times greater than in both medium and fat body condition dogs (OR = 16.15, 95% CI: 1.98–131.78, P-value = 0.07; OR = 13.87, 95% CI: 0.78–247.01, P-value = 0.07), respectively. The result of feed processing showed that the difference between uncooked and mixed food was significant. *Salmonella* in dogs fed uncooked food was at 12.9% compared to dogs fed mixed food at 1.49%, and the OR in dogs with uncooked food was 7.48 times greater than that in dogs with mixed food (OR = 7.48, 95% CI: 1.53–36.48, P-value = 0.01).

Table 1: Analysis of risk factors for dogs' *Salmonella* isolated from dogs

Factor	No. sample	No. samples positive	X^2 Value (P-Value)	OR (95%CL)	P Value
Diarrheic					
Yes	75	8(10.66)	5.12	5.25 *	0.04
NO	90	2(2.22)	0.02	1.08=25.55	
Breed					
Large	60	8(13.3)	8.75	7.92 **	0.01
Small	105	2(1.9)	(0.003)	1.62 – 38.65	
Body condition					
Thin	53	9(16.98%)	16.41 (0.0002)	0.78-247.01	0.07 0.009
Medium	32	0(0%)		16.15 **	
Fat	80	1(1.25%)		1.98-131.78	
Feed					
Uncooked	62	8(12.9%)	8.16	7.48 **	0.01
Mixed	103	2(1.94%)	(0.0004)	1.53-36.48	
Gender					
Male	90	3(3.33%)	2.58	2.98	0.12
Female	75	7(9.33%)	(0.10)	0.74-11.97 NS	
Age					
Young	100	8(8%)	0.72	2.74	0.21
Old	65	2(3%)	(0.39)	0.56-13.33 NS	
Educational state					
Below high school	115	6(5.21%)	0.47	0.63 NS	0.49
High school and above	50	4(8%)	0.49	0.17-2.35	

NS: non-significant *: significant **: highly significant.

The *Salmonella* prevalence rate in females was 9.33% higher than in males 3.33%, with no significant differences, and the OR in females was 2.98 times higher than in male dogs (OR = 2.98, 95% CI: 1.62–38.65, P = 0.01). In regards to age, the *Salmonella* prevalence rate in the young dogs did not differ significantly compared with the old dogs; young dogs reported higher isolates at 8% than old dogs at 3%, and the OR of the young dogs was 2.74 times that of the old dogs (OR = 2.74, 95% CI: 0.56–13.33, P = 0.21). According to the educational status of dog owners, no significant differences were found; *Salmonella* was identified in dogs' owners with high school and above education at (6/115) 8% than those of owners with below high school education at (4/50) 5.21% (OR=0.63, 95CL:0.17-2.35, P-value=0.49) (Table 1).

Antimicrobial resistance patterns of *Salmonella* isolates from dogs

Results of antibiotic resistance showed the isolates had complete resistance of 100% to both amoxicillin/clavulanic acid and cefotaxime, 70% resistance against azithromycin, and 60% resistance against each of ampicillin, gentamycin, and tetracycline. In comparison, resistance was 50%, 40%, and 30% against trimethoprim-sulfamethoxazole,

chloramphenicol, and ciprofloxacin, respectively. *S. muenchen* was 100% resistant to amoxicillin, clavulanic acid, and cefotaxime, whereas it was 100% susceptible to other antimicrobial agents. *S. Typhimurium* had 100% resistance to cefotaxime and amoxicillin/clavulanic acid, 66.6% resistance to ampicillin, azithromycin, and tetracycline, 50% resistance to gentamycin, 33.3% resistance to chloramphenicol and trimethoprim-sulfamethoxazole, and 16.6% resistance to ciprofloxacin. *S. enteritidis* was resistant 100% to amoxicillin/clavulanic acid, azithromycin, cefotaxime, gentamycin, and trimethoprim-sulfamethoxazole, and 66.6% to ampicillin, chloramphenicol, ciprofloxacin, and tetracycline. All of the *Salmonella* serovars were MDR 100%, except for *S. Muenchen*, and the isolates were high-risk (MAR Index of *S. Typhimurium* ranged from 0.4 - 0.7; *S. Enteritidis* from 0.7 - 0.8 and *S. Muenchen* was 0.2 recorded; also, nine of the ten nontyphoidal *Salmonella* isolates were resistant to three or more antimicrobials, and two (20%) were resistant to eight antimicrobials; furthermore, four of the six isolates of *S. Typhimurium* exhibited resistance to at least five antimicrobials (Tables 2 and 3).

Table 2: Antimicrobial resistance pattern of all dogs *Salmonella* isolates in Baghdad, Iraq

Antimicrobial	Total (n=10)	<i>S. typhimurium</i> (n=6)	<i>S. enteritidis</i> (n=3)	<i>S. muenchen</i> (n=1)
AMC	10 (100)	6 (100)	3 (100)	1 (100)
CTX	10 (100)	6 (100)	3 (100)	1 (100)
AZM	7 (70)	4 (66.6)	3 (100)	0
AMP	6 (60)	4 (66.6)	2 (66.6)	0
GEN	6 (60)	3 (50)	3 (100)	0
TET	6 (60)	4 (66.6)	2 (66.6)	0
SXT	5 (50)	2 (33.3)	3 (100)	0
CHL	4 (40)	2 (33.3)	2 (66.6)	0
CIP	3 (30)	1 (16.6)	2 (66.6)	0
NOR	0	0	0	0

AMP: Ampicillin, AMC: Amoxicillin/Clavulanic Acid, AZM: Azithromycin, CTX: Cefotaxime, CHL: Chloramphenicol, CIP: Ciprofloxacin, GEN: Gentamycin, NOR: Norfloxacin, TET: Tetracycline, SXT: Trimethoprim-Sulfamethoxazole.

Table 3: MDR profiles and MAR index for isolates of dogs *Salmonella* serovars in Baghdad, Iraq

No. of antibiotics	MAR index for ten antibiotics	Serovars	MAR profile
2	2/10 (0.2)	<i>Muenchen</i>	AMC CTX
4	4/10 (0.4)	<i>Typhimurium</i>	AMC CTX AZM GEN
4	4/10 (0.4)	<i>Typhimurium</i>	AMC CTX AZM TET
5	5/10 (0.5)	<i>Typhimurium</i>	AMC CTX AMP AZM SXT
6	6/10 (0.6)	<i>Typhimurium</i>	AMC CTX AMP AZM GEN TET
6	6/10 (0.6)	<i>Typhimurium</i>	AMC CTX AMP CHL SXT TET
7	7/10 (0.7)	<i>Typhimurium</i>	AMC CTX AMP CHL CIP GEN TET
7	7/10 (0.7)	<i>Enteritidis</i>	AMC CTX AZM CHL CIP GEN SXT
8	8/10 (0.8)	<i>Enteritidis</i>	AMC CTX AMP AZM CIP GEN SXT TET
8	8/10 (0.8)	<i>Enteritidis</i>	AMC CTX AMP AZM CHL GEN SXT TET

Discussion

Salmonella Typhimurium and *Salmonella* Enteritidis are extensively distributed and often linked with diseases in humans and animals (22-24). In the current study, *Salmonella* Typhimurium was the highest isolate from dogs, followed by *Salmonella* Enteritidis, which was similar to other findings: 63.63% of *Salmonella* Typhimurium and 36.36% of *Salmonella* Enteritidis were identified in dogs (25). Also, *Salmonella* Typhimurium was isolated from dogs at 50% (26). While *Salmonella* Enteritidis was reported as having the most isolates with a rate of 47.61% (10/21) compared to *Salmonella* Typhimurium at a rate of 19.04% (4/21) (27), *Salmonella* Muenchen was previously isolated from children and frozen beef meat in Iraq (28,29); in the current study, this serovar has been isolated from diarrheal dogs for the first time in Iraq, whereas globally, it was reported in dogs (30,31). This serovar has a broad range of hosts, causing severe infections and complications (32).

In the current study, 6.06% of dogs were positive for *Salmonella* in Baghdad city, which in diarrheal dogs was significantly higher than in apparently healthy dogs. It has been observed that dogs suffering from diarrhea have a higher likelihood of testing positive for *Salmonella* and shedding *Salmonella* in their feces compared to non-diarrheic dogs. Similarly, *Salmonella* was recorded in diarrheal and apparently healthy dogs at 6.4% (26). Also, Usmael *et al.* (10) mentioned that the *Salmonella* prevalence in dogs was 6.3%; in diarrheal dogs, it was elevated compared to dogs without diarrhea. The prevalence observed in this study was more significant than that documented by Reimschuessel *et al.* (33) stated that the dog's *Salmonella* occurrence rate was 2.47% and higher in diarrheal dogs than in non-diarrheic dogs, with significant differences. In addition, a study found the *Salmonella* prevalence rate in diarrheal dogs at 3.5% (22), and in other studies, the *Salmonella* prevalence rate in apparently healthy dogs was reported at 1.85, 8.2, 11, and 11.7% (6,27,31,34), respectively. The variation in the findings of the current investigation, when compared with other information, may be attributed to the variation in sample size, research time, technique and methods used for diagnosis, geographical area, and study season (35,36).

The higher rate of *Salmonella* prevalence in large breeds and higher risk in comparison with small breeds, with significant differences in the present study, corresponds with Chapple *et al.* (30), who recorded a higher rate of *Salmonella* infection in large breeds than in small breeds. No significant difference in dog breeds was observed by Gebremedhin *et al.* (34) and Núñez Castro *et al.* (35). The higher rate of *Salmonella* in large breeds than in small breeds may be due to physiological and anatomical differences; the weight of the intestines in large dogs is 3% of the body weight compared to 7% in smaller breeds; this means there is a small intestinal area for digestion and absorption of the food, and

the food spends a long time in the colon for large-breed dogs. Moreover, the low capacity of the stomach in small dogs creates sensitivity to disease (36,37). This research found that thin-body-conditioned dogs shed significantly more *Salmonella* and were at a higher risk than fat and medium-body-conditioned dogs. These findings are consistent with the results of Usaeml *et al.* (10), as they reported that the *Salmonella* levels in thin-body conditioned dogs were higher than those in fat-body conditioned dogs. Also, the results were incompatible with those of Núñez Castro *et al.* (35), who recorded no significant differences according to body condition in dogs. It is difficult to untangle the relationship between a body condition and a bacterial infection; dogs with weakened body conditions are more susceptible to infections, which are more likely to occur when they have reduced access to food and compromised immunity (38).

Dogs fed uncooked were infected higher than those fed a mixed diet, with a significant difference; these findings match another published paper, revealing a higher *Salmonella* rate in dogs fed on offal than in dogs fed a mixed diet (6,10). According to the Public Health Agency of Canada (PHAC), *Salmonella* contamination was commonly observed in uncooked meat and meat-based products. Raw diets were made at home and were recognized as a substantial reservoir of this bacterial pathogen (39). Focuses on the effect of gender; our data showed that female dogs had a higher incidence rate of *Salmonella*, with no significant difference in the current study. The findings of our study were consistent with those of previous research (6,34). Correspondingly, Jajere *et al.* (30) noted that gender of the dogs affected the probability of a dog harboring *Salmonella*. The variation of isolation rates found in this study compared to others may primarily be due to differences in the sampling period and the techniques used for isolation (40).

Regarding Dogs' ages, which is yet another risk factor for shedding *Salmonella*, this study indicated a higher *Salmonella* rate in young dogs than in old dogs, with no significant difference, and young dogs were more at risk than old dogs. Similarly, *Salmonella* in young dogs was higher than in adults, with no significant differences reported (10,31,41). Moreover, *Salmonella* was found infected in dogs under one year compared to dogs older than one year, with a significant difference reported by Núñez Castro *et al.* (35). It can be hard to compare data due to different age patterns being seen in different studies and because the selected society's lifestyles and dog care practices differ. Young animals usually have undeveloped immune systems, making them more vulnerable to bacterial infections (42,43). According to the educational status of dog Owners, our finding shows no significant difference in dog *Salmonella* prevalence depending on the owners' educational levels below high school or high school and above. These findings concord with an earlier study that reported no significant difference regarding the educational status of dog owners (44).

In the present work, the isolates of *Salmonella* dogs were very resistant to amoxicillin/clavulanic acid, cefotaxime, azithromycin, ampicillin, gentamicin, tetracycline, trimethoprim-sulfamethoxazole, chloramphenicol, and ciprofloxacin. In contrast, all isolates were susceptible to norfloxacin. These findings were more significant than those reported by Usmael *et al.* (10) as they documented that the resistance rates of *Salmonella* isolated from dogs were 41.7% for ampicillin, 21.2% for tetracycline, 12.5% for amoxicillin/clavulanate, and 4.2% for trimethoprim-sulfamethoxazole. In contrast, Kiflu *et al.* (31) report that 14 different *Salmonella* serotypes in dogs have a low level of resistance compared to our results, as they showed that the resistance rate was 26.2% for amoxicillin/clavulanic acid, 30.9% for ampicillin, 7.1% for chloramphenicol, 2.4% for gentamicin, 9.5% for sulfamethoxazole and trimethoprim, and 0% for ciprofloxacin; furthermore, they observed that *Salmonella* Muenchen and *Salmonella* Typhimurium isolated from apparently healthy dogs were sensitive to all these antibiotics mentioned above. Al-Rubaye and Al-Doori (26) observe that 62.5% of dog *Salmonella* isolates resist ampicillin, 50% to tetracycline, and 37.5% to chloramphenicol and gentamicin. The *Salmonella* isolates found in dogs have shown the greatest resistance to ampicillin 100%, tetracycline 93.3%, and chloramphenicol 20%. Nonetheless, they were entirely susceptible to norfloxacin, with a 100% percentage (45). Developing germs resistant to conventional antibiotics is a serious health hazard; it has rapidly and considerably increased in recent decades (46-48). The elevated resistance to cefotaxime and amoxicillin/clavulanic acid in this work may result from their widespread use in pet medicine in Baghdad.

The MAR index is a proactive, functional, and less expensive method for identifying the origins of bacteria that are resistant to antibiotics, and MAR index values of 0.2 or higher may reveal that the use of antibiotics is the contamination source with the most significant risk (21). There is a concerning incidence of multidrug resistance within *Salmonella* serotypes isolated from dogs, which poses a high risk. MDR patterns were observed among *Salmonella* isolates from dogs at 45.2%; other researchers found that the MDR of dog *Salmonella* isolates was between 6% and 46% (31,34). In the same circumstance, a study of a high risk of *Salmonella* isolated from other models, such as humans, was reported (13). The increase in *Salmonella* resistance is assigned to the indiscriminate utilization of antibiotics in the veterinary and human fields (44,45).

Conclusion

This study revealed that diarrheal dogs have a higher prevalence of *Salmonella* than apparently healthy dogs, and dogs fed uncooked feed are at high risk of becoming infected with *Salmonella*. Apparently healthy dogs act as potential sources of antimicrobials, and the pathogenic strains of

Salmonella can be transmissible to humans and other animals.

Conflict of interest

There are no conflicts among the authors; there is interest.

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تقييم عوامل الخطر والمقاومة الميكروبية لعزلات السالمونيلا من الكلاب السليمة ظاهريا والمصابة بالإسهال في بغداد، العراق

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الخلاصة

تعتبر الكلاب من أهم نواقل السالمونيلا. تم اخذ ١٦٥ عينة من مستقيم الكلاب السليمة ظاهريا ٩٠ ومن المصابة بالإسهال ٧٥ من محافظة بغداد /العراق. اعتمد عزل وتحديد أنواع السالمونيلا على الأوساط البكتيرية الروتينية والاختبارات البيوكيميائية ودليل الملف التحليلي ونظام الفايك المصنوع والنمط المصلي. تم فحص أنواع السالمونيلا المعزولة من حيث حساسيتها لعشر مضادات حيوية بطريقة الانتشار القرصي. أشارت النتائج إلى أن انتشار السالمونيلا بلغ ٦,٠٦٪ في عينات براز الكلاب، مع تحديد ثلاثة أنواع: التيفيموريوم هو المصلي السائد، يليه الانتريديس والمينشن التي تم عزلها لأول مرة من الكلاب في العراق. تم العثور على عوامل خطر ذات دلالة إحصائية تتعلق بحالة الإسهال، والسلالة، والتغذية، وحالة الجسم، وكان معدل عزل السالمونيلا من الكلاب المصابة بالإسهال ١٠,٦٦٪ أكبر من معدل عزل السالمونيلا من الكلاب الغير مصابة بالإسهال ٢,٢٢٪، وكانت سلالات الكلاب الكبيرة لديها معدل عزل السالمونيلا اعلى من السلالات الصغيرة؛ وكذلك الكلاب الضعيفة أكثر عرضة للخطر من الكلاب السمينه. الكلاب التي تناولت طعاما غير مطبوخ كانت نسبة عزل السالمونيلا منها أعلى من تلك التي تناولت أطعمة مختلطة حيث أن الكلاب التي تستهلك طعاما غير مطبوخ لديها معدل مخاطر مرتفع من التي تعتمد على الأطعمة المختلطة. تم العثور على فروق غير معنوية حسب الجنس والعمر والحالة التعليمية لأصحاب الكلاب. أظهرت عزلات السالمونيلا مقاومة عالية للـ سيفوتاكسيم والأمبيسلين والأزيثروميسين والجنتاميسين والنتراسيكلين ولكنها كانت حساسة للنورفلوكساسين. جميع العزلات كانت مقاومة للأدوية المتعددة ماعدا سالمونيلا مينشن. استنتجت الدراسة إن الكلاب المصابة بالإسهال والتي تبدو صحية على ما يبدو تحمل وتطرح السالمونيلا المقاومة، والتي تعتبر من المخاطر المحتملة على الصحة العامة.