

ANTIMICROBIAL RESISTANCE AMONG SALMONELLAE FROM ANIMALS

BY

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INTRODUCTION

Salmonellosis is an economically important disease of domestic animals, and appears to be one of the most common examples of an enteric disease that is transmitted from animals to humans (Threlfall et al., 1978; Hepner, 1980; Hadad et al., 1988; Donahue, 1986; Gillespre and Timoney, 1981). The extensive use of various antibiotics for prevention, therapeutic and nutritive purposes in domestic animals has contributed to the development of drug-resistant *Salmonella* to such antibiotics.

In recent years most of *Salmonella* strains isolated from domestic animals were resistant to antibiotics and most of these drug-resistant *Salmonella* carried conjugative R-plasmids (Duck et al., 1978; Makino et al., 1981; Mills and Kelly, 1985; Threlfall et al., 1985; Timoney, 1978; Ishiguro et al., 1980), which present a serious problem when using these antibiotics in disease eradication and it may possess serious public health hazard (Rowe et al., 1979; Threlfall et al., 1978, 1985).

In this paper, the antimicrobial susceptibility of 122 *Salmonella* isolates, isolated during 1982-1985 from animals in Mosul is examined.

MATERIALS AND METHODS**Bacterial strains:**

A total of 122 *Salmonella* strains (76 from poultry, 19 from starlings, 15 from goats, 8 from sheep and 4 from cattle) were isolated in Mosul from December 1982 to March 1985. All isolates were identified by the standard common biochemical tests (Carter, 1979) and sent to the National *Salmonella* Center in Baghdad for serotyping.

Susceptibility testing:

The standard disc-diffusion method described by Bauer et al. (1966) was used. The following antibiotic discs were used. Streptomycin (S), 10 µg; Tetracycline (TE), 50 µg; Co-Trimozazol (SXT), 25 µg; Chloramphenicol(C), 50 µg; Colisitin (CT), 10 µg ; Furazolidone (F) , 200 µg ; Sulphafurazole (SF), 500 µg , nalidixic acid (NA) 30 µg; Ampicillin. (AMP) 25 µg ; Gentamicin (CN), 10 µg; Cephaloridine (CR), 25 µg ; and Carbenicillin (CAR), 10 µg.

Muller-Hinton agar (Oxoid) was used for antibiotic susceptibility testing.

RESULTS

The antibiotic resistance of 122 *Salmonella* strains are shown in Table, 1. Frequency of resistance ranged from 74% for sulphafurazol to 3.2% for colisitin . Only 15.6% of the isolates were sensitive to all of the antibiotics used and these were of sheep, goats and cattle origin, while 84.6% of the isolates were resistant to one or more of the 12 antibiotics tested. Sixty-two isolates (50%) were resistant to 3 drugs or more. However, all isolates were sensitive to ampicillin, carbnicillin, gentamicin, furazolidone, cephaloridine and nalidixic acid. Thirteen patterns

Table 1: Frequencies of resistance to antibiotics for 122 *Salmonella* strains isolated from animals.

Antibiotic	No. of resistant strains	(%)
Sulphafurazol	90	74
Tetracycline	88	71
Streptomycin	64	52.5
Chloramphenicol	17	13.9
Co-trimoxazol	9	7.4
Colisitin	4	3.2
Ampicillin	0	0
Carbenicillin	0	0
Furazolidone	0	0
Cephaloridine	0	0
Nalidixic acid	0	0
Gentamicin	0	0

Table 2: The relationship between source and antibiotic resistance.

Animal species	No. of isolates	No. of resistant	% Res.
Poultry	76	76	100
Starlings	19	19	100
Cattle	4	3	80
Sheep	8	1	12.5
Goats	15	4	26.6

Table 3: The seven most frequent patterns of antibiotic resistant among *Salmonella* strains according to animal source.

Resistant pattern	Total no. of strains	Poultry	Starlings	Cattle	Sheep	Goats
S SF TE	38	38	-	-	-	-
S SF TE C	13	13	-	-	-	-
SF TE	11	8	3	-	-	-
S SF	7	1	-	1	1	4
S TE	4	-	4	-	-	-
S SF SXT	4	4	-	-	-	-
S SF TE SXT C	4	4	-	-	-	-

J.J. Hadad and A.Jemel.

of multiple-drug resistance were found among the 122 isolates. Seven of these patterns accounted for 66.4% (Table, 3). The single most frequent discrete pattern occurred 38 times, accounted for 31% of all resistant isolates and included resistant to streptomycin, sulphafurazol and tetracycline (Table, 3).

DISCUSSION

From this study antibiotic resistance seems to occur commonly among *Salmonella* isolates from animals in Mosul province. This is in accordance with other studies performed on *Salmonella* strains isolated from animals in different countries. (Timoney, 1978; Duck et al., 1978; Sojka et al., 1977, Ishiguro et al., 1980, Ikeda et al., 1986), where a high percentage of multiple resistance isolates has been found.

In the present study, *Salmonella* isolates were most frequently resistant to sulphafurazol, tetracycline, streptomycin and chloramphenicol drugs for which a high rate of resistance has been reported in *Salmonella* of animal origin (El-Din et al., 1987; Cox, 1980 Sojka et al., 1986; Pocurull et al., 1971, Ishiguro et al., 1980).

The overall incidence of resistance was higher (100%) in poultry isolates than in other species isolates (Tables 2 and 3), possibly reflecting, among other reasons the widespread use of antibiotic in poultry for prophylactic and nutritive purposes in this province.

Starlings isolates also showed 100% resistance. This may be due to seasonal pattern of starlings migration all over the world and their accessibility to all kinds and forms of waste of man and animals. In this view, starlings may constitute a potential hazard to animal and public health and may play a role in the transmission of antibiotic resistant *Salmonella* to man and susceptible animals.

Antimicrobial resistance among salmonellae from

Only 15.6% of the isolates were sensitive to all the antibiotics used and these were all of sheep, goats and cattle origin. Since these species are less likely exposed to antibiotics as feed additives, it is likely the frequent occurrence of resistance to multiple antibiotics has been due to the use of antibiotic at therapeutic levels in these species.

In recent years particular interest has been focused on the increase of the antibiotic resistance in *Salmonella* of animal origin and the presence of R-plasmid in these isolates (Threlfall et al., 1978, 1985; Olsvik et al., 1985; Makino et al., 1981; Ishiguro et al., 1980; Rowe et al., 1979; Mills and Kelly, 1985), since these isolates have been found to cause outbreaks of human Salmonellosis (Lyons et al., 1980; Taylor et al., 1980; Olsvik et al., 1985; Threlfall et al., 1978; Bezanson et al., 1983; Holmberg et al., 1984). The transmission occurs both through food products, such as meat, dairy products, and eggs and by direct contact between animals and humans through the fecal-oral route.

SUMMARY

The susceptibility to 12 antimicrobial agents of 122 *Salmonella* isolates of animal origin (Poultry, 76; starlings, 19; sheep, 8; goats, 15 and cattle, 4) was tested. Of these, 103 (84.6%) were resistant to one or more antibiotics. Resistance was most frequently to sulphafurazol, tetracycline, streptomycin and chloramphenicol. Poultry and starlings isolates exhibited 100% resistance, whereas a low rate of resistance was encountered in the sheep, goats and cattle isolates.

J.J. Hadad and A.Jemel.

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J.J. Hadad and A. Jemel.

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