



## Studies on different salmonella serotypes isolated from poultry in different governorates in Egypt

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### ABSTRACT

The aim of this study was to isolate Salmonellae from 579 birds (348 chickens, 104 ducks, 30 turkeys, 50 quail, 30 pigeons and 17 geese) from 4 Egyptian Governorates. The Samples collected from internal organs (liver, cecum, spleen and heart) were examined bacteriologically and serologically. Sixty-three (10.9%) out of 579 birds were found positive while 516 (89.1%) birds were negative for Salmonella isolation. The number and percentage of positive chickens, ducks, turkeys, quails, pigeons and geese were 43 (12.4%), 10 (9.6%), 3 (10%), 5 (10%), 2 (6.7%) and 0 (0%) respectively. In this study, *S. Typhimurium*, *S. Apoyem*, *S. Kentucky*, *S. Daula*, *S. Newport*, *S. Tamale*, *S. Molade*, *S. Colindale*, *S. Lexington*, *S. Bargny*, *S. Enteritidis*, *S. Papuana*, *S. Labadi*, *S. Santiago*, *S. Magherafelt*, *S. Rehovot*, *S. Takoradi*, *S. Angers* and *S. Shubra* were isolated from chickens. While *S. Inganda*, *S. Infantis* and *S. Larochelle* were isolated from ducks but *S. Virchow* and *S. Vejle* were isolated from turkeys. *S. Shangani* and *S. Jedburgh* were isolated from quails while *S. Alfort* and *S. Wingrove* were isolated from pigeons in this study.

**Keywords:** Salmonella, poultry, Egypt

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### 1. INTRODUCTION

Salmonella is Gram negative, none spore forming, usually motile, facultative anaerobic bacilli belonging to the family Enterobacteriaceae. Infection with Salmonella may or may not lead to a fatal Salmonellosis (Ekperigin and Nagaraja 1998). The detection of Salmonella in poultry production was an issue of great concern. Success of detection was likely to be highly dependent on the choice of an adequate sampling procedure combined with a sensitive culture method (Carrique-Mas and Davies 2008). Avian salmonellosis is an important disease causing serious impediment to the development of poultry industry especially in developing countries of Asia and Africa. Since no "effective"

immune-prophylactic measures are available for the disease till date, strict biosecurity is the only alternative to preclude the disease (Rajagopal et al., 2013).

This study aimed to isolate Salmonella from different Governorates in Egypt and to know the incidence of Salmonella in different poultry species.

### 2. MATERIAL AND METHODS

#### 2.1. Samples collection

A total of 579 (apparently healthy, diseased and freshly died) chickens, ducks, turkeys, quails, pigeons and geese were collected from Dakahlia, Kafr elsheik, Damietta and

Port Said Governorates and subjected to postmortem examination to collect samples for isolation and identification of Salmonellae. The internal organs (liver, cecum, spleen, heart) of 348 chickens (304 from Dakahlia and 44 from Damietta), 104 ducks (54 from Dakahlia and 50 from Damietta), 30 turkeys from Dakahlia, 50 quails (40 from Port Said and 10 from Kafrelsheik), 30 pigeons and 17 geese from Dakahlia were aseptically collected to prevent cross contamination and transferred immediately in ice box to Reference Laboratory for Veterinary Quality Control on Poultry Production.

### 2.2. Isolation of Salmonellae

It was done according to ISO 6579 (2002).

### 2.3. Biochemical identification of isolated Salmonellae

Oxidase reaction, hydrolysis of urea, H<sub>2</sub>S production, Lysine decarboxylation, Indole test, MR test, VP test and Simmon's Citrate agar was done according to (Cruickshank *et al.*, 1975).

### 2.4. Serological typing of Salmonella organism

The isolates that were identified biochemically as Salmonella was subjected to serological identification according to Kauffman-White Scheme (Kauffman, 1974) for determination of somatic (O) and flagellar (H) antigens (Cruickshank *et al.*, 1975).

## 3. RESULTS

### 3.1. Cultural, staining and biochemical characters of the isolated Salmonellae (Waltman *et al.*, 1998)

The cultural characters of the isolated Salmonellae appeared on XLD agar as smooth pink colonies with black center (H<sub>2</sub>S production) while H-E agar it appeared as deep blue colored colonies. On MacConkey's agar the colonies were pale, colorless smooth, transparent (non lactose fermenter), however, on S-S agar it appeared as pale colored colonies with or

without black centers. The staining characters of the isolated Salmonellae revealed a Gram negative, non spore forming short rod shaped bacilli (2-3x0.5 $\mu$ ). The application of different biochemical tests revealed a negative result (colorless) in oxidase reaction, a negative result on urea agar (yellowish coloration), a positive reaction on TSI agar (alkaline red slant, acid yellow butt with H<sub>2</sub>S and gas, a positive reaction on LI agar (alkaline deep purple slant and alkaline butt with no gas or H<sub>2</sub>S), a negative Indole reaction (Yellow ring), a positive reaction on MR test (red color at surface), a negative VP test (no bright red color) and a positive blue color on Simmon's Citrate agar.

### 3.2. Incidence of Salmonella isolation from different poultry species and different Governorates

A total number of 579 examined birds that were distributed as 348 from chickens, 104 from ducks, 30 from turkeys, 50 from quails, 30 from pigeon and 17 form geese examined for presence of Salmonellae. Sixty three (10.9%) out of 579 birds were found positive while 516 (89.1%) birds were negative for Salmonella isolation. The number and percentage of positive chickens, ducks, turkeys, quails, pigeons and geese were 43 (12.4%), 10 (9.6%), 3 (10%), 5 (10%), 2 (6.7%) and 0 (0%) respectively (Table 1). A total of 304 chickens, 54 ducks, 30 turkeys, 30 pigeons were examined from Dakahlia Governorate for Salmonella isolation, the number and percentages of positive chickens, ducks, turkeys and pigeons were 40 (13.2%), 6 (11.1%), 3 (10%), 2 (6.7%), respectively. Also, 44 chickens, 50 ducks from Damietta were examined giving 3 positive chickens and 4 positive ducks with percentage of 6.8%, 8% respectively. From Port Said and kafrelsheik Governorates, the results of examined quails revealed that all quails in kafrelsheik were negative for Salmonella but 5/40 (12.5%) quails were positive from Port Said (Table 2).

3.3. Results of serotyping, distribution and percentage of different serotypes of Salmonellae isolated from species and different Governorates in Egypt.

Forty-three Salmonella isolates were recorded from chickens in Dakahlia and Damietta Governorates (40 isolates from Dakahlia and 3 from Damietta). A total of 16 serotypes (*S. Typhimurium*, *S. Apeyeme*, *S. Kentucky*, *S. Daula*, *S. Newport*, *S. Tamale*, *S. Molade*, *S. Colindale*, *S. Lexington*, *S. Bargny*, *S. Enteritidis*, *S. Papuana*, *S. Labadi*, *S. Santiago*, *S. Magherafelt*, *S. Rehovot*) and

one untyped Salmonella were isolated from Dakahlia while 3 serotypes (*S. Takoradi*, *S. Angers* and *S. Shubra*) were isolated from Damietta (Table 3). Six isolates (two *S. Inganda* and 4 untyped Salmonellae) were recorded from Dakahlia ducks while three *S. Infantis* and one *S. Larochelle* were isolated from Damietta ducks. Three isolates (two *S. Virchow* and one *S. Vejle*) were recorded from Dakahlia turkeys. Three *S. Shangani* and two *S. Jedburgh* were isolated from Port Said quails. Two isolates (one *S. Alfort* and one *S. Wingrove*) were recorded from Dakahlia pigeons (Table 4).

Table 1. Incidence of Salmonella isolation from different poultry species.

Species	No. of examined birds	Results			
		positive birds		negative birds	
		No.	%	No.	%
Chickens	348	43	12.4	305	87.6
Ducks	104	10	9.6	94	90.4
Turkeys	30	3	10	27	90
Quails	50	5	10	45	90
Pigeons	30	2	6.7	28	93.3
Geese	17	0	0	17	100
Total	579	63	10.9	516	89.1

Table 2. Incidence of Salmonella isolation from different Governorates in Egypt.

governorate species	Dakahlia			Damietta			Port Said			kafrelsheik		
	total			total			total			total		
	No.	+Ve	-Ve	No.	+Ve	-Ve	No.	+Ve	-Ve	No.	+Ve	-Ve
Chickens	304	40	264	44	3	41	0	0	0	0	0	0
Ducks	54	6	48	50	4	46	0	0	0	0	0	0
Turkeys	30	3	27	0	0	0	0	0	0	0	0	0
Quails	0	0	0	0	0	0	40	5	35	10	0	10
Pigeons	30	2	28	0	0	0	0	0	0	0	0	0
Geese	17	0	17	0	0	0	0	0	0	0	0	0

+ Ve = positive number & -Ve = negative number

Table 3. Results of serotyping, distribution and percentage of different serotypes of Salmonellae isolated from chickens.

Species	Governorate	Isolated serotypes		
		Serotype	No. of serotypes	%
Chickens	Dakahlia	<i>S. Typhimurium</i>	8	18.6
		<i>S. Apeyeme</i>	1	2.3
		<i>S. Kentucky</i>	4	9.3
		<i>S. Daula</i>	1	2.3
		<i>S. Newport</i>	6	14.0
		<i>S. Tamale</i>	3	7.0
		<i>S. Molade</i>	3	7.0
		<i>S. Colindale</i>	1	2.3
		<i>S. Lexington</i>	1	2.3
		<i>S. Bargny</i>	2	4.7
		<i>S. Enteritidis</i>	2	4.7
		<i>S. Papuana</i>	1	2.3
		<i>S. Labadi</i>	1	2.3
		<i>S. Santiago</i>	2	4.7
		<i>S. Magherafelt</i>	2	4.7
		<i>S. Rehovot</i>	1	2.3
		Untyped	1	2.3
	Damietta	<i>S. Takoradi</i>	1	2.3
		<i>S. Angers</i>	1	2.3
		<i>S. Shubra</i>	1	2.3
Total		43	100	

Table 4. Results of serotyping, distribution and percentage of different serotypes of Salmonellae isolated from ducks, turkeys, quails and pigeons.

Species	Governorate	Isolated serotypes		
		Serotype	No. of serotypes	%
Ducks	Dakahlia	<i>S. Inganda</i>	2	20
		Untyped	4	40
	Damietta	<i>S. Infantis</i>	3	30
		<i>S. Larochelle</i>	1	10
	Total	10	100	
Turkeys	Dakahlia	<i>S. Virchow</i>	2	66.7
		<i>S. Vejle</i>	1	33.3
Total		3	100	
Quails	Port Said	<i>S. Shangani</i>	3	60
		<i>S. Jedburgh</i>	2	40
		Total	5	100
Pigeons	Dakahlia	<i>S. Alfort</i>	1	50
		<i>S. Wingrove</i>	1	50
		Total	2	100

#### 4. DISCUSSION

Salmonella was isolated from chickens in Dakahlia and Damietta Governorates in Egypt with a percentage of (12.4%) (43 out of 348 examined chickens) and these results agreed with El-Morsi (1998) who isolated Salmonella species from 25 liver samples of chicks with an incidence of 12%, Rehan (2004) who isolated Salmonella species from broiler chickens with an incidence of 12%. On the other hand, the results of this study differ from Osman (1992) who collected 150 random samples from different broiler farms, and isolated 45 Salmonella strains with an incidence of 30%, Schluter et al., (1994) who isolated Salmonella from chicken broiler flocks with an incidence of 6.2%. Salmonella was isolated from ducks in Dakahlia and Damietta Governorates in Egypt with a percentage of (9.6%) (10 out of 104 examined ducks) and these results differ from Shmoon et al., (1998) who isolated Salmonella from ducks in open houses which was 16.6% (10 out of 60 birds), Abd- El-Rahman et al., (2000) reported 25 positive samples for Salmonella out of 125 samples from 10 duck flocks in North Sinai. The percentage of isolation was 20%, Hoszowski and Wasyl (2005) who detected Salmonella in duck broilers with percentage of 14.3%. Salmonella was isolated from turkey in Dakahlia Governorate in Egypt with a percentage of (10%) and these results nearly in coordinated with Tel et al., (2013) who detected Salmonella with a percentage of (9.7%). Salmonella was isolated from quails in Port Said Governorate in Egypt with a percentage of (10%) (5 out of 50 examined quails) and these results differ from Zlem *et al.*, (2002) who isolated seven Salmonellae from 123 whole quail eggs with incidence of (5.69%), while Mukhopadhyay (2007) who isolated Salmonella from liver and heart of 128 Japanese quails with an incidence of 1.6% and Rahman *et al.*, (2011) who isolated Salmonella from quail in Bangladesh form liver, spleen and intestine with an incidence

of 29.62%. Salmonella was isolated from pigeons in Dakahlia Governorate in Egypt with a percentage of (6.7%) (2 out of 30 examined pigeons) and these results nearly in coordinated with González-Acuña et al., (2007) who isolated Salmonella from pigeons with a percentage of (4%) and Rahman et al., (2011) isolated Salmonella from pigeons in Bangladesh form liver, spleen and intestine with an incidence of 26.66%. Salmonella isolates were serotyped using poly and monovalent "O" and "H" antisera and the results of this study (table 3) revealed that 19 serotypes were isolated from Dakahlia and Damietta Governorates chickens (16 serotypes from Dakahlia and 3 serotypes from Damietta). The results in this study reported that *S. Typhimurium* participated with the higher percentage from the isolated serotypes (18.6%) by 8 isolates while *S. Apeyeme*, *S. Daula*, *S. Colindale*, *S. Lexington*, *S. Papuana*, *S. Labadi*, *S. Rehovot*, *S. Takoradi*, *S. Angers* and *S. Shubra* participated with the lower percentage (2.3%) by one isolate for each of them. Our results agreed with Verma and Gupta (1995) who isolated *S. Typhimurium* with a percentage of (18.10%) While these results differ from Osman (1992) who isolated 45 Salmonellae from different broiler farms with an incidence of 30% and the serological typing revealed 21 (46.7%) *S. Pullorum*, 9 (20%) *S. Gallinarum*, 7 (15.6%) *S. Typhimurium* and 8 (17.8%) *S. Entertidis* and Ibrahim (1995) who isolated 55 strains of Salmonella species, 22 were from chicks, 18 from broilers and 15 from layers. The isolated serovars were *S. Montevideo*, *S. Typhimurium*, *S. Entertidis*, *S. Lexington*, *S. Infantis*, *S. Reading*, *S. Cerro*, *S. Hadar* and *S. Tennessee*. Salmonella isolates that were serotyped from ducks isolates (table 4) revealed that 6 isolates (two (20%) *S. Inganda* and 4 (40%) untyped Salmonellae) were recorded from Dakahlia ducks while three (30%) *S. Infantis* and one (10%) *S. Larochelle* from Damietta ducks. These results were differ from Tsai and Hsiang (2005) who tested cloacal swabs from 100 duck farms in Taiwan and isolated *S.*

Potsdam (31.9%), *S. Dusseldorf* (18.7%), *S. Indiana* (14.3%), *S. Typhimurium* (7.7%), *S. Hadar* (5.5%), *S. Newport* (4.4%), *S. Derby* (4.4%), *S. Montevideo* (2.2%), *S. Schwarzengrund* (2.2%), and *S. Asinnine* (1.1%). While Asawy and El-Latif (2010) who recorded three different serovars including *S. Typhimurium*, *S. Derby* and *S. Enteritidis* from 120 sample of freshly dead ducks and 40 fecal samples from clinically sick ducks of different ages from private farms at the Dakahlia Governorate. *Salmonella* isolates that were serotyped from turkey isolates (table 4) revealed that two *S. Virchow* (66.7 %) and one *S. Vejle* (33.3%) were isolated from Dakahlia Governorate; these results were differed from Papadopoulou *et al.*, (2009) who isolated *S. Typhimurium* (20.8%), *S. Newport* (14.7%), *S. Derby* (10.6%), *S. Indiana* (8.3%) and *S. Agona* (6.4%). *S. Typhimurium* in the second half of the year 1990 from British turkey flocks, Anderson *et al.*, (2010) who reported that *S. Derby* (83%) was the predominant serotype in commercial turkey processing plant (A) located in USA whereas *S. Typhimurium* (39%) was the most common serotype recovered in plant (B) also in USA. *Salmonella* isolates that were serotyped from quail isolates (table 4) revealed that three (60%) *S. Shangani* and two (40%) *S. Jedburch* were isolated from Port Said Governorate and these results differ from Zlem *et al.*, (2002) who isolated seven *S. Enteritidis*, three of 7 strains were *S. Enteritidis* PT4, two of them were PT1, one was PT7 and another one was indefinite but Neto *et al.*, (2013) reported *S. enterica* subspecies *enterica*; *S. Corvalis*; *S. Give*; *S. Lexington*; *S. Minnesota*; *S. Schwarzengrund*; *S. Rissen* and *S. Typhimurium* from meat-type quails in Brazil. *Salmonella* isolates that were serotyped from pigeon isolates (table 4) revealed one *S. Alfort* (50%) and one *S. Wingrove* (50%) from Dakahlia Governorate and these results differ from Pasmans *et al.*, (2003) who reported that *Salmonella Typhimurium* var. Copenhagen

phage types 2 and 99 are the most commonly isolated subtypes form pigeons, Osman *et al.*, (2013) who isolated *Salmonella Typhimurium*, Braenderup and Lomita form pigeons in Cairo, Egypt. Different *Salmonellae* in this study were isolated from different poultry so that it's recommended for poultry owner to apply fast and correct diagnosis to such *Salmonellae* to avoid transmission in between farms and also to avoid infections to peoples who eat under cooked poultry and poultry products.

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