Incidence of *E. coli* in chickens and ducks in different governorates in Egypt

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Abstract
In the present study, 800 chickens and 550 ducks suffering from colisepticaemia, collected from different governorates, were examined for pathogenic ***E. coli***. The incidence of ***E. coli*** isolation was (43.1%) in chickens and (27.2%) in ducks. In chickens**,** the highest incidence was reported in Cairo Governorate (58.7%), followed by Fayoum (38%), Alexandria (30%), and El-Sharkia (23.5%). In ducks, the highest incidence was reported in Fayoum Governorate (35%), followed by Cairo (27.2%), El-Sharkia (24.4%), and Alexandria (21.4%). The incidence of ***E. coli*** in one day old living diseased chicks was (28.7 %), while in freshly dead chicks it was (15.5%). The incidence of ***E. coli*** in over one week old living diseased chickens was (80.5%), while in freshly dead chicks it was (62.2%). The incidence of ***E. coli*** in one day old living diseased ducklings was (26.8 %), while in freshly dead ducklings it was (23.8 %). The incidence of ***E. coli*** in over one week old living diseased ducks was (30.8 %), while in freshly dead ducks it was (28.4%). The typing of 345 ***E. coli*** strains isolated from different organs of chickens **revealed** that, 263 strains could be identified serologically. They belonged to 24 different serogroups. The most commonly isolated O groups in chickens were O44, O158, O114, O91, O111, O125, O103, O142, O26, O78, O127 andO164. The typing of 150 ***E. coli*** strains recovered from different organs of ducks revealed that 84 strains could be identified serologically. They belonged to 15 different serogroups. The most prevalent O groups in ducks were O158, O103, O125, O44, O114, O91, O111 and O78.

Key words: *Incidence,* ***E. coli,*** *chickens, ducks.*

Introduction

E. coli infections are of significant concern to the poultry industry. It is one of the most important and frequently encountered bacterial avian pathogen causing a wide variety of disease syndrome in birds causing up to 30% of poultry mortality (**Kaul *et al*., 1992**, **Barnes and Gross, 1997** and **Georgnaras *et al.*, 2001**).
Colisepticaemia in poultry is an important disease of chicks. It is also associated with other disease conditions like acute enteritis, air–saculitis, peri-carditis, peritonitis, coligranuloma of liver, synovitis, swollen-head syndrome and osteomyelities **(Amara *et al.*, 1995** and **Reddy *et al*., 1994).**
The species of ***E. coli*** are serologically divided in serogroups and serotypes on basis of their antigenic composition (somatic or O antigens for serogroups and flagella or H antigens for serotypes). Many strains express a third class of antigens (capsular or K antigens) (**Compos *et al.*, 2004).**
E. coli O-groups were found to be associated with different diseases as septicaemia, salpingitis, peritonitis, arthritis, omphalitis and tumor-like masses in the intestine and liver **(Khalid, 1990).** More than 1000 ***E. coli*** serotypes have been reported but only small percentages have been implicated in poultry diseases **(Cloud *et al.*, 1985).**
Epidemiological tracing of ***E. coli*** strains is of considerable importance in veterinary microbiology. The data can be used to monitor trends in the occurrence of pathogenic strains or to identify possible source of infection. Autologous bacterins provide limited serotype-specific protection, because multiple serogroups are associated with disease, especially O1, O2 and O78 among many others **(Dziva and Stevens, 2008).**

The aim of the present work was to study the incidence of *E. coli* O serogroups in one day old living diseased and freshly dead chickens and ducks in different governorates in Egypt.

Material and methods:

Samples:

The examined birds were submitted to the Central Laboratory for Veterinary Quality Control on Poultry Production, Dokki, to be checked for the presence of *E. coli* infection. The birds examined were 800 chickens (500 from one day old living diseased and freshly dead, 300 from over one week old living diseased and freshly dead) and 550 ducks (322 from one day old living diseased and freshly dead, 228 from over one week old living diseased). All birds showed lesions of colisepticemia, at post mortem examination, the birds came from different governorates (Cairo, Fayoum, Alexandria, and El-Sharkia).

Diagnostic antisera:

E. coli Polyvalent (1): O114:K90, O158:K-, O44:K74, O26:K60, O142:K86, O125:K70.
E. coli Polyvalent (2): O127:K63, O119:K69, O126:K71, O111:K58, O91: K-, O55:K59.
E. coli Polyvalent (3): O164: K-, O157:K-, O145:K-, O148:K-, O118:K-O103: K-, O78:K80, O57:K11.O86:K61.
E. coli Polyvalent (4): O8: K-, O6: K-, O18: K-.

Collection of samples

Samples were collected from one day old and over one week old freshly dead and diseased alive birds of different farms .Liver, lung, heart, yolk sac and bone marrow were collected using sterile scissor and forceps and under aseptic condition .. Samples were labeled and kept on ice containers and transported to laboratory for examination.

Isolation and identification of *E. coli* isolates:

Under aseptic conditions loop full from (liver, lung, heart, yolk sac and bone marrow) were directly cultivated onto MacConkey agar then E.M.B. The plates were incubated at37^{o}C for 24-48 hours and then examined for the characteristic *E. coli* colonies. Pure colonies were subjected to biochemical test to identify and differentiate between members of *Enterobacteriaecae* according to **Quinn *et al.* (2002).**

Serological typing of *E. coli* (Edwards and Ewing, 1972):

Suspected isolates of *E. coli* were subcultured on semisolid or slop agar and incubated for 24 hrs at 37^{o}C, then subcultured on MaCconkey agar medium and incubated for 24 hrs at 37^{o}C. 3-5 colonies of the growth were suspended in 3ml saline, and kept in water bath at 100^{o}C for 1hr, then centrifuged at 2000 rpm. The supernatant was poured and the precipitate was kept, to which 0.5ml saline was added. The serology was carried out as follows a drop from the tube on a glass slide and try one drop from the O .polyvalent anti serum and mix them using a wooden strike or glass rod. If agglutination occurs continue to serotype the factor in the some way.

Results

Incidence of E. coli recovered from examined (chickens and duck) samples in different governorates:

As shown in Table (1), the incidence of *E. coli* isolation was highest in chickens (43.1%), while in ducks it was (27.2%). In chickens, the highest incidence was reported in Cairo Governorate (58.7 %), followed by Fayoum (38%), Alexandria (30%), and El-Sharkia (23.5%). In ducks, the highest incidence was reported in Fayoum Governorate (35%), followed by Cairo (27.2%), El-Sharkia (24.4%), and Alexandria (21.4%).

Incidence of E. coli in different organs of one day old chicks:

As demonstrated in Table (2), the incidence of *E. coli* in one day old living diseased chicks was 28.7 %; while in freshly dead chicks it was 15.5%. The highest percentages of organs isolation were obtained from liver (10% and 8.3% in both living diseased and freshly dead respec-

tively), followed by heart (7.8% and 3.3%), yolk sac (6.2% and 1.7%), and finally the lung (4.7% and 2.2%).

Incidence of *E. coli* in different organs of over one week old chicks:

Table (3) indicates that the incidence of *E. coli* in over one week old living diseased chickens was 80.5%, while in freshly dead chicks it was 62.2%. The highest percentages of organs isolation were obtained from bone marrow (18% in living diseased and 46.7% in freshly dead), followed by liver (36.2% and 7.8%), heart (14.3% and 3.3 %), and finally the lung (11.9% and 4.4%).

Table (1). Incidence of *E. coli* recovered from examined (chickens and ducks) samples in different governorates:

Locality	Chickens			Ducks		
	No examined	No positive	%	No examined	No positive	**%**
Cairo	315	185	58.7	228	62	27.2
Fayoum	250	95	38	120	42	35.0
Alexandria	150	45	30	112	24	21.4
El-Sharkia	85	20	23.5	90	22	24.4
Total	800	345	43.1	550	150	27.2

Table (2). Incidence of *E. coli* in different organs of one day old chicks.

No of Examined birds	Positive results in different organs								Incidence of *E. coli*.	
	liver	%	lung	%	Heart	%	Yolk sac	%	Total	%
Living diseased 320	32	10	15	4.7	25	7.8	20	6.2	92	28.7
Freshly dead 180	15	8.3	4	2.2	6	3.3	3	1.7	28	15.5
Total 500	47	9.4	19	3.8	31	6.2	23	4.6	120	24.0

Table (3). Incidence of *E. coli* in different organs of over one week day old chicks.

No of Examined birds	Positive results in different organs								Incidence of *E.*	
	liver	%	lung	%	Heart	%	Bone marrow	%	Total	%
Living diseased 210	76	36.2	25	11.9	30	14.3	38	18.0	169	80.5
Freshly dead 90	7	7.8	4	4.4	3	3.3	42	46.7	56	62.2
Total	83	27.7	29	9.7	33	11	80	26.7	225	75.0

Incidence of *E. coli* in different organs of one day old ducklings:

As demonstrated in Table (4), the incidence of ***E. coli*** in one day old living diseased ducklings was 26.8 %, while in freshly dead ducklings it was 23.8 %. The highest percentages of organs isolation were obtained from liver (14.3 % and 10.2% from both of living disease and freshly dead respectively), followed by yolk sac (5.7 % and 8.8 %), heart (4.6% and 3.4%), and finally the lung (2.3% and 1.7%).

Incidence of *E. coli* in different organs of over one week old ducks:

As evident from Table (5), the incidence of ***E. coli*** in over one week old living diseased ducks was 30.8 %, while in freshly dead ducks it was 28.4%. The highest percentages of organs isolation were obtained from liver (13.5 % in living disease and 8.4 % in freshly dead), followed by bone marrow (7.5 % and 13.7 %), heart (5.3% and 6.3 %), and finally the lung (4.5 %).

Serotyping of *E. coli* strains isolated from different poultry samples:

As shown in Table (6), the typing of 345 *E. coli* strains isolated from different organs of chickens revealed that, 263 strains could be identified serologically. They belonged to 24 different serogroups. The most commonly detected *E. coli* serogroups isolated from different organs of chickens were O44, O158, O114, O91, O111, O103, O125, O78 and O142, while 82 strains were untypable by available antisera. The typing of 150 *E. coli* strains isolated from different organs of ducks revealed that 84 strains could be identified serologically. They belonged to 15 different serogroups. The most commonly detected ***E. coli*** serogroups isolated from different organs of ducks were O158, O103, O125 and O44, while 66 strains were untypable by available antiserum.

Table (4). Incidence of *E. coli* in different organs of one day old ducklings.

No of Examined birds	Positive results in different organs								Incidence of	
	liver	%	lung	%	Heart	%	Yolk sac	%	Total	%
Living diseased	25	14.3	4	2.3	8	4.6	10	5.7	47	26.8
Freshly Dead	15	10.2	2	1.7	5	3.4	13	8.8	35	23.8
Total	40	12.4	6	1.9	13	4.0	23	7.1	82	25.5

Table (5). Incidence of *E. coli* in different organs of over one week day old ducks.

No of Examined birds	Different organs								Incidence of *E.*	
	Liver	%	lung	%	Heart	%	Bone marrow	%	Total	%
Living diseased 133	18	13.5	6	4.5	7	5.3	10	7.5	41	30.8
Freshly dead 95	8	8.4	0	0	6	6.3	13	13.7	27	28.4
Total	26	11.4	6	2.6	13	5.7	23	10	68	29.8

Table (6). Serotyping of *E. coli* strains isolated from different poultry samples:

No.	*E. coli* serogroups	Chicken		Ducks	
		No.	%	No.	%
1	O44	32	9.3%	9	6%
2	O158	27	7.8%	12	8%
3	O114	23	6.7%	7	4.7%
4	O91	20	5.8%	6	4%
5	O111	20	5.8%	6	4%
6	O125	19	5.5%	11	7.3%
7	O103	19	5.5%	12	8%
8	O142	18	5.2%	3	2%
9	O26	15	4.3%	3	2%
10	O78	18	5.2%	5	3.3%
11	O127	11	3.2%	2	1.3%
12	O164	9	2.6%	2	1.3%
13	O86	5	1.4%	0	0
14	O119	7	2%	3	2%
15	O118	4	1.1%	1	0.7%
16	O145	4	1.1%	2	1.3%
17	O157	1	0.3%	0	0
18	O126	3	0.9%	0	0
19	O55	2	0.6%	0	0
20	O57	1	0.3%	0	0
21	O6	1	0.3%	0	0
22	O148	2	0.6%	0	0
23	O18	1	0.3%	0	0
24	O8	1	0.3%	0	0
	Typable	263	76.2 %	84	56%
	Untypable	82	23.8 %	66	44%
	Total No	345	100%	150	100%

Discussion

The results presented in this work, showed that ***E. coli*** isolates obtained in the highest rate from chickens showing symptoms of colisepticaemia, indicating the role of the organism as potentially important avian pathogen in Egypt. These findings agreed with those obtained by **Khalid (1990); Yun *et al.* (1997)**; **Mukhopadhyaya and Mishra (1992)** and **Sripoernomo *et al.*, (1992).**

E. coli was isolated from (43.1%) in chickens and (27.2%) in ducks. Almost similar percentages (47.3%) in chickens were reported by **Ramaswamy *et al.* (1982) and Barbour *et al.* (1985),** who isolated ***E. coli*** from (40.4%) of samples from colisepticaemia chickens.

On the other hand, higher incidence (81.46%) was published by **Prukner (1986)** and an incidence of (88.2%) was mentioned by **El-Sukhon *et al*. (2002).** On the other side, lower incidence (34.3%) was reported by **Sripoernomo *et al.* (1992)**.

The variations in the prevalence rates of ***E. coli*** in cases of diarrhoea and septicaemia may be due to the difference in the pathogenicity, virulence of the strains, the severity of the cases and the immunological status of the host.

Even in the present work, the incidence of ***E. coli*** varied according to the age. In one day old chicks it was (24%), while in over one week old chicks it was (75%). However, such wide difference was not observed in ducks, as the corresponding rates were (25.5%) and (29.8%), respectively.

Avian colibacillosis is a complex syndrome characterized by multiple organ lesions with airsacculitis and associated pericarditis, perihepatitis and peritonitis being most typical

(Ewers *et al*., 2003). From the results presented in this work, it is evident that ***E. coli*** was isolated from different organs, namely liver, lung, heart, yolk sac and bone marrow. Similar findings were reported by **Hassanain (1977)** and **Mukhopadhyaya and Mishra (1992),** who isolated ***E. coli*** from liver, lung, kidneys and yolk materials.

The species of ***E. coli*** are serologically divided in serogroups and serotypes on basis of their antigenic composition (somatic or O antigens for serogroups and flagella or H antigens for serotypes). Many strains express a third class of antigens (capsular or K antigens) (**Compos *et al.*, 2004).** More than 1000 ***E. coli*** serotypes have been reported but only small percentages have been implicated in poultry diseases **(Cloud *et al.*, 1985).**

Epidemiological tracing of ***E. coli*** strains is of considerable importance in veterinary microbiology. The data can be used to monitor trends in the occurrence of pathogenic strains or to identify possible source of infection. Multiple serogroups are associated with disease, especially O1, O2 and O78 among many others **(Dziva and Stevens, 2008).**

In the present study, 263 out of 345 ***E. coli*** isolates recovered from chickens could be serotyped in 24 O groups and 84 out of 150 ***E. coli*** isolates recovered from ducks were found to belong to 15 O groups.

The predominant serogroups in poultry were O 44 (9.3%), O158 (7.8%), O114 (6.7 %) and O91 (5.8%). Ducks revealed the predominance of O158 (8%) and O44 (6%), These results go hand to hand with the previous studies of **Suwanichkul and Panigrahy (1988), Gross (1991) and Bosch *et al.* (1993**), who reported that serogroups O44, O158, O114 and O91 were traditionally associated with colibacillosis in poultry.

Other serogroups were identified in this investigation as O26, O142 and O126 from chickens suffer from septicemia. These serogroups are not common in chickens and ducks but may be transmitted from other animals to chickens raised near to these animals. So raising chickens and ducks far from other animals' farms was important to prevent transmission of ***E. coli*** isolates between them.

The percentage of untypable ***E. coli*** strains was (23.8% in chickens and 44% in ducks). This nearly agreed with studies of **Kim and Namgoon (1987) and Allan *et al.* (1993),** who found that the high percentage of untypable ***E. coli*** strains was common characteristics of all groups of ***E. coli*** obtained from avian colibacillosis regardless of geographic location.

Indeed little number of *E. coli* serovars was detected in the present study and this may be accredited to the diminutive accessible serovars and it is possible that if there had been a wider range of diagnostic sera, more of the strains of *E. coli* isolates could have been typed. But on the other hand, our results concerning the serogroups of *E. coli* was confirmed to a great extent with that mentioned by **Tamaki *et al.* (2005)** ,who said that serogrouping-based diagnosis of *E. coli* should be restricted to those serogroups that are most likely to be associated with virulent strains such as (O119, O111, O26, etc).

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دراسة عن عوامل الضراوة للميكروب القولونى المعزول من الطيور

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الملخص العربي

لقد تم تجميع ٨٠٠ من الدجاج و ٥٥٠ من البط أظهرت أعراض المرض القولوني من اماكن مختلفة من المحافظات وعند فحصها كان الايجابي للدجاج (٤٣.١%) والبط (٢٧.٢%) وقد سجلت أعلي نسبة في الدجاج المصاحبة لميكروب القولوني في محافظة القاهرة (٥٨.٧%) يليها الفيوم(٣٨%) يليها الأسكندرية (٣٠%) واخيرا الشرقية (٢٣.٥%) اما بالنسبة للبط فقد سجلت أعلي نسبة في محافظة الفيوم (٣٥%) يليها القاهرة (٢٧.٢%) يليها الشرقية (٢٤.٤%) واخيراً الاسكندرية (٢١.٤%).

كانت نسبة عزل الميكروب القولوني عند عمر يوم واحد للدجاج المصاب (٢٨.٧%) وللدجاج الميت المصاب(١٥.٥%) بينما نسبة الميكروب القولوني عند عمر اكبر من أسبوع للدجاج المصاب (٨٠.٥%) والدجاج الميت المصاب(٦٢.٢%) أما بالنسبة للميكروب القولوني عند عمر يوم واحد للبط المصاب كان (٢٦.٨%) وللبط الميت المصاب كانت (٢٣.٨%) بينما نسبة الميكروب القولوني عن عمر اكبر من أسبوع للبط المصاب كانت (٣٠.٨%) والبط الميت المصاب كانت(٢٨.٤%).

أوضح التصنيف السيرولوجي للميكروب القولوني الذي تم عزله من اعضاء مختلفة من الدجاج(٣٤٥) تم تصنيف (٢٦٣) منها إلى ٢٤ مجموعة سيرولوجيه بينما تم تصنيف ٨٤ عترة من الـ(١٥٠)عترة المعزولة من البط إلى١٥ مجموعة سيرولوجية.