

## Prevalence and Serotyping of *E. Coli* Isolated from Broiler Chickens at Ismailia Governorate

Mohamed E. Enany<sup>1</sup>, Basma Abdullah Mohamed<sup>2</sup>, Samah Eid<sup>3</sup>, and Marwa E. Abo Hashem<sup>1</sup>

<sup>1</sup>Bacteriology, Immunology and Mycology Department, Faculty of Veterinary Medicine, Suez Canal University.

[enanyeg@yahoo.com](mailto:enanyeg@yahoo.com)

[drvet42@yahoo.com](mailto:drvet42@yahoo.com)

<sup>2</sup>Directorate of V Veterinary Medicine, Fayoum, Egypt

[drbasmaabdallah84@gmail.com](mailto:drbasmaabdallah84@gmail.com) .

<sup>3</sup>National Laboratory for Veterinary Quality Control on Poultry Production, Animal Health Research Institute, Dokki, Egypt. [samaheid@ymail.com](mailto:samaheid@ymail.com)

\*Corresponding author: Basma Abdullah Mohamed Email:

[drbasmaabdallah84@gmail.com](mailto:drbasmaabdallah84@gmail.com)

### Abstract

Colibacillosis is one of major problems in poultry houses caused by avian pathogenic *Escherichia coli* (APEC) which is the main cause of high morbidity and mortality rate in poultry houses lead to high economic losses. The present study was established to investigate the incidence of *Escherichia coli* (*E. coli*) infection in broiler birds suffered from yellowish colored droppings, diarrhea, and soiled vent openings with or without septicemia signs. Aseptically, 200 samples were collected from the internal organs of diseased broiler chickens (liver, Heart, spleen and yolk) at different farms in Ismailia governorate, 70 samples were *E. coli* positive with 35% prevalence rate. The high prevalence of *E. coli* was recovered from yolk (40%), followed by liver (37.5%), heart (33.33%) and spleen (25%), respectively. Serological test was used to identify ten *E. coli* isolates as slide agglutination test. The most predominant serotype was O44 (20%), O157 (20%), O119 (10%), O128 (10%), O78 (10%), O164 (10%), O145 (10%), O55 (10%).

**Key words:** *E. coli*, prevalence, serotypes, broiler chickens

### Introduction

A member of the Enterobacteriaceae family, *Escherichia coli* is a Gram-negative rod bacterium that often exists in the intestines of many organisms.

Extra-intestinal associated *E. coli* (APEC)-related diseases in poultry are a major source of extremely economic losses. Cellulitis, omphalitis, colibacillosis, airsacculitis, and salpingitis are

among the clinical symptoms that have been related to APEC which associated with diseases of production birds, such as broilers, layers, turkeys, geese, etc (*Maluta et al, 2016*). Certain bacteria can be identified from infections of the yolk sac in chicks in different locations around the world such as *Enterobacter* spp., *Proteus* spp., *Pseudomonas* spp., *Klebsiella* spp., *Staphylococcus* spp., *Streptococcus* spp., *Clostridium* spp., *Bacillus cereus* and *Enterococcus* spp. The most frequent isolated bacteria from omphalitis were *E. coli* (*Ulmer Franco, 2011*).

The classification of different serotypes of *E. coli* was according to three antigenic structures: the somatic antigen (O), flagellar antigen (H) and capsular antigen (K). O antigen is the most important antigen due to when cell lysis the portion of lipopolysaccharide (endotoxin) released (*Barnes et al., 2008*).

#### **Aim of work**

Isolation of *E. coli* from diseased broilers and serological identification of isolates.

#### **Material and Methods**

##### **Samples**

200 samples were collected aseptically from internal organs (liver, Heart, spleen and yolk) of freshly dead diseased broiler chickens suffered from yellowish colored droppings, diarrhea, and soiled vent openings with or without septicemia signs from

different farms in Ismailia government as shown in Table (1)

##### **Isolation of E. coli**

Briefly, the isolation of *E. coli* was carried out in accordance with *Collee et al (1996)*; the samples were pre-enriched in buffered peptone water (Lab M) and cultured aerobically for 24 hours at 37°C. Following culture on selective media such as eosin methylene blue agar (HI media) and MacConkey agar (HI media), *E. coli* develops into pink colonies on MacConkey media and a green metallic sheen on EMB medium. Under a microscope, it is Gram-ve rods.

##### **Biochemical reactions**

Biochemical identification was performed according to *Holt et al (1993) and Swayne et al (1998)* for the following tests: lactose fermentation, indole, methyl red, oxidase, urea hydrolysis, Voges-Proskauer, citrate utilization, H<sub>2</sub>S production. *E. coli* isolates exhibited methyl red positive, lactose fermentation, and indole fermentation. For oxidase, urea hydrolysis, Voges-Proskauer, citrate utilisation, and hydrogen sulphide production, the tested isolates were negative.

##### **Serological identification of E. coli strains**

In accordance with *Quinn et al (2002)*, serological identification was carried out using O polyvalent sera and corresponding monovalent for serogrouping of *E. coli* strains based on somatic (O) antigen and flagellar (H) antigen (sifin diagnostic gmbh).

**Table (1):** Different types and numbers of samples collected from organs of diseased broiler chickens.

Source	Organs	No. of tested samples
Diseased broiler chickens	liver	80
	heart	30
	spleen	40
	yolk	50
<b>Total</b>		200

**Results**

**The prevalence of isolated E. coli**

*E. coli* identified from broiler chickens had a 35% prevalence rate (70 out of 200). Each chick's internal organs were examined bacteriologically to determine the prevalence of *E. coli* in each organ. According to table (2) and Figure (1) *E. coli* was found in the following internal organs: the yolk (20/50: 40%), liver (30/80: 37.5%), heart (10/30: 33.33%), and spleen (10/40: 25%).

**The serological identification of isolated E. coli**

The serological examination of 10 *E. coli* isolates resulted in detection of different serogroups including O44, O157, O119, O128, O78, O164, O145 and O55 by percentage of 20%, 20%, 10%, 10%, 10%, 10%, 10% and 10 %, respectively as shown in Table (3) and Figure (2). The most prevalent serotypes were O157 and O44.

**Table (2):** Total prevalence of *E. coli* isolated from different organs of diseased broiler chickens

Source	Types of samples	No. of tested samples	<i>E. coli</i>		Negative samples	
			No.	%	No.	%
Organs of diseased broiler chickens	Liver	80	30	37.5	50	62.5
	Heart	30	10	33.33	20	66.66
	Spleen	40	10	25	30	75
	yolk	50	20	40	30	60
Total	Total	200	70	35	130	65

**Table (3):** Serotyping of selected *E. coli* strains isolated from organs of diseased broiler chickens (n=10)

<i>E. coli</i> serogroup	No. (%)
O119	1 (10)
O44	2 (20)
O128	1 (10)
O78	1 (10)
O145	1 (10)
O164	1 (10)
O157	2 (20)
O55	1 (10)

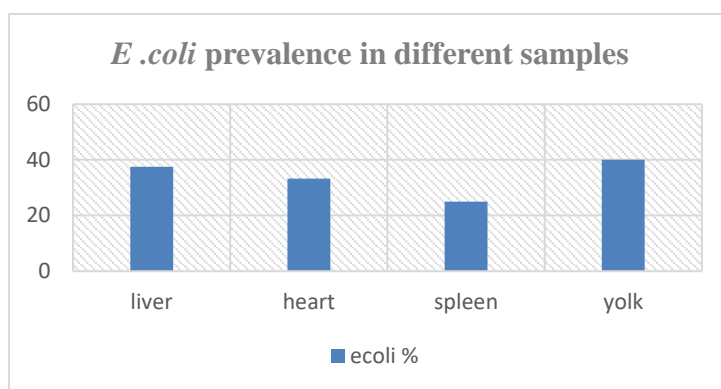


Fig. (1): Total prevalence of *E. coli* isolated from different organs of diseased broiler chickens.

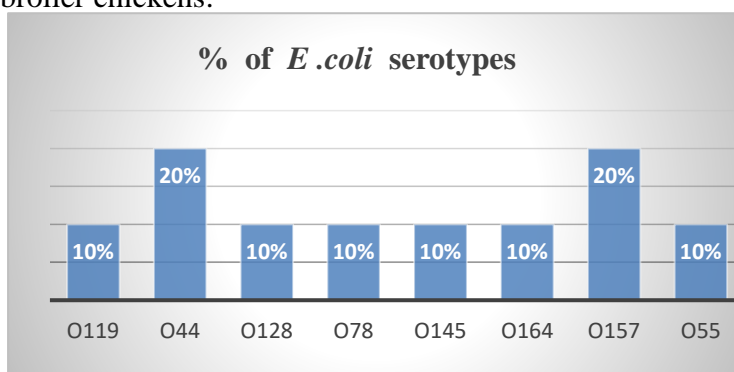


Fig (2): Serotyping of selected *E. coli* strains isolated from organs of diseased broiler chickens.

## Discussion

One of the most serious diseases affecting broiler chickens is avian colibacillosis, which results in high morbidity and mortality rates among layers, broilers and chicks as well as a high economic loss (*Paixão et al., 2016*). Septicemia with high mortality rates among poultry farm are signs characterized a cute form of avian colibacillosis while sub-acute form characterized by different lesions as airsacculitis, pericarditis, perihepatitis and peritonitis (*Younis et al., 2017*).

This study investigated the prevalence of avian colibacillosis in broiler chickens. The findings showed that 70 *E. coli* isolates were recovered from 200 diseased broiler chickens, indicating a 35% prevalence rate of *E. coli*. These findings were comparable to those of *Amer et al (2018)*, who also found 35% prevalence in diseased broiler chickens. Other results that were almost identical were reported by *Ibrahim et al (2019)*, *Saad et al (2019)* and *Abd El Tawab et al (2017)* with percentages of **34%, 32.5% and 32%, respectively**. This finding was less than those previously described by *Nouran et al (2023)*, *Enany et al (2019)*, *Awad et al (2020)*, *Rekaz et al (2019)* and *Reem et al. (2024)* by percentages of **56%, 50%, 50.44%, 51.85% and 53%, respectively** but higher than those recorded by *El Seedy et al (2019)* and *Radwan et al (2020)* by **22.9%**

**and 26.7%**, respectively. In present study the prevalence of *E. coli* from different organs showed that the yolk was the highest organ then liver then heart and finally spleen this results disagreed with *Saad et al (2019)* they recorded the liver was the highest organ for isolation then heart then spleen and finally lung and with *Abd El- Tawab et al (2017)* they reported that the first organ of isolation was liver then yolk then spleen then heart and caecum then lung and finally Cloacal swab.

The serotypes isolated in this study were O119, O44, O128, O78, O145, O164, O157 and O55 and the most predominant serotypes were O44 and O157 this finding agreed with *Amer et al (2015)* they found O44, O125 and O114 were the most prevalent serogroups then O78, O86, O158, O127, O91, O25 and O119 also *Awad et al (2020)* found the most prevalent serotypes were O115, O142, O158, O55, O125, O114, O27, O20, and O15. Other matched results were reported by *Nagwa et al (2022)* found that O157, O142, O26 were the most predominant serotypes and *Reham et al (2021)* reported that O78, O26, O44, O55, O157, and O127 were the most predominant serotype but *Pratik et al (2020)* found that the most predominant serotype was O83 followed by O88, O8, O35, O119 and O149 and *Gamb et al (2022)* reported that most

predominant serotype were O2 and O88 and O78 while *Abdelaziz et al(2022)* reported that the most common serotype was O78, then O91 , O1 , O128 , O2 , O146 , O55 , O26 , O127, O159 and O17.

### Conclusion

*E. coli* was isolated from different organs of diseased broilers with 35% prevalence rate and the highly incidence of *E. coli* was found in yolk, liver, heart and spleen, respectively. The most predominant serotypes were O157 and O44 then O119, O128, O78, O164, O145and O55. So, colibacillosis is considering the major problem affecting poultry industry leading to high economic losses.

### Conflict of interest

There are no conflicts of interest for the authors.

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## مدى انتشار والتعرف السيرولوجي للميكروب القولوني المعزول من بداري التسمين

محمد السيد عناني<sup>1</sup> ، بسمة عبدالله محمد<sup>2</sup> ، سماح عيد<sup>3</sup>، مروة السيد حسن ابو هاشم<sup>1</sup>  
<sup>1</sup>قسم البكتيريا و المناعة و الفطريات كلية الطب البيطري جامعة قناة السويس  
<sup>2</sup>مديرية الطب البيطري بمحافظة الفيوم  
<sup>3</sup>المعمل المرجعي للرقابة البيطرية على النتاج الداجنى الدقى (معهد بحوث صحة الحيوان)

### الملخص العربية

تعد بكتيريا الإشريكية القولونية من المشاكل الرئيسية في مزارع الدواجن والتي تسببها البكتيريا المسببة لمرض الطيور الإشريكية القولونية (APEC) والتي تعد السبب الرئيسي لارتفاع معدل الإصابة والوفيات في مزارع الدواجن مما يؤدي إلى خسائر اقتصادية عالية. أجريت هذه الدراسة للتحقيق في حدوث عدوى الإشريكية القولونية (*E. coli*) في طيور دجاج التسمين التي تعاني من براز أصفر اللون وإسهال مع أو بدون علامات تسمم بالدم. تم جمع 200 عينة معقمة من الأعضاء الداخلية لدجاج التسمين المصاب (الكبد والقلب والطحال وصفار البيض) في مزارع مختلفة بمحافظة الإسماعيلية، كانت 70 عينة إيجابية للإشريكية القولونية بمعدل عزل 35%. تم عزل نسبة عالية من الإشريكية القولونية من الصفار (40%)، يليه الكبد (37.5%)، والقلب (33.33%) والطحال (25%) على التوالي. تم التعرف مصليا على عشر عزلات من الإشريكية القولونية كاختبار تراس الشرائح. كان النمط المصلي الأكثر انتشارًا هو O44 بنسبة 20% و O157 بنسبة 20% ثم O119 بنسبة 10%، O128 بنسبة 10%، O78 بنسبة 10%، O164 بنسبة 10%، O145 بنسبة 10% ثم أخيرا O55 بنسبة 10% على التوالي.