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Salmonella is a Food-Borne Bacterial Infection Related to Poultry Products in Tobruk, Libya

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السالمونيلا كعدوى بكتيرية منقولة بالغذاء مرتبطة بمنتجات الدواجن في مدينة طبرق، ليبيا

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Abstract

Six samples of poultry meat and twenty-four samples of poultry eggs were among the thirty samples of poultry items that were gathered from stores and farms in the Tobruk region. Twelve of these were farm hen eggs, and the remaining twelve were commercial eggs. Salmonella spp. were detected in the poultry meat using horizontal methods of examination. In food, 225 milliliters of buffered peptone water and 25 grams of chicken meat were combined overnight. Following liquid media, the eggs were streaked on XLD and Hekton entric agar for examination, and the remaining 26 eggs were also streaked on the same medium. While the findings of the chicken eggs indicated the growth of two salmonellae and validated the growth of Salmonella spp., the results of the chicken meat revealed no growth. The two growth farms that produced the two Salmonella spp. growths used thirty samples (2/30) to represent (6.67%) and the remaining twenty samples (93.33%) to represent samples. The current study's objectives are to determine whether Salmonella is present in poultry products in Tobruk and to identify the tools and techniques used to detect the pathogen.

Keywords: Salmonella, poultry products, eggs and Tobruk-Libya.

الملخص

تم جمع ثلاثين عينة من منتجات الدواجن من المتاجر والمزارع في منطقة طبرق، تضمنت ست عينات من لحوم الدواجن وأربعًا وعشرين عينة من بيض الدواجن. من بين هذه العينات كان هناك اثنا عشر بيضًا من مزارع الدجاج، في حين كانت العينات الاثنا عشر الأخرى من البيض التجاري. تم الكشف عن بكتيريا Salmonella spp. في لحوم الدواجن باستخدام طرق فحص أفقية. حيث تم خلط 225 مل من ماء البيبتون المعزز مع 25 غرامًا من لحم الدجاج طوال الليل. بعد ذلك، تم تلقيح العينات على أوساط زراعية سائلة، ثم خُطّت عينات البيض على أطباق آغار XLD و Hekton enteric للفحص، كما خُطّت العينات المتبقية البالغ عددها 26 بيضة على الوسط ذاته. أظهرت نتائج فحص بيض الدجاج نمو سلالتين من السالمونيلا، مما أكد وجود Salmonella spp.، بينما لم تُظهر نتائج فحص لحوم الدجاج أي نمو. وقد مثّلت العينتان الإيجابيتان من أصل ثلاثين عينة (30/2) نسبة 6.67%، في حين مثلت العينات السلبية نسبة 93.33%. وتهدف الدراسة الحالية إلى التحقق من وجود بكتيريا السالمونيلا في منتجات الدواجن في مدينة طبرق، والتعرف على الأدوات والتقنيات المستخدمة في الكشف عن هذا الممرض.

الكلمات الدالة: السالمونيلا، منتجات الدواجن، البيض، طبرق – ليبيا.

Introduction

A genus of gram-negative, rod-shaped (bacillus) bacteria belonging to the Enterobacteriaceae family is called Salmonella. Salmonella enterica and Salmonella bongori are the two species of the bacterium. There are six subspecies within the type species, S. enterica. (1,2)

Salmonella was given its name in honor of American veterinary physician Daniel Elmer Salmon (1850–1914). Certain types of salmonella do not generate spores. Enterobacteria that are mostly motile, having cell lengths of 2 to 5 µm, diameters of roughly 0.7 to 1.5 µm, and peritrichous flagella (all around the cell body). (3)

Salmonella is a member of the Enterobacteriacea family of bacteria. There is a chance that its new taxonomy will cause confusion. *S. bongori* and *S. enterica* are the two species in the genus; the latter is further subdivided into six subspecies: *S. e. salamae, S. e. arizonae, S. e. diarizonae, S. e. houtenae, and S. e. indica.* (4,5)

More than 2500 serotypes, or serovars, are found in this taxonomic group. These are characterized by the somatic O (lipopolysaccharide) and flagellar H antigens (the Kauffman White classification). An abbreviation for a serotype's complete name is *Salmonella Typhimurium*, although it can also be written as *Salmonella enterica* subsp. enterica serotype Typhimurium. Antibiotic sensitivity testing, along with other molecular biology techniques like pulsed-field gel electrophoresis and, increasingly, whole genome sequencing, can help differentiate bacteria further for use in clinical and epidemiological investigations. Based on host choice and human illness symptoms, salmonellae have historically been clinically classified as invasive (typhoidal) or noninvasive (non-typhoidal salmonellae). (6,7)

Karl Eberth discovered salmonella in the spleen and Peyer's patches of typhoid patients in 1880. (8) Georg Theodor Gaffky successfully cultivated the pathogen in pure culture four years later. (9)

The following year, Theobald Smith, a medical researcher, made the discovery that would subsequently be identified as *Salmonella enterica (var. Choleraesuis)*. Smith was employed by the US Department of Agriculture's Veterinary Division at the time as a research laboratory assistant. Veterinary pathologist Daniel Elmer Salmon was in charge of the division. (10)

Combining cells with antibodies against a specific antigen is the process of serotyping. It may provide some sense of danger. According to a 2014 study, S. reading is highly prevalent in samples of young turkeys but does not significantly contribute to salmonellosis in humans. (11)

When Salmonella subspecies are grown on ferrous sulfate-containing media, as that employed in the triple sugar iron test, they generate hydrogen sulfide (12), which is easily recognized. There are two phases to most isolates: a motile phase and a non-motile phase. Using a Craigie tube or ditch plate, cultures that are non-motile during primary culture can be transitioned to the motile phase. (13)

Method and Material

Study Population

Thirty samples of poultry were obtained, three from commercial and three from balady, in order to identify the presence of salmonella spp. in 24 farm eggs from two different varieties of chicken and 6 frozen poultry meat samples.

Sample Collection

24 samples were collected from 2 types of fresh poultry eggs by sterile swabs in Tobruk Provence in May 2022 and two types of poultry meat, frozen in row 4, two balady and two commercial, also frozen ready to eat or frozen ripening.

Processing of a Sample

One of their horizontal methods involves first suspending 10g of chicken meat in 900ml of buffered peptone water and letting it sit at 37° for the entire night. Next, they add 0.1ml of the suspension to 10ml of RVS broth and 10ml of MKTT broth, both of which are kept at 37°. Finally, they streak in both media—XLD agar and Hekton Enteric agar—and conduct additional testing and evaluations. Finally, they analyze and take swabs from fresh chicken eggs and incubating them overnight at 37°.

Result:

This study's objectives were to evaluate poultry infections with Salmonella spp. and to elucidate the tools and techniques used to identify and isolate these bacteria. This investigation includes four sources of poultry products: as table 1 illustrates, swabs from little balady hen eggs, large white balady hen eggs, and raw frozen poultry meat that is ready to eat. Furthermore, the percentages of ready-to-eat (10%), little (40%) and large (40%) balady hen eggs, as well as raw frozen poultry meat (10%) are displayed in Figure 1. Table (2) indicates that there were six

(20%) specimens of poultry meat and twenty-four (80%) specimens of poultry egg swabs. In our investigation, no Salmonella isolates were found in poultry flesh. Salmonella was isolated and confirmed to be growing in chicken eggs. Table displays two specimens out of 24 (8.33%). (3). Two specimens had positive results in their flesh, displaying proliferation of Salmonella from all specimens (2/30; 6.67%) displayed in Fig 3. One of the two varieties of eggs from deceased birds that exhibit visceral wrath is one of the samples from poultry products.

Table 1 shows the different types of poultry samples.

Sample	Frequency	Percent
- Row frozen poultry meat.	3	10%
- Refrozen ready to eat poultry meat.	3	10%
- Swabs from red small balady eggs.	12	40%
- Swabs from white large balady eggs.	12	40%

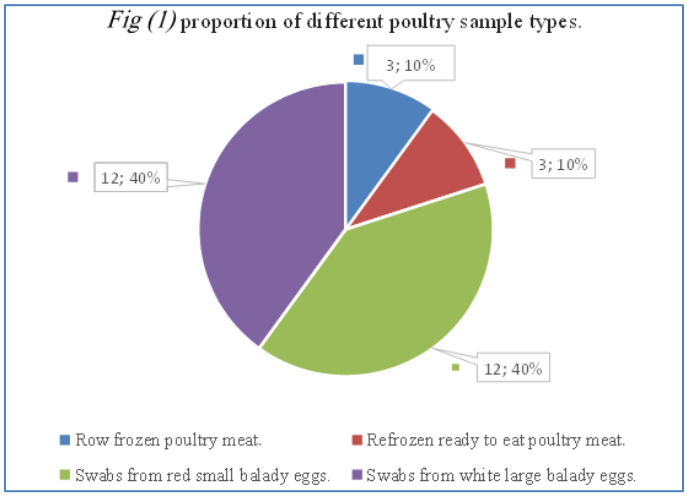


Table 2: specimen types and percentages.

Sample	Frequency	Percent
- Poultry meat.	6	20%
- Poultry egg swab.	24	80%

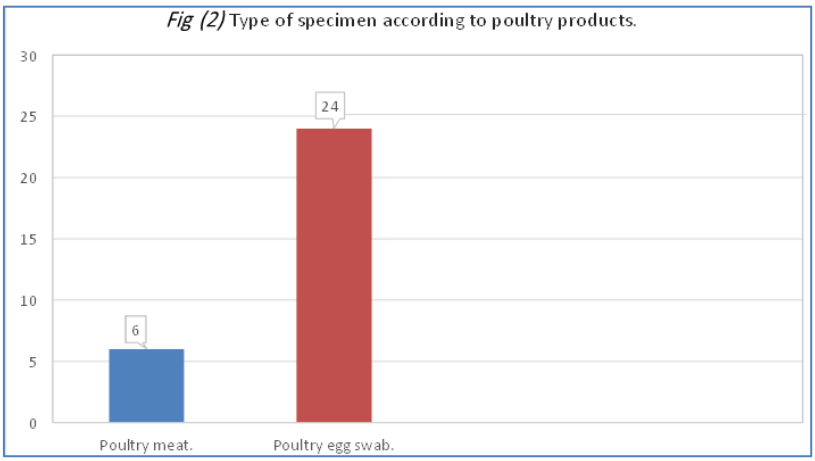


Table 3 shows the quantity of isolates of salmonella found in specimens.

Type	No. of type	No. of isolation	Percent
- Poultry meat.	6	0	20%
- Poultry eggs.	24	2	80%

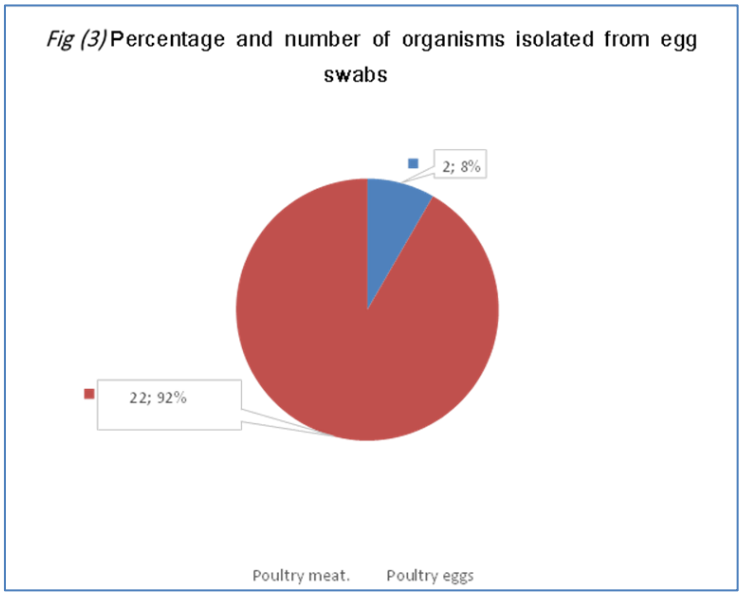
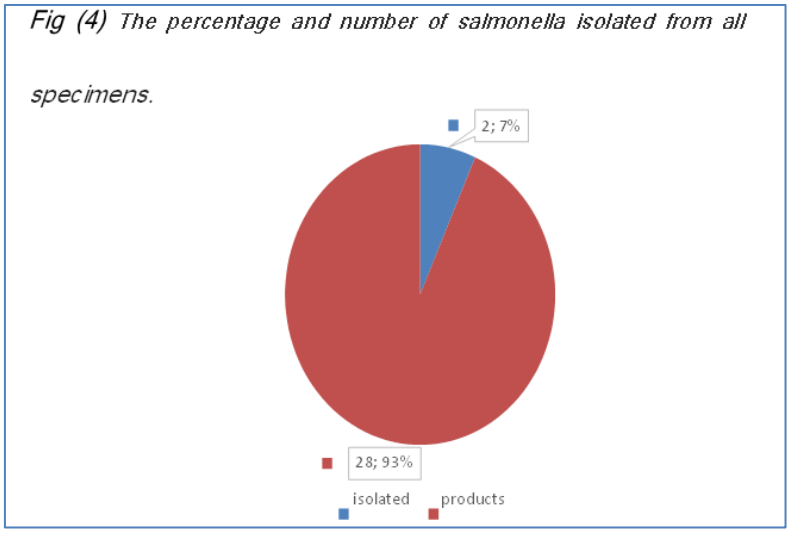


Table (4) shows the total number of salmonella isolated from all specimens.

	All specimens	Isolated	Percent
- Poultry products.	30	2	6.67%



Discussions

in poultry flocks near Tehran, and to determine the most common serogroups and serotypes implicated. Twenty-eight samples (n = 1463) were randomly collected from pullet, layer, and broiler flocks, including freshly dropped feces from live birds and visceral organs from dead birds. In most flocks, sixty samples were collected, with ten fecal samples pooled from each. Standard methods were used to culture Salmonella spp. Isolation slide agglutination and tube agglutination tests were performed using salmonella somatic O poly AS antisera and various somatic O monovalent or flagellar H monovalent antisera. Out of 1,463 samples, 31 isolates of Salmonella were recovered; these findings are consistent with our study. (14)

Food safety and the prevention of salmonellosis are closely related. Accordingly, a study was carried out in Egypt to ascertain the incidence of Salmonella in 300 hen's eggs (backyard and commercial), or 150 eggs each, that were randomly selected from Assiut city. One sample is represented by each five eggs. Using S.S. to identify *S. enteritidis* on S.S. agar, 6.67%, 13.33%, and 3.33%, 10% of *S. arizona* and *S. enteritidis* were isolated from the shell of a Baldy egg. Additional Salmonella species found were *S. kentucky*, *S. anatum*, and *S. typhimurium*. This study tested the antibiotic susceptibility of *S. arizona* and *S. enteritidis*. The study examined antibiotic resistance

in relation to nine different antibiotics: Novobiocin (NV30, 30mg), Neomycin (Neo, 30mcg), Eryton (CIN, 15mcg), Ciprofloxacin (Cip, 5mcg), Cloxacillin (CX1, 1mcg), Doxveto (Dov, 30g), Lincomycin (L2, 2mcg), and Cephradine (CE30, 5mg). The findings showed that while S. arizona and *S. enteritidis* were resistant to the remaining antibiotics, they were responsive to Doxveto (Dov, 30 g) and Novobiocin (NV30, 30 mg). The purpose of this study was to determine how S. arizona and S. enteritidis fared in hens' eggs at various temperatures. According to the findings, *S. enteritidis* was only discovered in the third week of inoculation eggs with test organisms kept at 4 C, whereas S. arizona was discovered until the fifth week. Following a 10- to 15-minute immersion of the infected eggs containing the test organisms in boiling water, the eggs were chilled and analyzed; the findings showed that *S. arizona* and *S. enteritidis* had been completely destroyed. We could draw the conclusion that eggs need to be cooked for at least 10 minutes and that they should always be kept in the refrigerator. The significance of *S. arizona* and *S. enteritidis* for the economy and public health, as they have an impact on human health through egg intake (15)

An additional study involved the collection of 100 samples of meat and poultry goods, comprising 50 samples of meat products and 50 samples of poultry products, from stores and supermarkets throughout the Aswan governorate. In order to identify the serotypes and antigenic structures of Salmonella isolates found in meat and poultry products, as well as to investigate the relationship between serotypes and meat type, samples were gathered. Salmonella was isolated using standard techniques, and the slide agglutination method, which uses antisera specific for Salmonella, was used to serotype Salmonella isolates. The results showed that 26% (13/50) of the samples were positive, while 6% (3/50) of the samples from poultry were positive. The isolates of Salmonella that were found to have different serotypes were *Salmonella enteritidis* 6.25% (1/16), *Salmonella Newlandd* 18.75% (3/16), *Salmonella Kentucky* 12.5% (2/16), *Salmonella Heifaaa* 6.25% (1/16), *Salmonella Bronnn* 6.25% (1/16), *Salmonella Rissensss* 12.5% (2/16*), Salmonella Fortunee* 12.5% (2/16), *Salmonella Agona* 6.25% (1/16), *Salmonella Hessarek* 6.25% (1/16), *Salmonella Hoboken* 6.25% (1/16), and *Salmonella veneziana* 6.25% (1/16). Pathogenic Salmonella was found in meat and poultry products; the most common isolates were *Salmonella enteritidis*, *Salmonella heifa, Salmonella bron*, *Salmonella agona*, *Salmonella hessarek, Salmonella hoboken*, and *Salmonella veneziana*. The most common serotypes were *Salmonella Newlandd, Salmonella rissens, Salmonella fortune*, and *Salmonella Kentucky*. The findings indicated that sheeshtawook, liver gizzard, and minced beef kofta were more contaminated with Salmonellae. Meat and poultry products are thought to be a significant source of high-risk serotypes of Salmonella that are harmful to humans, hence precautionary steps should be taken to prevent Salmonella contamination of these foods. (16)

Conclusion

Poultry suffers large financial losses due to salmonella illnesses in many different countries and areas. The production center had to continuously undertake thorough risk reduction practices due to the zoonotic infection. The majority of salmonella species that causes infection are caused by *Salmonella enteritidis.*

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