Bacterial contamination of table eggs in Babylon, Iraq

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Summary

To study the bacterial contamination of table eggs in Babylon city, a total of 214 eggs collected from different sources, including 100 from farms and 114 from supermarkets, all samples were cultured for the bacteria on Salmonella Shigella Agar(SS Agar) and nutrient agar. The results of the farms samples showed that there are no growth of bacteria in all samples under study whereas the results of supermarkets samples showed that about 21.05% of supermarkets eggs were contaminated with bacterial strains, and the results showed the presence of *Stahylococcus aureus* in 10.52% of the samples, *Pseudomonas aeruginosa* in 7.89%, a *Proteus mirabilis* in 3.50%, *S. epidermidis* in 0.87% and *Bacillus subtilis* in 0.87%. Also, the antibiotic sensitivity tests were tested for all isolates and the result showed that the sensitivity was 100% for ciprofloxacin, 85.18% for gentamicin, 85.18% for Amikacin, 59.25% for rifampin, 48.14% for cefotaxime, 44.44% for chloramphenicol, 28.5% for clarithromycin and 0 % for cephalexin. The results showed there was not *Salmonella spp.* strains in all eggs samples so that present work tried to check the presence of *Salmonella spp* in farm chickens in farms, 213 chicken stool samples were collected from four farms, the samples were cultured on SS Agar, the results showed presence of *Salmonella spp*. in 10.37% of stool samples and the antibiotic sensitivity tested, also,the result showed that the sensitivity was 63.6% for ciprofloxacin, 86.36% for gentamicin, 86.36% for amikacin, 36.36% for rifampin, 27.27% for cefotaxime, 4.54% for chloramphenicol and 0% for cephalexin. The results indicated that there were 90% of the isolate of *Salmonella spp*. isolate have Multi-drug resistance phenomenon.

Keywords: **Table eggs**, ***Salmonella*, antibiotic sensitivity.**

Introduction

Food of animal origin, meat and eggs are considered as the most common cause of food infection. Contaminated eggs and their products are increasing the risks of illness in humans. Salmonelosis which is an infectious disease associated with contaminated eggs, *Salmonella spp.* may be found inside the eggs and, if eaten row or not well cooked, it can cause illness. In the United States of America, an estimated 1.4 million non-typhoidal *Salmonella* infections, resulting in 580 deaths annually. In recent years problems related to *Salmonella* have increased significantly. Strains of *Salmonella* which are resistant to a range of antimicrobials, including first-choice agents for the treatment of humans, have emerged and are threatening to become a serious public health problem. Multi-drug resistance to critically important antimicrobials is compounding the problems (1).

Many researchers study the bacterial contamination of table eggs. In the Caribbean countries, bacteria isolated from table eggs were correlated to human illness (2). Sabarin - ath(3) try to evaluate the bacterial contamination in Grenada in West Indies the results showed the presence of many type of pathogenic bacteria in table eggs. In Poland a study (4) found many types of pathogenic bacteria in table eggs. The present study aims to estimate the contamination of table eggs in Babylon city, in Iraq.

Materials and Methods

The eggs samples were collected from 10 October to 15 December, 2012 from different locations including, 100 eggs from four farms in Babylon city, namely Al - Fayhaa No.1, Al-Fayhaa No. 2, Al-Nile and Al- Sharif for chicken hindered and forteen(114) normal eggs randomly purchased from supermarkets of Babylon city. For each farm, 25 eggs were randomly collected at the day of

laying and the eggs were transported to the laboratory and cultured within 1 hour of collection. 213 stool samples were collected from the same farms by swabs and culture within 1 hour of collection.

The outer surface of the eggs was disinfected by wiping with surgical gauze soaked in 70% ethanol. Each complete egg was cracked aseptically in sterile beakers, Interior components (albumen) was tested for aerobic bacteria. The samples were cultured on SS agar and nutrient agar and incubated for 48h at 37° C. Stool samples 213 were collected from farms and cultured on SS Agar within 1hour and incubated for 48 h at 37° C. Different colonies were picked up from SS agar and nutrient agar for purification; the purified colonies were identified using routine bacteriological methods (5).

The disc diffusion method was used to check the antibiotic sensitivity of all isolates. The bacterial isolates were grown overnight in nutrient broth for activation and bacterial suspension was prepared in normal saline at 10^6 cells/ml following the McFarland tube method (6). Mueller Hinton agar plates were inoculated with microorganisms by swabs, by streaking in three different directions on the agar surface. The antibiotic discs were placed on the upper surface of the seeded plate, the plates were incubated on 37° C for 24 h. The diameters of inhibition zones were measured. The experiment was repeated twice and the mean values were taken.

Results and Discussion

The study was undertaken to evaluate the microbial quality of eggs that are sold for human consumption in Babylon city. The results showed that there is no contamination by *Salmonella spp* in all 214 eggs samples tested, however there are contamination with other pathogenic bacteria in supermarkets samples but not in farms samples, about 21.05% of supermarkets eggs were contaminated with bacterial strains. The major contaminants in supermarkets eggs samples were *Stahylococcus aureus,* followed by *Pseudomonas aeruginosa, Proteus mirabilis, S. epidermidis* and *Bacillus subtilis*.

The identified isolates are tabulated and presented in Table (1). Which shows the percentages of isolates for a given species listed for each of source of eggs collection. A total of 27 cultures belonging to 5 genera are obtained.

Table, 1: the percentages of bacterial isolates in eggs samples

Isolate	Farms eggs	Supermarkets eggs
Stahylococcus aureus	**0%**	**10.52%**
Pseudomonas aeruginosa	**0%**	**7.89%**
Proteus mirabilis	**0%**	**3.50%**
S. epidermidis	**0%**	**0.87%**
Bacillus subtilis	**0%**	**0.87%**

The results showed that there is no bacterial contamination in farms eggs, previous studies on eggs concluded that over 90% of hen's eggs are microbiologically sterile at lay (7). But the method of storage, marketing procedures may play a role of causing bad quality; many researchers suggest that the main bacterial contamination occurs within a short period after laying. Sparks(8) used electron option and appropriate microbiological techniques to study the bacterial penetration of egg shell at oviposition and demonstrated that the shell structure is vesicular within a few minutes of laying, so that there was a low incidence of experimentally penetration challenge with bacteria. The present work demonstrate that there is no contamination by *Salmonella spp.* in all 214 eggs samples from both source farms and supermarkets, Similar finding in a study on 100 eggs samples in Shahrekord, Iran was reported (9).

The five genera of bacteria found in contaminated eggs samples are *Staphylococcus aureus, Pseudomonas aeruginosa, Proteus mirabilis, S. epidermidis* and *Bacillus subtilis*. These results are in agreement with observations made in previous studies they collected 450 eggs samples from Grenada in West Indies and evaluate the microbial contamination. Their results showed the presence of *Staphylococcus, Pseudomonas, Proteus mirabilis, Bacillus* in addition to many other genera [3].

The results showed the presence of *P. aeruginosa* in 7.89% of eggs samples. The genera found in the present work also reported

to be associated with spoilage packed and processed food (10). With respect to *P. aeruginosa*, it has an ability to dissolve cuticle when humidity available that leading to higher frequency of penetration (11). Previous researcher tried to study penetration ability of many types of pathogenic bacteria to eggs shell his results showed that the *Pseudomonas aeruginosa* showed higher penetrability when tested artificially followed by *Proteus vulgaris*, *Staphylococcus aureus* and *Escherichia coli* respectively (12).

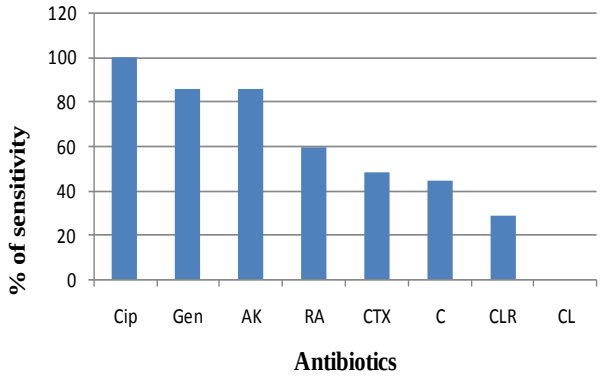
The highest bacterial contamination with *S. aureus*, results are in agreement with observations made in previous studies (13) that also his results showed that the highest ratio of contamination in eggs is with *S. aureus*

The antibiotic sensitivity were tested for all isolates and the results showed that the sensitivity is 100% for ciprofloxacin, 85.18% for gentamicin, 85.18% for Amikacin, 59.25% for rifampin, 48.14% for cefotaxime, 44.44% for chloramphenicol, 28.5% for clarithromycin and 0 % for cephalexin (figure 1).

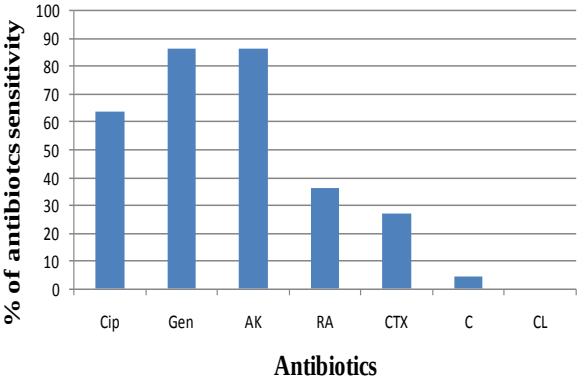
The antimicrobials most widely regarded as first choice for optimal treatment of salmonellosis is the group of fluoroquinolones and the antibiotic which is used as alternatives is chloramphenicol [1] but in the present work the sensitivity for chloramphenicol is only 4.54%. I think that is because it is old antibiotic.

The results of chicken stool samples cultures showed the presence of *Salmonella spp*. in 10.32% of stool samples. The results of the antibiotic sensitivity of these isolates showed that the sensitivity is 63.6% for ciprofloxacin, 86.36% for gentamicin, 86.36% for amikacin, 36.36% for rifampin, 27.27% for cefotaxime, 4.54% for chloramphenicol and 0% for cephalexin (figure. 2). There are 90% of *Salmonella spp.* Isolates that have multi-drug resistance phenomenon (resistant to 3 or more antibiotics). Several factors seem to increase the number of antibiotic-resistant bacteria in feces. One important factor is the exposure of the intestinal flora to antibacterial drugs and antibiotics used as feed additives seem to play an important role in the development of antibiotic resistance in normal flora bacteria (14).

The results showed that there were 90% of *Salmonella spp*. isolates had Multi-drug resistance phenomenon (resist to three or more antibiotics). The antimicrobial agents are given to animals with food as therapy for an infection or, in the absence of disease, for subtherapeutic purposes with the goals of growth promotion and enhanced feed efficiency and improved nutritional benefits of the animal feed. The use of antimicrobials in animals food increases resistant strains and enhances their persistence in the environment. Drug resistance in *salmonella* can increase the frequency and severity of infections with such organisms, limit treatment options, and raise health care costs (15).



Figure, 1: Antibiotics sensitivity of bacterial strains which isolated from eggs
Cip: Ciprofloxacin Gen: Gentamicin AK: Amikacin RA: Rifampin CTX: Cefotaxime C: Chloramphenicol CLR: Clarithromycin CL: Cephalexin



Figure, 2: Antibiotics sensitivity of *sallonella* strains which isolated from stool samples
Cip: Ciprofloxacin Gen: Gentamicin AK: Amikacin RA: Rifampin CTX: Cefotaxime C: Chloramphenicol CLR: Clarithromycin CL: Cephalexin

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التلوث البكتيري لبيض المائدة في مدينة بابل, العراق

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الخلاصة

لدراسة التلوث البكتيري لبيض المائدة في مدينة بابل, جمعت 214 عينة بيض من مصادر مختلفة, بضمنها 100 عينة من الحقول و114 عينة من الاسواق, العينات زرعت على نوعين من الاوساط الزرعية, وسط سالمونيلا شكلا اكار وعلى الوسط الزرعي المغذي. اظهرت النتائج خلو عينات البيض الماخوذة من الحقول من التلوث البكتيري, اما عينات بيض الاسواق فقد اظهرت النتائج ان 20.5% من عينات بيض الاسواق ملوثة جرثوميا. و اظهرت النتائج وجود بكتريا *Stahylococcus aureus* في 10.52% من عينات بيض الاسواق وبكتريا *Pseudomonas aeruginosa* في 7.89% وبكتريا *Proteus mirabilis* في 3.50% وبكتريا *S. epidermidis* في 0.87% وبكتريا *Bacillus subtilis* في 0.87%. وقد تم اختبار حساسية جميع العزلات تحت الدراسة للمضادات الحياتية واظهرت النتائج ان نسبة الحساسية كانت 100% لمضاد السبروفلوكساسين, و85.18% للجنتامايسين, 85.18% للاميكاسين, 59.25% للريفامبين, 48.14% للسيفاتاكسيم, 44.44% للكلورومفينيكول,28.5% للكلارثرومايسين و 0% للسيفالكسين. واظهرت النتائج عدم وجود بكتريا *Salmonella spp* في كل عينات البيض تحت الدراسة لذلك حاولنا فحص الدجاج في الحقول في مدينة بابل, وذلك تم بجمع 213 عينة من عينات خروج الدجاج من اربع حقول وزرعت العينات على وسط سالمونيلا شكلا اكار. اظهرت النتائج وجود بكتريا ال *Salmonella spp* في 10.37% من عينات الخروج وتم اختبار حساسية عزلات *Salmonella spp* تجاة المضادات الحياتية واظهرت النتائج ان نسبة الحساسية كانت 63.6% لمضاد السبروفلوكساسين, و86.36% الجنتامايسين , 86.36% للاميكاسين, 36.36% للريفامبين, 27.27% للسيفاتاكيم, 4.54% للكلورومفينيكول, و 0% للسيفالكسين. كما اظهرت النتائج بان 90% من عزلات بكتريا *Salmonella spp* لها صفة المقاومة المتعددة.

الكلمات المفتاحية: بيض المائدة, سالمونيلا, الحساسية للمضادات الحياتية.