PREVALENCE AND PUBLIC HEALTH HAZARDS OF S. AUREUS ASSOCIATED WITH CONSUMPTION OF HEN'S EGGS IN QENA GOVERNORATE (With 2 Tables and 3 Figures)

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ABSTRACT

A total of 250 of fresh commercial hen eggs of native breeds (Balady) and poultry farms representing (50 groups) were collected from cities markets and poultry farms in Qena Governorate. All samples including egg shells and eggs contents were investigated for the prevalence of S. aureus as a pathogenic micro-organism of serious public health. The general highlight of the results showed that S. aureus was found in (68% and 28%) of the total examined samples of shells and contents respectively. Whereas, only 4% of the total eggs examined were free from infection by Staphylococcus species. Additionally, the obtained results revealed that S. aureus scored higher percentage of contamination than CNS especially from shell surface and contents of both types Balay and poultry farms eggs. The percentage of contamination by S. aureus (52% and 44%) and CNS (24% and 20%) were higher in case of farm hen eggs than of Balady eggs. Consequently, Balady eggs proved to be the best for consumption if compared with farm hen eggs.

Key words: *Eggs, S. aureus, CNS, Public health hazard*

INTRODUCTION

The hen egg is one of the most versatile foods. It contains high-quality proteins and lipids, as well as valuable minerals, carbohydrates, and vitamins. Eggs are also widely used in the food industry due to their multifunctional properties such as foaming, gelling, and emulsifying and control of crystallization **(Meszaros 2006)**.

The interior of the newly laid eggs is usually free from micro-organisms but contamination of egg contents occasionally occurs either before the egg is laid or shortly after. Microorganisms can contaminate eggs at different stages, from production through processing to preparation and consumption.

In literature few data are published about the bacterial contamination on the shell of consumption eggs. Data available concern mostly research on hatching eggs because trans-shell contamination of hatching eggs may reduce hatchability **(Quarles, et al.,**

1970). The extent of contamination of hatching eggs was reported by **Board and Tranter (1986)** with a variation ranging from 102 up to 107 cfu for individual eggshells.

The shell can already be infected when passing through the vent, but many researchers suggest that the main contamination occurs within a short period after laying due to contact with dirty surfaces **(Quarles et al., 1970)**. External eggshell contamination could be important for the shelf life and the food safety of consumption eggs and egg products. It is hypothesized that bacterial contamination of the internal egg content could be the result of the penetration of the shell by bacteria deposited on the surface of the egg after it has been laid **(Schoeni, et al., 1995)**. **Smith, et al., (2000)** also reported that high excreta moisture can directly increase the microbial contamination of the eggshell and consequently increase the risk of microbial contamination of the internal contents of ostensibly clean eggs.

As a result, the egg may be responsible for transmitting diseases among poultry and man **(Board and Fuller, 1994)**. Consequently, the increasing consumer awareness of food safety issues has changed the public perception of a "good egg" from shell cleanliness and physical properties to that of microbial integrity. Egg and egg derivatives have been linked to several enteric outbreaks compromising public health. Among the pathogenic food poisoning organisms that affect the public health of human due to consumption of eggs is S. aureus which is of serious concern to public health **(Wyah, 1992)**. S. aureus strains produce heat-resistant enterotoxins, which cause nausea, vomiting and abdominal cramps when ingested by human and are responsible for staphylococcal food poisoning outbreaks **(Kluytmans et al. 1997)**. There have been many reports deal with S. aureus in hen eggs **(Bastawrows et al. 2002 and Korashy et al. 2008)**.

Therefore the present study was then performed to isolate and gain further insights into the actual prevalence of S. aureus as a pathogenic microorganism of public health concern from hen eggs in Qena Governorate.

MATERIALS AND METHODS

a) Samples collection:

A total of 250 of fresh commercial hen eggs of native breeds (Balady) and poultry farms were investigated, the groups were collected from cities markets (Balady) and poultry farms in the same day of laying from Qena Governorate in Egypt, (25 groups each). Every 5 eggs constitute one group were placed in a sterile plastic bag and transferred to laboratory with a minimum of delay to be prepared and examined for the concerned organisms.

b) Samples preparation:

Egg shells were tested by a surface rinse method as described by **Moats, (1980)**. The egg was prepared for evacuation of its content according to **Speck, (1976)**.

c) Enrichment procedure:

One ml of each rinse solution as well as from the homogenous egg contents was transferred to 10 ml of selective enrichment broth,(brain heart infusion broth (BHI))and

the inoculated broth was incubated at 37°C for 48 hours.

d) Isolation and identification:

Loopful of the incubated broth was streaked into plates of selective media Baird-Parker agar (Oxoid) **(Finegold & Martin, 1982)**, and incubated at 37°C for 48 hours. The suspected colonies were inoculated into slope of nutrient agar for morphological and biochemical tests. The identification was carried out using Gram staining, production of coagulase, catalase and fermentation of mannitol **(Bennett and Lancette, 1995)**.

RESULTS AND DISCUSSION

Although eggs are valuable and even indispensable food, they may play an important role in transmitting different diseases. Human infection due to consumption of infected eggs has been reported in numerous countries all over the world **(Ko and Chang, 1995)**.

Figure 1 illustrate general view about the actual prevalence of S. aureus in the total examined samples of hen eggs and it is apparent that S. aureus was found in (68% and 28%) of the total examined samples of egg shells and egg contents, respectively. Whereas, only 4% of the total examined eggs were free from infection by Staphylococcus species.

As well the present study showed that S. aureus scored higher percentage of contamination than CNS that isolated from the shell surface and contents of both types Balay and poultry farms eggs (Table 1 and 2).

S. aureus was recorded in 32% and 36 % of the shell surface examined for Balay hen eggs and poultry farms eggs respectively (Table 1 & 2 and Fig. 1 & 2). The obtained results were higher than that recorded by **Korashy et al. 2008** and they were lower than those observed by **Bastawrows et al. 2002**. The discrepancy in theses results may be due to the health status of hens as transovarian transmission of S. aureus to eggs which recorded by **Math and Hanscke (1977)** of accidental transmission from shell **(Math, 1984)**.

Comparison of different studies gave sometimes conflicting conclusions. As most studies are old, differences in animal feeding, rearing, genetic deposition, methodological possibilities, methodology, groups of hens, flock ages, measured shell characteristics, incubation times and conditions, viability of inoculated bacteria, etc. and differences in eggshell membranes and the albumen (having a pivotal role in exclusion of bacteria from the inside of an egg) can explain this.

Additionally S. aureus was detected in 12% and 16% of the content examined for Balay hen eggs and poultry farms eggs respectively (Table 1 & 2 and Fig. 1 & 2). The comparatively low incidence of S. aureus in the egg contents of the examined samples may be due to the presence of lysozyme in the inner shell membrane which act as an effective agent against Gram positive organism, thus the chance of S. aureus enterance into a shell is very remote. Regarding CNS shell surface show twice (16%) percentage of contamination as compared to the egg contents (8%) in case of farm hen eggs (Table 2 and Fig. 2)

As recorded in (Table 1 & 2 and Fig. 1 & 2) the percentage of contamination by S. aureus

(52% and 44%) and CNS (24% and 20%) were higher in case of farm hen eggs than of Balady eggs. Consequently, Balady eggs proved to be the best for consumption if compared with farm hen eggs.

So in order to assure the production of high quality eggs and to reduce the risk of some pathogenic micro-organisms it is necessary to apply the hygienic measures in the farm during handling and storage. Using of hot soapy water with those come in contact with eggs and egg containing foods in work areas. Eggs must be held at low temperature 5°C to prevent proliferation of the pathogens. Cleaning with sanitizer minimize the contamination of the shells. Educational programs for consumers informed the risk resulted from eating under cooked eggs particularly the elderly and immune-comprised persons who are more susceptible to infection.

Table (1): Incidence of *S. aureus* isolated from Balady hen eggs.

Egg samples	Staph. Spp.			
	S. aureus		*CNS	
	No.25	%	No.25	%
Shell	8	32	3	12
Content	3	12	2	8
Total	11	44	5	20

• CNS= Coagulase Negative Staphylococci

Table (2): Incidence of *S. aureus* isolated from poultry farms hen eggs.

Egg samples	Staph. Spp.			
	S. aureus		CNS	
	No.25	%	No.25	%
Shell	9	36	4	16
Content	4	16	2	8
Total	13	52	6	24

Fig. 1: Prevalence of *S. aureus* in the total eggs examined

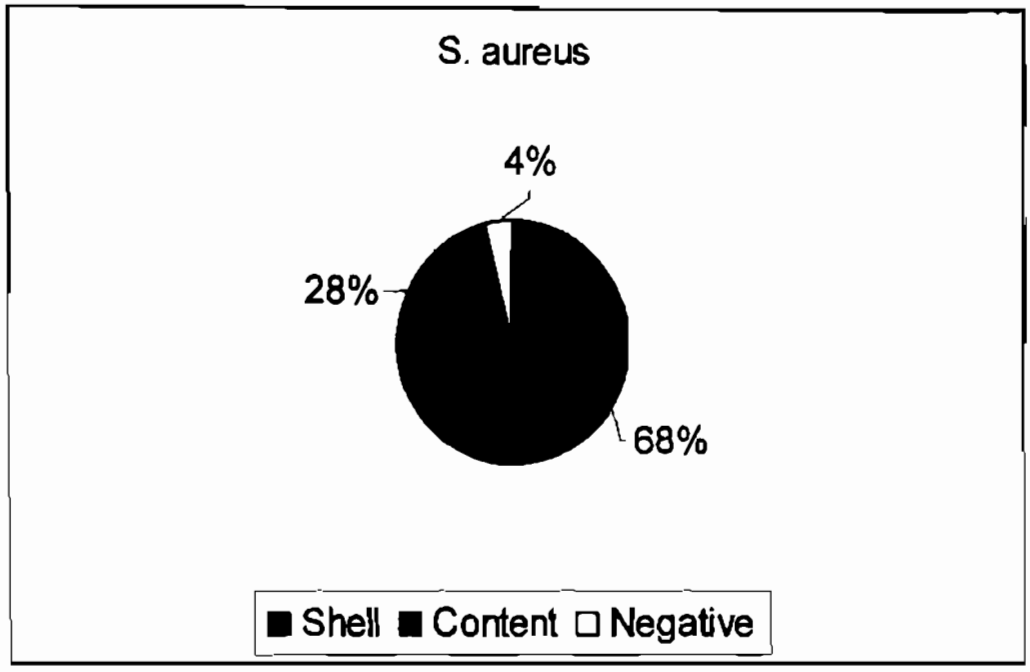


Fig 2: Incidence of *S. aureus* in Balady hen eggs

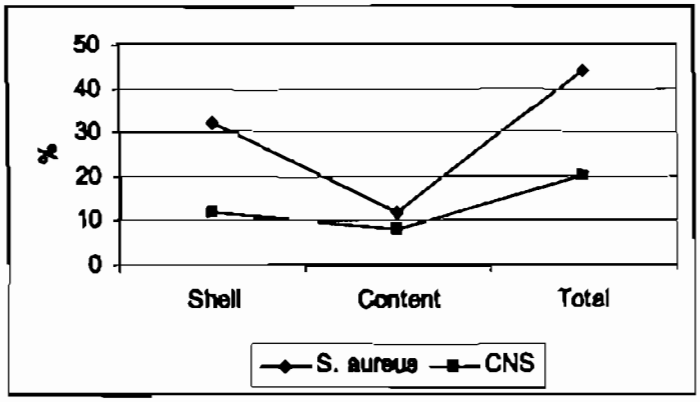
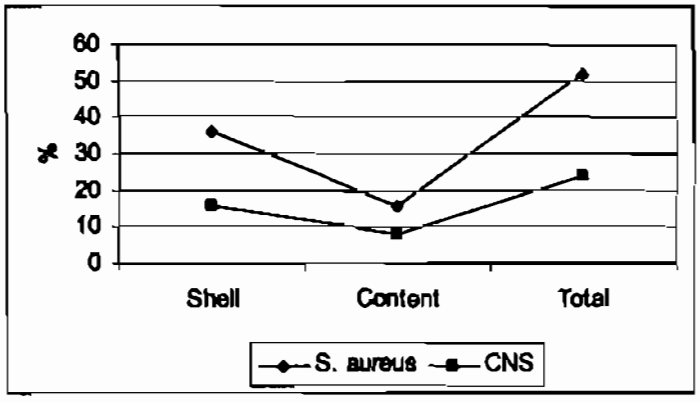


Fig. 3: Incidence of *S. aureus* in poultry farm hen eggs



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الملخص العربى

مدى انتشار المخاطر الصحية للمكور العنقودى الذهبى المرتبط باستهلاك بيض الدجاج بمحافظة قنا

كريمه جلال عبدالحميد و ليلى مصطفى الملط

يقبل الكثيرون على تناول البيض باعتباره مصدراً من مصادر البروتين الحيوانى وكذلك لاحتوائه على العناصر لذا هدفت الدراسة إلى عزل ميكروب الغذائية والفيتامينات الهامة لمراحل العمر المختلفة للحفاظ على صحة الإنسان المكور العنقودى الذهبى لما له من أهمية صحية حيث أنه سبباً فى تلوث البيض متسبباً فى إحداث التسمم الغذائى للإنسان لذا تم جمع مائتان وخمسون بيضة بطريقة عشوائية من أسواق مدينة قنا وكذلك من مزارع إنتاج الدواجن بمحافظة قنا بواقع وقد تمثلت العينة الواحدة فى خمس بيضات ومائة وخمس وعشرون بيضة من البيض البلدى ومزارع إنتاج الدواجن من عينات القشرة وعينات المحترى الداخلى ملوثة بميكروب المكور العنقودى ٢٨٪ و ٦٨٪ اتضح من النتائج أن ودلت النتائج أيضاً على أن بيض الدجاج فقط من العينات خالية من التلوث بهذا الميكروب ٤٪ الذهبى بينما وجد أن البلدى هو الأقل تلوثاً بميكروب المكور العنقودى الذهبى عن بيض مزارع إنتاج الداجن حيث تم عزل المكور العنقودى أما بالنسبة المكور العنقودى سالب من بيض مزارع إنتاج الدواجن ٥٢٪ من البيض البلدى وبنسبة ٤٤٪ الذهبى بنسبة وقت مناقشة الأهمية (من بيض مزارع إنتاج الدواجن ٢٤٪ من البيض البلدى وبنسبة ٢٠٪ التجلط فقد تم عزله بنسبة لميكروب المكور العنقودى الذهبى والذى يصيب الإنسان من خلال تناوله لبيض المائدة والإجراءات الصحية والاقتصادية الواجب إتباعها لمنع تلوث البيض بهذا الميكروب والحفاظ عليه أثناء تخزينه.