

EVALUATION OF MICROBIAL CONTAMINATION OF CHICKEN EGGS FROM DIFFERENT POULTRY FARMS IN AL ZAWIA REGION

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Abstract

Table eggs are consumed worldwide and are considered the most nutritious inexpensive source of protein that makes part of a healthy diet. Mistreated eggs have the ability to carry microorganisms or microbial toxins causing disease. The **objective** of this study is to determine how safe eggs are by identifying the bacterial load and pathogens resident on eggshells. **Method:** This study was conducted in the Microbiology Laboratory, Department of Biotechnology, Faculty of Medical Technology Sabratha. Shells of One hundred and fifty of chicken eggs collected from different poultry farms in region of Alzawia-Libya. Each egg shell membrane was swabbed and immediately transferred to appropriate broth media and incubated at 37°C° for 18 hours. After incubation period a loop-full of broth media was transferred to agar media and incubated at 37°C for 48 hrs. **Results:** The result obtained showed microbial contamination was present on 135 (90%) of all eggshells. Of the microorganisms present 43% was bacteria and 47% was fungi. **Conclusion:** It can be concluded that eggs got from the Libyan farm-hens can be contaminated and need for optimum hygienic conditions at the farm level to decrease the bacterial load.

Keywords: Egg Shells, Microorganisms Contamination, Food Poisoning.

Introduction

Food-borne illnesses are a major public health problem affecting developed as well as developing countries. Mistreated eggs have the ability to carry microorganisms or microbial toxins causing disease. However, poultry may carry bacteria that can cause illness; infected birds do not usually appear sick and even unbroken clean fresh shell eggs may contain harmful bacteria. (Barbara et al., 2010; Sabarinath et al, 2009). Human illnesses resulting from the consumption of poultry products contaminated with by *Salmonella* can be expensive for the poultry industry, governments, and can affect individuals. The total annual costs of medical care and lost productivity resulting from food-borne *Salmonella* infections of humans in the United States has been estimated at up

to \$3.5 billion. A single serotype, *S. Enteritidis*, may account for as much as \$870 million of this total. (Andrew et al., 2004). Eggs can be contaminated with microorganisms such as bacteria and fungi. There is a variety of microbes with a wide range of pathogens such as *Campylobacter jejuni*, *Listeria monocytogenes*, *Escherichiacoli*, *Yersiniaenterocolitica* and *Salmonella Spp* (Ricke et al., 2001). These microorganisms can evade the defense mechanism of eggs and penetrate inside the egg. This process can increase the risk of food-borne illnesses or product spoilage (Board et al., 1995). International markets for poultry products are increasingly subject to restrictions based on food safety considerations. (Tan et al., 2012). The current study is to investigate the microbial quality of Libyan chicken eggs by identifying the microbial load on eggshells.

Materials and Methods

Sample

One hundred and fifty, ready for sale, poultry farm eggs were randomly picked and sent to the laboratory for examination. These poultry farms are located in the region of Alzawia, Libya

Sample Processing

Within six hours of collection, the egg samples were processed for the isolation of microorganisms from eggshells. For eggshell sampling, all eggs were processed regardless of their outer appearance like cracks on the eggshell, blood spots, or the presence of fecal material on the egg surface. Sterile cotton swabs dipped in sterile buffered peptone water (BPW) was used to swab the surface of the eggshell. The swabs were directly inoculated into 10 ml BPW in screw-capped bottles and incubated at 37°C for 24h (Tan et al., 2012). At the end of incubation period a loop full of media was transferred to Blood Agar, *Salmonella-Shegilla* agar (Oxoid), Macconkey Agar (Oxoid), and Sabouroud Dextrose Agar (Oxoid), microorganisms were then isolated and identified (Collee et al., 1996).

Isolation and Characterization

Microorganisms were identified by culturing and incubation. The morphology of organisms was studied for size, shape, outline, color, and changes on various media. Bacteria was stained using the Gram stain method and examined using a light microscope of X100 with oil immersion. Biochemical tests to correct diagnosis included coagulase, catalase, and oxidase tests (Collee et al., 1996).

Data Analysis

Microsoft Office Excel 2007 was used to analyze and plot the collected data into charts.

Results

Out of 150 eggshells 135 (90%) yielded growth of microorganisms. Amongst the isolated microorganisms, 43% was bacteria and 47% was fungi. Gram's staining showed that 23%

isolates were Gram negative: whereas 20% isolates were gram-positive bacteria. The results revealed that the eggshells were contaminated with 20% *Staphylococcus aureus*, 5% *Pseudomonas aeruginosa*, 5% *Escherichia coli*, 3% *Klebsiella pneumonia*, and 10% *Bacillus subtilis*. *Staphylococcus Spp.* and *Bacillus spp.* were predominantly found associated with eggshells.

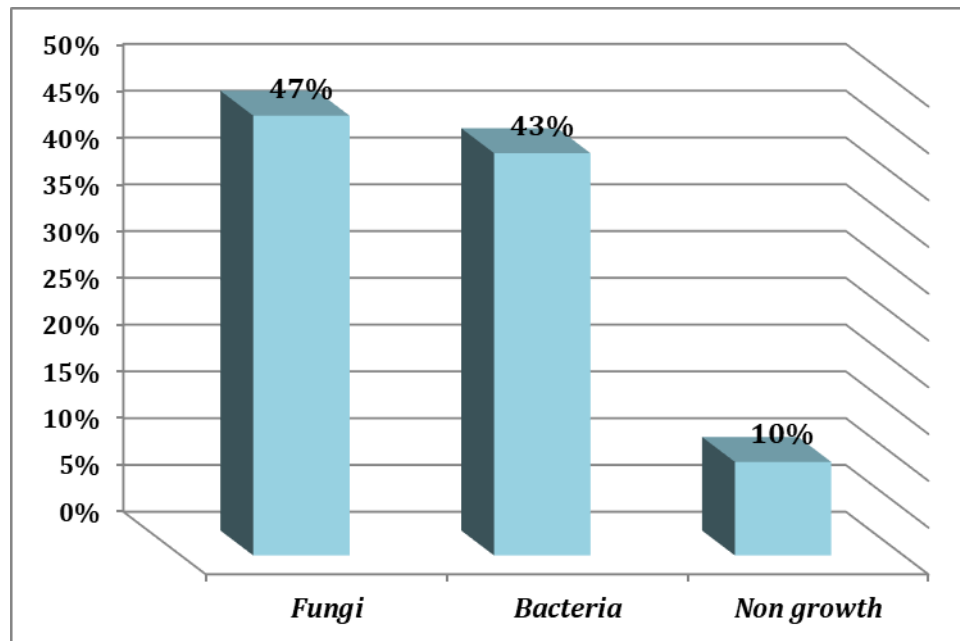


Figure (1): Percentage of Microbial Contamination of Egg Shells.

Out of all the pathogenic microorganisms, the viable *Salmonella Spp* was not noticed within the 150 eggshell surface swabs that were examined and grown on the Salmonella-Shegilla agar selective media. The types of bacteria that were isolated from the eggshells are presented on Table (1) below.

Table (1): Percentage of Microbial Isolates from Egg Shells (n=150)

Gram stain	Types of organisms	Percentage (%) of isolated organisms from eggshells
Gram- positive	<i>Staphylococcus aureus</i>	20%
Gram- Negative	<i>Proteus spp</i>	10%
	<i>Escherichia coil</i>	5%
	<i>Pseudomonas aeruginosa</i>	5%
	<i>Klebsiella pneumonia</i>	3%
	<i>Salmonella spp</i>	0%
Fungi	fungi	47%

Non growth		10%
Total		100%

Discussion and conclusion

Microbial contamination of eggs affects both public health and poultry industry (MAFF, UK, 2009). This study was undertaken to evaluate the microbial quality of eggs that are sold for human consumption in Libya. It has been found that the major contaminants are fungi and gram-negative bacteria that are belonging to the family *Enterobacteriaceae*. However, gram-positive *Staphylococcus aureus* was the only microorganism present on the eggshells. These observations are in agreement with the previous reports (Hang'ombe et al., 1999; Biomerieux, 2002). Eggs contamination could have occurred at either industry or household level because of suitable microbial growth conditions or because of improper handling. Bacterial contaminations might also be due to the contaminated clothes and hands of the poultry and market workers, (Loongyai et al., 2010).

The disinfection of eggs is extremely important as pathogenic contamination can have a disastrous effect on the community and population after consuming such contaminated eggs. Lack of standard structures and drainage systems in the market, and the presence of relatively high humidity could have contributed to the high microbial contamination. It has also been noticed that most retailers do not store eggs in refrigerators. Such conditions encourage microbial growth since the rate of egg spoilage depends on nutrient availability, temperature, storage, and handling, (Abdullah, 2010).

The isolated pathogenic microbes can cause severe health problems like diarrhea, nausea, and abdominal pain, (Al-Bahry et al., 2012). *E. coli* is a gram-negative bacterium of the family *Enterobacteriaceae* and is a normal inhabitant of intestinal tract of birds, (Adday et al., 2009). It is one of the opportunistic pathogen responsible for a number of disease conditions such as yolk sac infection, air sac disease, prehepatitis, enteritis, omphalitis, and coligranuloma, colibacillosis. (Singleton et al., 1981; Kabuusu et al., 2003; Arathy et al., 2009). The researchers did not notice the presence of *Salmonella* on the external shell surface of all the eggs. However, the presence of the other microorganisms can be a major risk for the individuals who consume such eggs.

Because this study is not a good representative of the eggs available in the market and the breeding conditions vary from one breeder to the other, the researchers suggest that further actions need to be put in place to improve eggs hygiene and to achieve public health goals. Such actions can be in the form of educating hen breeders and making them abide to the hygienic practices as well as building up safe consumer handling and egg refrigeration at retail levels. If the eggs are held at the farm for more than 36 hours after production, it should be kept at or below 7.5°C. The data highlights the need for optimum hygienic conditions at farm level to decrease the bacterial load in commercial chicken eggs in Libya. It can be concluded that eggs got from the Libyan farm-hens can be contaminated and might be a viable source of disease.

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