
***Staph. aureus*, *Salmonella* Spp. and *Listeria monocytogenes* in locally fresh and frozen chicken meat in Damietta city**

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Abstract

A total of 100 random samples (50 each of locally fresh and frozen chicken meat) collected from different shops at Damietta city were examined bacteriologically for the presence of *Staph. aureus*, *Salmonella* spp. and *Listeria monocytogenes*. Results revealed that incidence of *Staph. aureus*, *Salmonella* spp. and *Listeria monocytogenes* in locally fresh chicken meat samples in Damietta city was 26 (52%), 3 (6%) and 4 (8 %) respectively. While lower incidence obtained from locally frozen chicken meat samples was 11 (22 %), 2 (4 %) and 3 (6 %), respectively. Results of the study demonstrated difference in the incidence of isolated pathogenic bacteria depend on the type of collected chicken meat samples in Damietta city.

Key words: *Staph.aureus*, *Salmonella* spp., *Listeria monocytogenes*, locally fresh& frozen chicken meat, Damietta city.

Introduction

Chicken meat is more popular to the consumer because of its easily digestibility and acceptance by the majority of people (**Yashoda et al., 2001**). Contamination of chicken meat with food borne pathogens remains an important public health issue, because it can lead to illness if there are malpractices in slaughtering, processing, handling and preparation of the product. Two kinds of chicken slaughtering are used in Damietta city. One is an automated chicken slaughtering process, whereby automated systems are used for scalding, plucking, eviscerating, rinsing and packaging carcasses. Carcasses are then stored at 4°C before sale to supermarkets. The second is traditional slaughtering, which is commonly practiced in shops under poor hygienic conditions. Thus controlling microbial contamination in chicken meat during slaughtering, processing, storage, handling and preparation becomes a great challenge (**Jorgen, 2002; Abamuslum et al., 2003; Gill and Badoni, 2005; Abbas et al., 2012**).

According to **Fries (2002)**, the microflora of chicken is transferred from the primary pro-

duction sites to the production lines, and further, by subsequent contamination. Additionally, during food preparation, bacteria became widely disseminated to hand and food contact surfaces (**Cogan et al., 1999**). Several studies indicated that various bacteria, including *Staph. aureus*, *Salmonella* spp. and *Listeria monocytogenes* survive on hands, sponges/ cloths, utensils and currency for hours or days after initial contact with the microorganisms (**Scott and Bloomfield, 1990; Kusumaningrum et al., 2003**). In other studies, the extent of bacterial survival and cross-contamination between hands and foods or various kitchen surfaces have been quantified (**Zhao et al., 1998; Montville et al., 2001 and Chen et al., 2004**).

Epidemiological reports suggest that chicken meat is still the primary cause of human food poisoning (**Jablonski and Bohach, 1997; Mulder, 1999 and Nirmaladevi et al., 2011**).

Staph.aureus is a Gram positive cocci resistant to heat, drying and radiation. They produce disease when the bacteria contaminate food, they produce some enzymes which are implicated with *Staphylococcus* invasiveness and

many extracellular substances some of which are heat stable enterotoxins that renders the food dangerous even though it appears normal (Prescott *et al.*, 2005). Though the bacteria can be killed during extensive cooking but the toxin may not be destroyed because most of the toxins are gene based i.e. they can be carried on the plasmid (Talaro and Talaro, 1996). The intensity of the signs and symptoms may vary with the amount of contaminated food ingested and susceptibility of the individual to the toxins as well as the type and the dose of the enterotoxin as enterotoxin A & D more incriminated in food poisoning cases and outbreaks. Some signs and symptoms of Staphylococcal food poisoning includes: nausea, vomiting, abdominal cramp, prostration and diarrhea 1-6 hours after eating food contaminated with toxin produced by this organism. (Jablonski & Bohach, 1997 and Scott, 1999). Also *Staph. aureus* is responsible for diseases caused by exotoxin production (toxic shock and staphylococcal scalded-skin syndromes) and by direct invasion and systemic dissemination (bacteremia, septic shock syndrome, skin infections and abscesses) (Martineau *et al.*, 2000).

Salmonella infection is one of the most important bacterial diseases in poultry causing heavy economic loss through mortality and reduced production (Talha *et al.*, 2001 and Haider *et al.*, 2004). Avian salmonella infection may occur in poultry either in acute or chronic form by one or more member of genus Salmonella, (Hofstad *et al.*, 1992). Salmonella is a common causative agent of food-borne illness in humans (Monthon *et al.*, 2013). The symptoms and onset of Salmonella food poisoning mentioned by Scott, 1999 includes: acute diarrhea, vomiting, abdominal pain, and fever. Occasionally, may cause blood stream infections and death. Symptoms occur within 6 to 72 hours after consumption of contaminated chicken carcasses.

Listeria monocytogenes is an opportunistic human pathogen, widely distributed in the environment and transmitted to humans and ani-

mals via contaminated foods with causative agent (Scott, 1999; Slutzker & Schuchat, 1999 and Finlay, 2001). The organism is well adapted to very different environmental conditions encountered in foods; it tolerates high levels of salt content (10 to 20 %), can grow at pH values below 6, with low oxygen, and at temperatures down to 1°C (Seeliger and Jones, 1986). *Listeria monocytogenes* is the major pathogens causing listeriosis in both animals and man (McLauchlin *et al.*, 2004). Listeriosis may result in gastroenteritis, septicemia, meningitis, encephalitis, or humans fetal loss during pregnancy (Hof, 2001 and Vazquez-Boland *et al.*, 2001).

This study is aimed to isolation and identification of *Stap. aureus* according to (FDA, 2001), isolation of Salmonella spp. according to (ISO 6579, 2002) and isolation and identification of *Listeria monocytogenes* according to (ISO 11290-1, 2005) and to clarify the health risks of isolated pathogenic bacteria and the necessary preventive measures to ward off this danger.

Materials and Methods.

One hundred random samples (50 each of locally fresh and frozen chicken meat) were collected from different shops at Damietta city. Each sample was aseptically transferred, without delay, in an insulated ice box to the laboratory and then subjected to the following examinations:-

1- preparation of food homogenate (APHA, 200)

2-Isolation and identification of *Staph. aureus* (FDA, 2001) using Baird-Parker agar medium (DIFCO, Franklin Lakes, USA) containing egg yolk (5 %) with tellurite (1%) enrichment (LABORCLIN, Pinhais, Brazil). The suspected colonies of *Staphylococcus aureus* (grey to black, shiny colonies with narrow white margin and surrounded by opaque zone and another clear zone) were identified biochemically

3- Isolation of Salmonella spp., according to (ISO 6579, 2002). Salmonella growth in black

centered red colonies were cultivated on to nutrient agar and incubated at $37\pm 1^{\circ}\text{C}$ during 24 ± 3 hours. Isolated *Salmonella* spp. colonies with Modified Gram stain were gram negative, pink colour, small rod shape organisms, arranged in single or paired. Suspected colonies were identified biochemically.

4 - Isolation and identification of *Listeria monocytogens* according to ISO 11290-1, (2005). PALCAM agar provides a quantitative cultivation of *Listeria monocytogens*, while, at the same time, inhibiting the Gram-negative and most of the Gram-positive accompanying bacteria such as Enterococci or Staphylococci grow as yellow colonies, if they are not inhibited, further biochemical tests should be carried out. Confirmation of Isolates (Seeliger and Jones, 1986) by applying Gram staining, motility, carbohydrate fermentation, hemolysin

production and CAMP test against *Staph. aureus*.

Results and Discussion.

Special attention in poultry meat production is paid to the fact that live animals are hosts to a large number of different microorganisms residing on their skin, feathers or in the alimentary tract. During slaughter most of these microorganisms are eliminated, but subsequent contamination is possible at any stage of the production process, from feather plucking, evisceration, and washing to storage by cooling or freezing. Microorganisms from the environment, equipment and operators' hands can contaminate chicken meat (Mead, 1989 and Živkovic *et al.*, 2001). Generally, microbiological examination is a sensitive measure collectively verifying the quality of raw material used the perfection of processing, as well as the proper storage.

Table (1). Incidence of *Staph. aureus* , *Salmonella* spp. and *Listeria monocytogens* in examined locally fresh and frozen chicken meat in Damietta city.

Samples	No. of examined Samples	<i>Staph.aureus</i>		<i>Salmonella</i> spp.		<i>Listeria monocytogens</i>		-ve of examined samples	
		No.	%	No.	%	No.	%	No.	%
Fresh chicken meat	50	26	52	3	6 %	4	8%	17	34 %
Frozen chicken meat	50	11	22	2	4%	3	6%	34	68 %
Total	100								

Figure (1). Incidence of *Staph. aureus*, *Salmonella* spp. and *Listeria monocytogens* in examined locally fresh chicken meat in Damietta city.

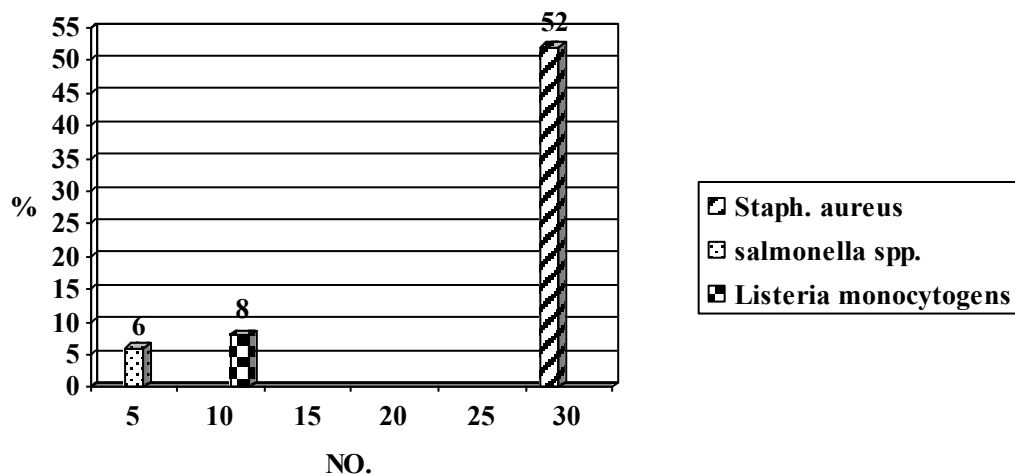


Figure (2). Incidence of *Staph. aureus* , *Salmonella* spp. and *Listeria monocytogens* in examined locally frozen chicken meat in Damietta city .

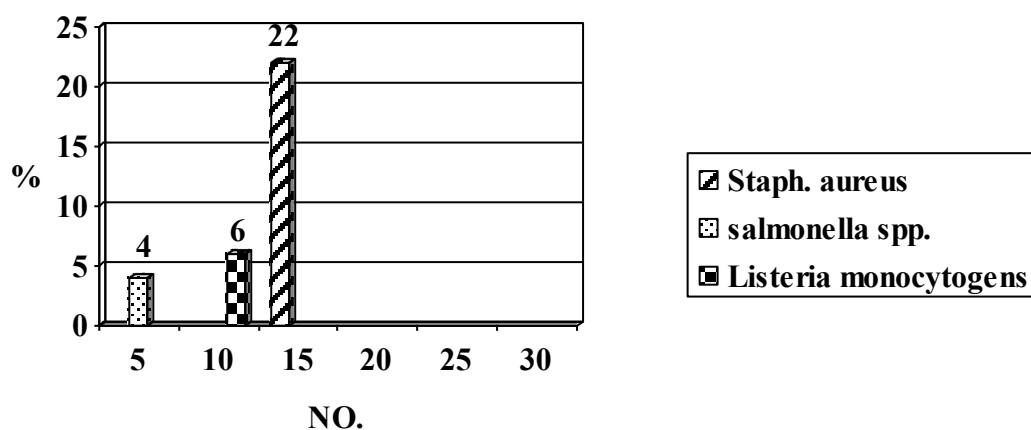
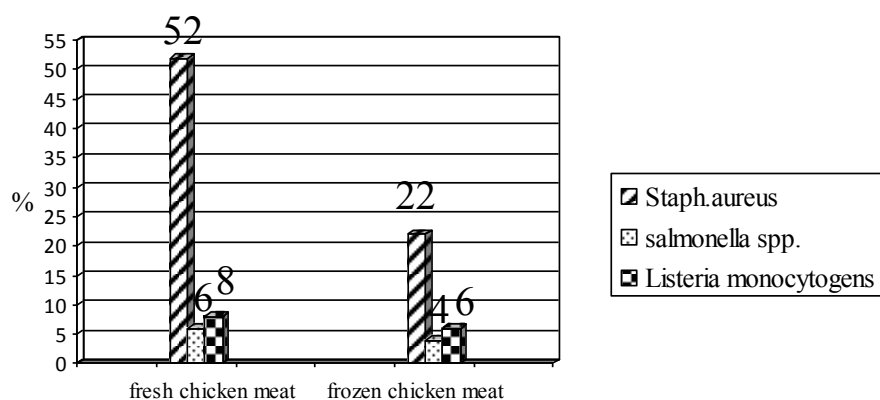


Figure (3). Incidence of *Staph. aureus* , *Salmonella* spp. and *Listeria monocytogens* in examined locally fresh and frozen chicken meat in Damietta city



Results in Table (1) and Figure (1,2,3) indicated that incidence of *Staph.aureus* was 26 (52%) and 11 (22 %) for fresh and frozen chicken meat, respectively. Higher incidences were recorded by **Rosa et al., 2001** (85.71 %) - **Gundogan et al., 2005** (53 %) - **Lidija et al.,2006** (30.30 %) - **Rasheed, 2011** (50.98 %) and **Abo EL-Enaen et al., 2012** (24 %). But lower incidences were recorded by **Hee et al. 2008** (12.8 %) – **Jyhshiun et al., 2009** (7.8 %) and **Ali & Anil,2013** (18.18 %) .*Staphylococcus* is a Gram positive bacterium; they are facultatively anaerobes growing better in the presence of air (**Prescott et al., 2005**). Their presence in food indicates human contact such as poor personal hygiene, poor manufacturing practices of the food vendor and improper storage conditions (**Musa & Okande, 2002** and **Gundogan et al., 2005**). They also can withstand high sodium chloride concentration (**Jawetz et al., 2008**). So contamination with *Staph. aureus* is important in the evaluation of safety and hygienic quality of chicken meat (**Jyhshiun et al., 2009**).

Results in Table (1) and Figure (1,2,3) indicated that incidence of *Salmonella* spp.was 3 (6 %), and 2 (4 %) for fresh and frozen chicken meat , respectively. Lower incidences of *Salmonella* spp. in chicken meat reported by **ŽIVKOVIĆ et al. ,1997** (8.6 %) - **Zhao et. al., 2001** (4.2 %) - **Lidija et al., 2006** (10.60 %) - **Marcelo Augusto et al., 2011** (2.7 %) - **Abo EL-Enaen et al.,2012** (2 %) - **Irena et al.,2012** (3.75 %) and **Ali & Anil, 2013** (5.26 %) . But higher incidences were recorded by **Machado & Bernardo, 1990** (57 %) - **Waltman et al.,1992** (65.4 %) – **Carraminana et al.,1997** (55 %)) - **Wilfred Ruban et al., 2010** (29 %) - **Abbas, 2012** (21.5%) – **Fernández et al., 2012** (22.7 %) and **Monthon et al., 2013** (67.5 %).

Irena et al., 2012 mentioned that microbial contamination of poultry carcasses by *Salmonella* spp. can be influenced by many factors during processing steps (scalding, plucking, evisceration, washing and chilling) which affect on incidence of *Salmonella* spp. Regarding

Salmonella isolation in this study, we observed that the incidence of *Salmonella* spp. was highest in the fresh chicken meat compared to that of those obtained from frozen chicken meat (Table, 1 and Figure 3) indicating high level of hygiene in place in state of art processing facilities, which can control the presence of *Salmonella* in chicken meat (**Capita et al., 2003** and **Wilfred Ruban et al., 2010**). Therefore, high contamination of *Salmonella* implies that hygienic performance in carcass production processes, probably are insufficiently attended (**Monthon et al., 2013**). Results given in Table (1) and Figure (1,2,3) revealed that incidence of *Listeria monocytogens* was 4 (8%) and 3 (6 %) for fresh and frozen chicken meat, respectively. As these pathogens are capable of surviving even under refrigerated conditions, posing threat to the food industries and there by the consumers (**Ryser and Marth, 1991**).

Lower incidence of *Listeria monocytogens* in fresh chicken meat was recorded by **Gohil et al., 1995** –**Abd El-Aziz et al., 2001** (8.9%) – **Mahmoud et al., 2003** – **Katarzyna et al., 2005** (14 %) - **Saleh, 2005** (4 %) - **Lidija et al., 2006** (3. 03 %) and **Marouf and Dawoud 2009** (10 %).While higher incidence was obtained by **Uyttendale et al., 1999** (38.2 %) – **Miettinen et.al., 2001** (62 %) – **Cristina et.al., 2004** (60 %) - **Shrinithiviahshini et al., 2011** (33 %) and **Nirmaladevi et al., 2011** (33%) .

In case of frozen chicken meat lower incidence of *Listeria monocytogens* was recorded by **Mahmoud et al., 2003** (7.5 - 12.5 %) - **Gudbjörnsdottir et al., 2004** (22.2 %) -**Marouf & Dawoud, 2009** (16 %) and **Kanarat, 2011** (2.5 %) but higher incidence was recorded by **El-gazzar and Salam ,1997**.

When comparing all results to other authors results, several factors must be taken into consideration, such as differences in origin, time period and age of samples, specific part of analysed chicken meat, sampling procedure, contamination level of animals, slaughterhouse sanitation, level of processing and cross contamination of the products, mode of packaging

& storage after distribution to the market and differences in methodology applied to detect the pathogen (Uyttendaele *et al.*, 1998; Bryan & Doyle 1995 and Lidija *et al.*, 2006).

Conclusion and Recommendation.

In this work, results revealed a higher incidence of *Staph. aureus* than *Listeria monocytogenes* and *Salmonella* spp. in locally fresh and frozen chicken meat samples in Damietta city (Table, 1 and Figure 1,2). Also a higher incidence in locally fresh chicken meat samples than frozen chicken meat samples (Table, 1 and Figure, 3)

WHO's (2001) was reported that, it is important to handle food in such a way that the microorganisms present do not have a chance to multiply and to prevent food from becoming contaminated with other microorganisms by:

- (1) Wash and dry hands before preparing any food and after handling raw foods as poultry.

- (2) Ensure that food preparation areas and equipment are clean.

- (3) Protect kitchen areas or restaurants and food from insects, pests and other animals.

- (4) People with gastrointestinal illness, such as vomiting or diarrhoea, should not handle food intended for consumption by others.

We can also concluded that if people have meals of raw chicken or frozen chicken and regularly and in suitable quantities, there will not be any health problems, relating habits concerning to nutrition according to what the healthy nutritional experts specify, if all the society follow right nutritional habits, healthy foods, they have health.

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