

**Original Paper****Detection of food poisoning bacteria in some semi-cooked chicken meat products marketed at Qaliubiya governorate**

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ABSTRACT

Ninety random samples of semi cooked chicken meat products represented by strip; pane and nuggets (30 of each) were collected from different supermarkets at Qaliubiya governorate for bacteriological examination. The mean values of Aerobic plate count, Enterobacteriaceae count and Staphylococcus count were $4.9 \times 10^4 \pm 1.2 \times 10^4$, $3.1 \times 10^2 \pm 8.2 \times 10^2$ and $1.5 \times 10^3 \pm 7.1 \times 10^3$ for chicken strips, $8.4 \times 10^4 \pm 3.3 \times 10^4$, $8.9 \times 10^2 \pm 5.6 \times 10^2$ and $7 \times 10^3 \pm 4.5 \times 10^3$ cfu/g for chicken pane and $7.46 \times 10^4 \pm 1.7 \times 10^4$, $1.2 \times 10^2 \pm 2.1 \times 10^2$ and $7.2 \times 10^3 \pm 2.3 \times 10^3$ cfu/g for chicken nuggets. Moreover, the incidence of *S. entretidis* was 6.6% for chicken strips and not detected in pane and nuggets. *Staph. aureus* incidence was 20%, 26.6% and 26.6% for chicken strips, pane and nuggets for total examined samples by using conventional culture method. For more confirmation, identification of *Staph. aureus* from 5 random samples by Vitek 2 compact system was applied. Results recorded was identical to that of culture method with accuracy 100% for examined chicken products samples and showed that the Vitek 2 system is a suitable tool for rapid and direct identification of gram positive cocci as an ideal detection system should include high specificity and sensitivity; fast response time; capability for mass production; simplification of sample preparation steps ;minimal perturbation of sample; and providing continuous data analysis as that obtained by the Vitek 2 compact system

1. INTRODUCTION

In recent years, chicken meat products are considered one of the most products which attract the consumers because they represent quick, easily prepared meat meals with high health benefits and good flavor.

Bacterial contamination is possible at any stage of production, Also, chicken meat products consider a favorable environments for the survival and transmission of microorganisms in the human food chain especially *Staph. aureus* and *Salmonella* (Olimpia *et al.*, 2006).

Staphylococcal food poisoning is of major concern in public health programs worldwide. As *Staph. aureus* is a leading cause of gastroenteritis resulting from consumption of products in which entero-toxigenic Staphylococci have grown and produced enterotoxins (Bhatia and Zahoor, 2007). *Salmonella* cause illness by means of infection, as it multiplies in the intestine, colonizes and subsequently invades the intestinal tissues, producing an enterotoxin and causing inflammatory reaction and diarrhea (ICMSF, 2006).

Aim of this study is through the light on role of *Salmonella* and *Staph. aureus* as food poisoning microorganisms in semi cooked chicken meat products.

2. MATERIAL AND METHODS**2.1. Collection of samples:**

Ninety random samples of semi cooked chicken meat products represented by chicken strips, pane and nuggets (30 of each) were collected from different supermarkets at Qaliubiya governorate. The collected samples were kept in a separate sterile plastic bag and preserved in an insulated ice box then transferred directly to the laboratory.

2.2. preparation of samples according to (APHA, 2001).

2.3. Determination of Aerobic plate count (ICMSF, 1996).

2.4 Determination of total Enterobacteriaceae count (ISO, 2004).

2.5. Determination of Staphylococcal count (FDA, 2001).

2.6 Isolation and identification of *Salmonella* (ISO, 2002)

2.7 Isolation and identification of *Staph. aureus* (ICMSF, 1996), and using of confirmatory identification of *Staph. aureus* by using Vitek 2 compact system technique (Pincus, 2006).

3. RESULTS

It is evident from the result recorded in table 1 that the mean value of APC were $4.9 \times 10^4 \pm 1.2 \times 10^4$ cfu /g for strips

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8.4x10⁴±3.3x10⁴ cfu/g for chicken pane and 7.4x10⁴±1.7x10⁴ cfu/g for chicken nuggets.

Table 2 showed that the mean value of total Enterobacteriaceae were 3.1x10²±8.2x10 cfu /g for chicken strips, 8.9x10²±5.6x10²cfu/g for chicken pane and 1.2x10²±2.1x10cfu/g for chicken nuggets.

In table 3 the mean values of total Staphylococcal count were 1.5x10²±7.1x10 for chicken strips,7x10³±4.5x10³for chicken pane and 7.2x10³±2.3x10³cfu/g for chicken nuggets.

Table 4 recorded that *S. entretidis* and *Staph. aureus* has been isolated and identified ,the incidence of *S. enteritidis* were 6.6% from chicken strips samples and failed to isolate from other samples. *Staph aureus* were 6(22%) from strips, 8(26.6%) from pane and 8(26.6%) from nuggets .

Table 5 reported that using of Vitek 2 compact system provide very good and trustable accuracy and reproducible results as shown in reported samples that mean 100% when compared with conventional method from different semi cooked chicken samples.

4. DISCUSSION

The main source of transmission of pathogenic bacteria is contaminated food; and the major cause of most enteric diseases, mortality and morbidity (Gunasegaran *et al.*, 2011)

Table 1 Statistically analytical results of total aerobic count of examined chicken samples (n=30)

Samples of chicken	Positive samples		Count of C.F.U/g.		
	No.	%	Min.	Max.	Mean ±S.E.
Chicken strips	30	100	2.6x10 ²	1.8x10 ⁵	4.9x10 ⁴ ±1.2x10 ⁴ *
Chicken pane	30	100	3.4x10 ²	6.1x10 ⁵	8.4x10 ⁴ ±3.3x10 ⁴ *
Chicken nuggets	30	100	5.1x10 ²	3.8x10 ⁵	7.4x10 ⁴ ±1.7x10 ⁴ *

S.E=Standard error of mean *= in significant differences (P 0.05)

Table 2 Statistically analytical results of total Enterobacteriaceae count of examined chicken samples (n=30)

Samples of chicken products	Positive samples		Count of C.F.U/g.		
	No.	%	Min.	Max.	Mean ±S.E.
Chicken strips	15	50	3.1x10	1x10 ³	3.1x10 ² ±8.2x10*
Chicken pane	10	33.3	1x10	3.2x10 ³	8.9x10 ² ±5.6x10 ² *
Chicken nuggets	12	40	1x10	2.6x10 ²	1.2x10 ² ±2.1x10*

*= in significant differences (P 0.05)

Table 3 Statistically analytical results of total Staphylococcal count of examined chicken samples (n=30)

Samples of chicken products	Positive samples		Count of C.F.U/g.		
	No.	%	Min.	Max.	Mean ±S.E.
Chicken strips	8	26.6	0.5x10	5.7x10 ²	1.5x10 ² ±7.1x10*
Chicken pane	8	26.6	1x10	3.1x10 ⁴	7x10 ³ ±4.5x10 ³ *
Chicken nuggets	13	43.3	1.1x10	2.5x10 ⁴	7.2x10 ³ ±2.3x10 ³ *

S.E= Standard error of mean. *= in significant differences (P 0.05)

Table 4 Prevalence of some food- borne pathogens in examined chicken samples (n=30)

Microorganism	Examined chicken samples(n=30)					
	Chicken strips		Chicken pane		Chicken nuggets	
	No.	%	No.	%	No.	%
<i>Staph. aureus</i>	6	20	8	26.6	8	26.6
<i>Salmonella</i>	2	6.6	-	-	-	-

It is evident from the result recorded in table [1] that the APC in chicken pane showed more contaminated rather than other products. This high bacterial count may be attributed to difference of ingredients and steps in their formulation and preparation also, the hygienic status of raw materials and worker’s hands.

Nearly similar results were obtained by Younes (2014) and Abdallah (2018). Furthermore, this results disagreed with those of Arab (2010); Edris (2015) and Shaltout *et al.*, (2018) who recorded higher counts but Sobieh (2014) and Raphael (2014) were obtained lower results. The variation of this result is due to the difference in hygienic measures management during different processing stages.

Table 2 recorded the Enterobacteriaceae count that nearly similar to results were obtained by Younes (2014) and Shakran (2014) and lower than that obtained by Nawar (2007), Edris (2018) and Shaltout *et al.*(2018).

Presence of considerable numbers of *Enterobacteriaceae* with high results in pane samples of semi cooked products indicates inadequate processing and/or post processing contamination, most probably workers, dirty instrument, surfaces or from raw food before processing

Total Enterobacteriaceae can be applied to monitor the hygienic level during handling, preparation, storage condition of chicken products.

The obtained results in table 3 revealed that pane and nuggets samples showed more contamination rather than strips that may indicate improper hygiene practices during processing ,transportation and storage. These results came in agreement with Ali (2011); Edris (2015) and Shaltout *et al.*(2018) and lower than that obtained by Amin (2015) and Arab (2010) but higher than that obtained by Shakran (2014) and El-Kholy (2019). Pane and nuggets samples showed more contamination with *Staphylococcus*, most of outbreaks result of contamination of food from food handlers; *Staphylococcus* can be carried on hands, nasal passage or throat, and production of heat stable toxin in food is the major public health threat; So sanitary food handling and proper cooking and refrigerating should prevent *Staphylococcus* food poisoning (FSIS, 2003).

Tables 4 revealed that the incidence of *Staph. aureus* in examined samples. These results came in accordance with those obtained by Atia (2017) and El-Kholy (2018), Arab (2010) of pane; while, these results were disagreed with Abou-El Roos (2010); Amin (2015), and Shaltout *et al.*, (2018) with higher incidence. Also, it was disagreed with Shaltout *et al.* (2002), Olimpia (2006) and Edris (2015) who isolated *Staph. aureus* with lower incidence. But Shanab (2014) failed to detect *Staph. aureus* in examined samples.

The presence of *Staph. aureus* in heat treated food may be due to its contamination from food handlers, inadequate cleaned equipment or post processing contamination.

Also, the prevalence of *Salmonella* in examined samples of chicken strips was 6.6% of all examined samples and negative results were recorded in chicken pane and nuggets.88 samples out of 90 samples were accepted as they free from *Salmonella* isolates according to EOS (2005).Moreover, the isolated serotype of *Salmonella* was *S.entritidies*. The presence of *Salmonella* indicates faulty slaughter techniques, lack of hygiene and sanitary measures. *S. entretidis* was isolated from heat treated semi cooked chicken strips by Shaltout *et al.*, (2018) and Sharaf (2018) and failed to isolated from chicken pane by Arab

(2010), Younes (2014) .But failed to isolated from nuggets by Raphael (2014) and Shaltout *et al.*, (2018).

Low incidence rate may be due to the fact that Salmonella kill at 72°C to 83°C. So cooking thoroughly is effective route to avoid food poisoning.

Table 5 showed the using of confirmatory identification to 5 isolates of *Staph. aureus* from examined samples by using Vitek 2 compact system. The results appear 100% accuracy and were rapid and accurate method for

identification. This result came in accordance with Spanue *et al.*(2003) and Millessa *et al.*,(2017). Also, Khallaf – Fatma (2019) said that viteck 2 compact systems showed accurate and rapid method for bacterial identification, she identified *Staph. aureus* from chicken pane with ratio (50%).

Table 5 Identification of *Staph. aureus* by using recent biochemical technique (Vitek2 compact system).

Biochemical Details																	
2	AMY	+	4	PIPLC	-	5	dXYL	-	8	ADH1	+	9	BGAL	+	11	AGLU	+
13	APPA	-	14	CDEX	-	15	AspA	-	16	BGAR	-	17	AMAN	-	19	PHOS	-
20	LeUA	+	23	ProA	-	24	BGURr	-	25	AGAL	-	26	pyrA	-	27	BGUR	-
28	AlaA	-	29	TYrA	-	30	dSOR	-	31	URE	-	32	POLYB	+	37	dGAL	-
38	dRIB	+	39	iLAtk	+	42	LAC	-	44	NAG	+	45	dMAL	-	46	BACI	+
47	NOVO	-	50	NC6.5	+	52	dMAN	+	53	dMNE	+	54	MBdG	+	56	PUL	-
57	dRAF	-	58	O129R	+	59	SAL	+	60	SAC	+	62	dTRE	+	63	ADH2s	-
64	OPT	++															

5. CONCLUSION

The presence of some food poisoning bacteria as *S. enteritidis* and *Staph aureus* that considered objectionable, not only as they render the product of inferior quality and unfit for consumption but also, is considered a reliable index of using of contaminated ingredients and improper handling during production, storage and distribution .So strict hygienic measures must be applied in all stages of production specially during cold storage and handling. Vitek 2 compact system is a good, rapid and accurate method for identification of food poisoning bacteria.

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