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Microbiological Loads for Some Types of Cooked Chicken Meat Products at Al-Taif Governorate, KSA

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Abstract: This Study was carried out on 40 random samples of cooked chicken products represented by chicken luncheon and Shawerma (20 of each). Samples were collected from different markets at Al-Taif governorate, KSA. and subjected to some microbiological investigations; including determination of total aerobic plate, *Enterobacteriacae spp*, *E.coli*, S*taph.spp.*, *Staph.aureus* bacterial count, mould and yeast count. Results revealed that the mean values for of *Staph.aureus*, *E.coli, mould*, *yeast* were 8.5×10^3, 3×10^4, 3.7×10, 4.1×10^2, 1×10^3, 8×10^2 and 4.3×10^3, in Luncheon and 1.2×10^5, 2×10^4, 3.9×10^2, 5.6×10^3, zero, 6.2×10^4 and 5.2×10^5 in Shawerma, respectively. The isolation percentages of *Staph.aureus*, *E.coli, mould*, *yeast* were 10.0, 25.0, 50.0 and 65.0% in Lunchon and zero, 20.0, 65.0 and 70.0% in Shawerma, respectively,

Key words: Cooked Chicken Meat products · Luncheon · Shawerma · *E.coli* · *Staph.aureus*

INTRODUCTION

Chicken and chicken products provide animal protein of high biological value for consumers at all ages, where they contain all the essential amino acids required for growth with high proportion of unsaturated fatty acids and low cholesterol value. Moreover, poultry meat is good source of different types of vitamins as niacin, riboflavin, thiamine and ascorbic acid as well as sodium, calcium, iron, phosphorus, sulpher and iodine [1].

Some studies showed the presence of *Listeria spp* in retail foods, ready-cooked chicken, on the hands of food workers, food stuffs, human feces, sewage and soil from urban source. Also, the prevalence of *Campylobacter spp., Staph. spp., E.coli, Salmonella spp., Yesinia Spp.* and *Listeria* in meat, sea foods, vegetable ingredients, chicken Shawermas, raw and cooked foods, raw chicken, beef burger sandwiches, ready-to eat salad vegetables, commercial mayonnaise, frozen chicken, poultry products and on the hands of food workers was reported [2].

The bacterial level in chilled meats after transportation and storage at the retail level has little or no relationship to that at the processor's level because bacterial growth has continued [3].

In processing plants, contamination of poultry meat products can occur throughout ideal processing, packaging and storage until the product is sufficiently cooked and consumed. Heavy bacterial loads enter the processing operations with the living birds and these bacteria can be disseminated throughout the plant during processing. Diseases can also result when these products are not properly cooked and post-processing contaminated [4].

Staph.aureus is the most prevalent contagious pathogens, which rapidly and easily transmitted, as well as it cause a zoonotic disease which transmitted to human being, due to the permanent interchange of *Staph.aureus* from human to animals the reverse occurs as a result of the close ecological relations between man, environment and animal [5].

Poultry are known as a harbor of large number of bacteria which are known to be pathogenic to human being. Typically, these occur in low sanitation levels and only pose a threat to the consumer if the product is not handled in a safe manner, therefore, the production, transportation and sale of meat products must be performed with the almost care and preferably be subjected to hazard analysis critical control point (HACCP) evaluation, to prevent the presentation of any undue hazard [6]**.** Therefore, the present study was planned out to monitor aerobic plate count, *Enterobacteriaceae* count, *E.coli* count, *Staph.aureus* count, total mould and yeast count in some poultry products in the market.

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MATERIALS AND METHODS

Collection of Samples: A total of 40 random samples of cooked chicken products represented by chicken Shawerma and Luncheon (20 of each) was collected from different supermarket. Weight of each sample was 100g and aseptically transferred, without delay, in an insulated ice box to the laboratory and then subjected to the following examinations:

Bacteriological Examination [7]: Twenty five grams of the examined samples were homogenized with 225 ml of sterile buffered peptone water (0.1%) to give a dilution of (10^{-1}). One ml of the clear homogenate was mixed with 9 ml of buffered peptone water (0.1%) and then decimal serial dilutions were prepared.

Determination of Aerobic Plate Count (APC) [8]: Nutrient agar (Oxoid) plates were dried, then spread 0.1 ml dilution over the medium using sterile glass spreader in backward and forward movement, while rotating the plates, covered the plate and left to dry for 1-2 hrs before being inverted and incubated at 30°c for 48 hrs. Colonies were counted in countable plates (30-300) to get the count in 1 ml of the homogenate, the total aerobic bacteria/g was calculated.

Determination of *Enterobacteriaceae* Count [9]: T surface plate technique was applied using Violet red bile glucose agar (Oxoid CM 485). Inoculated plates were incubated at 37°C for 24 hours. All purple colonies surrounded by purple zone were counted and the average number of *Enterobacteriaceae*/g of the sample was calculated and recorded.

Estimation of *E.coli* count (MPN) [10]: Three tubes of Lauryl sulphate tryptose broth Durham's tubes containing inverted Durham's tubes were inoculated with 1ml of the previously prepared homogenate 1:10 and 3 tubes of dilution 1:1000 were inoculated, then the (LST) tubes were incubated at 37°C for 24- 48 hrs. Test tubes that showed collected gas in Durham's tubes were recorded after 24 hrs, as positive result, the negative tubes were re-incubated for further 24 hrs, then the positive one recorded. A loopful from each gas- negative tube of (LST) was transferred to *E.coli* broth (EC). The inoculated tubes were incubated at 45.5°C in water bath for 24-48 hrs. Positive tubes showed gas production density in Durham's tubes were recorded and the bacterial density was estimated according to the MNP Table.

Dtermination of *Staph.spp.* and *Staph.aureus* Count [10] Accurately, 0.1 ml from each of previously prepared serial dilutions was spread over a duplicated plate of Baird Parker agar using a sterile bented glass spreader. The inoculated d control plates were incubated at 37°C for 48 hrs. Shiny black colonies were enumerated and the total *Staph. spp*. count/g was calculated. The suspected colonies of *Staph.aureus* appear as black, shiny colonies with narrow white margin and surrounded by a clear zone were enumerated and *Staph.aureus* count/g was calculated. The suspected colonies of *Staph.aureus* were stabbed into semisolid agar tubes for further biochemical identification according to ICMSF [9].

Mycological Examination

Total Mould and Yeast Count [11]: 0.1ml from each of the previously prepared serial dilutions was inoculated into duplicate Petri dishes of Sabouraud dextrose agar medium supplemented with chloramphenicol and tetracycline (100 mg/L of each) [12]. The inoculated plates were incubated at 25°C and examined daily for "star like shape" colonies. The total fungal count/g was calculated and recorded.

RESULTS

Results in Figure 1, Tables 1 and 2 indicated that the APC of examined cooked chicken-product samples were 8.5×10^3 for Luncheon and 1.2×10^5 for Shawerma, while *Enterobacteriacae* count was 3×10^4 and 2×10^4, respectively.

E.coli counts for Luncheon and Shawerma were 3.7×10 and 3.9×10^2, respectively. The frequency of distribution for *E.coli* of positive samples of both Luncheon and Shawerma were 25.0 and 20.0%, respectively. *Staph. spp*. count were 4.1×10^2 for Luncheon and 6.2×10^4 for Shawerma, the frequency distribution of *Staph. spp*. count for positive samples of both Luncheon and Shawerma were 80.0 and 70.0%, respectively.

Mould count averaged 8×10^2 for Luncheon and 6.2×10^4 for Shawerma. The positive product samples were 50% for Luncheon and 65% for Shawerma. Yeast count for Luncheon and Shawerma were 4.3×10^3 and 5.2×10^5, respectively.The positive product samples were 65% for luncheon and 70% for shawerma.

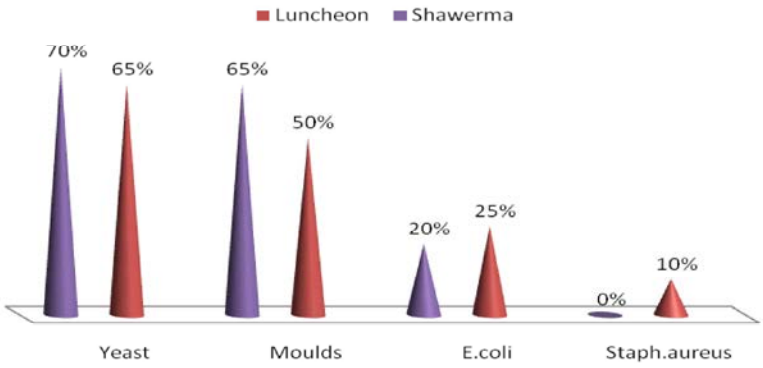

Fig. 1: Incidence of food borne pathogens isolated from cooked chicken meat products at Al-Taif

Table 1: Mean count of microbial types isolated from cooked chicken meat products at Al-Taif

Samples	Aerobic plate count	*Enterobacteriacae* count	*E.coli* count	*Staph. spp*. count	*Staph.aureus* count	Mould count	Yeast count
Luncheon	8.5×10^3	3×10^4	3.7×10	4.1×10^2	1×10^3	8×10^2	4.3×10^3
Shawerma	1.2×10^5	2×10^4	3.9×10^2	5.6×10^3	-	6.2×10^4	5.2×10^5

Table 2: Incidence of food borne pathogens isolated from cooked chicken meat products at Al-Taif

	Staph.aureus		*E.coli*		Moulds		Yeast	
Samples	no. of positive samples	%	no. of samples	%	no. of samples	%	no. of samples	%
Luncheon	2	10%	5	25%	10	50%	13	65%
Shawerma	-	-	4	20%	13	65%	14	70%

*no. = number

*% = percentage

DISCUSSION

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.

The present results reported that the APC of examined cooked chicken Product samples was 8.5×10^3 for Luncheon and 1.2×10^5 for Shawerma and were in agreement with previous studies [13-15]**.** While *Enterobacteriacae* count was 3×10^4 for Luncheon and 2×10^4 for Shawerma and in line with other studies [15, 16]. *E.coli* count for Luncheon was 3.7×10 and 3.9×10^2 for Shawerma with frequency of distribution of its positive samples in both Luncheon and Shawerma of 25.0 and 20.0%, respectively. However, Hefnawy and Moustafa [17] and Lotfi *et al*.[18] reported 10% *E.coli* in ready- to eat products.

Staph. spp. count was 4.1×10^2 for Luncheon and 6.2×10^4 for Shawerma with frequency distribution of positive samples of 80.0 and 70.0%, respectively. However the high incidence of *Staph. spp*. organisms in chicken products is an indicative of unacceptable level of contamination during handling [19-21].

The epidemiological data of *Staph.aureus* showed that, *Staph.aureus* continued to be a major cause of food borne intoxication and its presence in food constitute an important problem for food processors, food service workers and consumers. Table1, 2 showed low incidence of *Staph.aureus* 2 (10%) for luncheon and (zero) for shawerma, *Staph.aureus* count was1×10^3 for luncheon and (zero) for Shawerma [21], such results were relatively higher as compared to those of Lotfi *et al*. [15]. The low incidence of *Staph.aureus* in examined samples may be attributed to exposure of those products to high temperature during processing [22]. Chicken Luncheon was the most contaminated product and this may due to inadequate cooking, post processing contamination, cross contamination through slicing machines or cutting knives used in food serving centers in addition to raw material and spices introduced during manufacture [23].

Mould and yeast contamination of chicken products may lead to their spoilage, in addition to some *mould spp* which were incriminated in human mycosis [24]. In this study, mould count was 8×10^2 for Luncheon and 6.2×10^4 for Shawerma, with positive product samples of 50.0% for Luncheon and 65% for Shawerma with similar results as Gad [21] and Edris *et al*. [25].

In this study, yeast counts were 4.3×10^3 for Luncheon and 5.2×10^5 for Shawerma; the positive product samples were 65.0% for luncheon and 70.0% for Shawerma [26]. Mould and yeast contamination usually occurred due to handling, deboning, processing, packing and washing with polluted water and may due to dust, flies, air, workers, equipments and fluctuation of temperature during transportation and storage [27, 28].

Results of the study is indicative for contamination and inadequate of hygienic conditions in production and processing of chicken meat products. Finally to improve the hygienic quality of chicken meat products to be safe for human, consumption the contamination must be reduced by implementing satisfactory manufacturing practices and effectively training plant workers in hygiene, safety and quality assurance; application of strict hygienic measures during handling preparation and serving the products.

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