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Determination of Microbial Content in Poultry Meat in Local Iraqi Markets

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Abstract The current study was designed to assess microbial pollution (bacteria and fungi) in frozen and fresh local and imported poultry meat in Iraqi markets. A total of 120 random samples were collected from various shops and supermarkets. The collected samples were situated in two categories, each one contains 60 samples. The first category was for frozen and the second was for fresh. Each sample was divided into three replicates. These samples were taken from two meat parts (breast and legs).Total viable count, *Pseudomonas, E.coli,* fecal *Streptococcus, staphylococcus, salmonella,* fecal *coliform, Candida and Cryptococcus* were determined at 0, 24, 48 hrs at 4 Cº and -18 Cº. The results have found that initial viable count was 6.35 log 10 CFU/ gm, 5.23 log 10 CFU/ gm for fresh legs and breast. while these data were 3.2 log 10 CFU/ gm, 2.55 log 10 CFU/ gm for, frozen legs and breast at zero time. At, 24 h, these values were 6.45±0.24 and 5.33±0.11 log 10 CFU/ gm for fresh parts whilst for frozen parts, these data were 3.35±0.21 and 2.23±0.05 log 10 CFU/ gm for leg and breast parts respectively. However, at 48 h, Fresh parts had higher values (6.55±0.14 log 10 CFU/ gm for leg and 5.5±0.11 log 10 CFU/ gm for breast) than those (3.45±0.24 log 10 CFU/ gm for leg and 2.33±0.01 log 10 CFU/ gm for breast) of frozen parts. *Salmonella, Candida and Cryptococcus* of fresh samples gave positive test at deferent times while frozen samples had negative test again at deferent times.

Keywords Poultry Meat, Contamination, Microbial Flora, Total Viable Count

1. Introduction

In recent years, Iraqi local markets were invaded by various food stuff from different known and unknown origins regardless whether such food valid for human consumption or not. Also, the lack of proper requirements of transporting, storing and marketing of such food may result in contamination of the food with various physical, chemical, and biological contaminants that may form serious health threats particularly of those imported products. The refrigerated poultry meat would be spoilage when stored for a long period due to the microorganism actions in addition to the biochemical transformations inside the product[1, 2, 3]. After the birds being slaughtered, the muscular tissue suffers irreversible physical, chemical and biochemical transformations that determine the muscle to convert in meat. The microbial spoilage processes occurs later. Using refrigeration temperatures for meat conservation purpose reduces microorganism activity[4]. In Iraq, poultry slaughtered manually, there for contaminated by different types of microorganisms bacteria, fungus even parasites from soil or from contaminated earth with other poultry wastes[5, 6]. Sometimes the washing is unbeneficial to be pure from microorganisms and we need immediately cooking for meat to kill these creatures especially pathogenic one[7], While the frozen poultry meat which comes to markets from unknown origins may be contaminated by certain microbial pollutants, because unknown sources, processing and transporting in addition to instability of electrical power.

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2. Materials and Methods

2.1. Samples Collection

120 samples of poultry meats (fresh and frozen) were collected from local markets, three replicates of each sample were place in polyethylene clear bag under cold conditions (0 -1°c), and transformed to the lab within one hour. 25 gm of each sample (drumstick and breast) was treated with 225 ml of 0.9% normal saline and homogenized using a stomacher (Lab Blender 400; Seward Medical) for 60s at room temperature. Total viable microbial count was determined. Bacteria was identified whilst fungi was isolated and diagnosed from these samples[8].

2.2. Total Viable Count

Total viable plate count (TVC) was enumerated on Plate Count Agar (Biomark Labolatories, India), by incubating at

37 °C for 48 hrs. Yeasts and moulds were enumerated using Potato Dextrose Agar (Biomark Labolatories, India) supplemented with chloramphinecol (100µg/ml) after incubating at 28ºC for 72 hr. *Escherichia coli*, Enterobacteriaceae and coliform were grown on McCongy agar plates *E coli* diagnosed on EMB agar (Biomark Labolatories, India).

Staphylococcus was determined using manittol salt agar (Biomark Labolatories, India) after incubation at 37 °C for 48 hrs. All plates were examined visually for typical colony types and morphological characteristics associated with each growth medium. Suspected colonies were tested biochemically by the methods as described in the Food and Drug Administration Bacteriological Analytical Manual (http://www.cfsan.gov/~ebam/bam-5.html)[9]. Three replic ations of at least three appropriate dilutions were enumerated.

2.3. Statistical Analyses

All data were analyzed by using SPSS software program by using ANOVA I test and multiple comparisons.

3. Result and Discussion

3.1. Microbial Flora from Fresh Poultry Meat

The present study focused on monitoring the changes in microbial flora of fresh and frozen poultry meat which stored at 4ºC and -18ºC, under normal conditions without any processing and additions, from table 1 we can see increasing in the VTC and other species of microorganisms as a result of stored at 4ºC, this may due to elevated of initial viable count, beside of at 4ºC is inadequate to stop and suppression the microbial growth.

Drum stick have higher content of microbial flora than breast, this may be belonged to high content of fat as a compared with breast. From table 1 we see *Salmonella, Candida* and *Cryptococcus* gave positive results due to high contamination of slaughter Shops with different type of microorganisms which attached to animal bodies during slaughter and cleaning.

Within the same column there is significant differences at Probability ≤0.05 between the deferent species of bacteria, viable count gave higher counting while the coliform came in the second level.

3.2. Microbial Flora from Frees Poultry Meat

According to Table 2, the total viable bacteria, *Pseudomonas* and fecal *Streptococcus* counts ($\log_{10}$ CFU/g) in poultry meat stored at -18 ºC at day 0 were 3.2, 1.2 and 2.5, respectively. After 2 days at -18ºC, the counts ($\log_{10}$ CFU/g) increased to 2.25 in *Pseudomonas* bacteria and became 2.33 in TVC and 1.4 in fecal *Streptococcus*, while *Salmonella*, *Candida* and *Cryptococcus* showed negative result in all samples which stored under -18 ^{o}C. According to[10], the *Salmonella* and *E. coli* in poultry meat were positive at the first day. *Pseudomonas* spp. was also present among the aerobic poultry spoilage micro-flora and could play a role in the aerobic spoilage of poultry meat. According to[11], *Pseudomonas* counts ($\log_{10}$ CFU/g) on fresh poultry meat at day zero which then spoiled at day seven, were 2.3 and 7.4, respectively.[12], found that *Pseudomonas* spp. represented 5% and 72% of total count in fresh and spoiled poultry meat, respectively.

Some studies in Saudi Arabia have indicated that retail meat products were more likely to carry higher total viable bacteria, *Pseudomonas*, fecal *Streptococcus* and coliform counts in summer season.

In general TVC and both *Pseudomonas, E.coli,* fecal *Streptococcus,* fecal *coliform and staphylococcus suffered* graduated increasing in growth rate with storage time, while *salmonella, Candida and Cryptococcus* gave positive results in (drumstick and breast) which stored at 4 °C, while poultry meat which stored at -18 °C suffered depression in TVC as well as *Pseudomonas, E.coli,* fecal *Streptococcus,* fecal *coliform* and *Staphylococcus* with storage time.

Moreover *salmonella, Candida and Cryptococcus* gave negative results in two anatomical parts (drumstick and breast).

Table (1). Microbial content ($\log_{10}$ CFU/gm) of fresh sloughed poultry meat

Type of microorganisms/ viable count ($\log_{10}$ CFU/gm)	Drum stick			Breast		
	Time at 4ºC					
	0	24	48	0	24	48
Total viable count	6.35±0.12a	6.45±0.24a	6.55±0.14a	5.23±0.15a	5.33±0.11a	5.5±0.11a
Pseudomonas	3.2±0.09b	3.42±0.05b	4.1±0.11b	3.15±0.21b	2.85±0.35b	3.1±0.52b
Fecal *Streptococcus*	4.4±0.025c	4.62±0.32c	5.1±0.16c	4.2±0.13c	4.4±0.14c	4.2±0.42c
Staphylococcus	4.1±0.091c	3.2±0.41b	3.5±0.12d	2.1±0.22d	3.1±0.15d	3.3±0.32b
Fecal *coliform*	5.5±0.2d	5.3±0.15d	4.84±0.11e	3.5±0.14b	3.1±0.32d	2.4±0.22d
E. coli	3.65±0.4b	3.66±0.23b	2.78±0.4f	2.2±0.11d	2.6±0.16b	2.65±0.12d
Salmonella	Positive	Positive	Positive	Positive	Positive	Positive
Cryptococcus	Positive	Positive	Positive	Positive	Positive	Positive
Candida	Positive	Positive	Positive	Positive	Positive	Positive

Each number refer M±SD of three replicate
Different letters in the same column refer to significantly differences at ($p<0.05$)

Table (2). Microbial content (log 10 CFU/gm) of frozen poultry meat

Type of microorganisms/ viable count (Log10 CFU/gm)	Drum stick			Breast		
	Time at -18 °C					
	0	24	48	0	24	48
Total viable count	3.2±0.21a	3.35±0.21a	3.45±0.24a	2.55±0.16a	2.23±0.05a	2.33±0.01a
Pseudomonas	1.2±0.11b	2.2±0.19b	2.42±0.05b	1.1±0.01b	1.15±0.11b	2.25±0.05a
Fecal *Streptococcus*	2.5±0.24c	3.4±0.125a	3.62±0.32a	1.1±0.06b	1.2±0.12b	1.4±0.12b
Staphylococcus	1.4±0.14b	1.1±0.15c	1.2±0.41c	1.5±0.02b	2.1±0.25a	2.1±0.05a
Fecal *coliform*	2.65±0.26c	2.5±0.21a	2.3±0.15b	1.84±0.61c	2.5±0.15a	3.1±0.12c
E. coli	3.4±0.092a	3.15±0.14a	3.26±0.23a	2.78±0.24a	2.2±0.17a	2.1±0.11a
Salmonella	Negative	Negative	Negative	Negative	Negative	Negative
Cryptococcus	Negative	Negative	Negative	Negative	Negative	Negative
Candida	Negative	Negative	Negative	Negative	Negative	Negative

Each number refer M±SD of three replicate
Different letters in the same column refer to significantly differences at ($p<0.05$)

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