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PUBLIC HEALTH HAZARDS OF EDIBLE CHICKEN GIBLETS

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ABSTRACT

A total of 45 chilled of chicken giblets (liver, heart, gizzard) were collected randamly from different retail shops at El Bohiera Province and examined for sensory, chemical and microbilogical examination. For chemical examination, mean value of TVN (mg/100g) in chilled samples (liver, heart and gizzard) were 13.33, 14.61 and 14.87, respectively and mean value of TBA (mg malonaldehyde/kg sample) were 0.70, 0.80 and 0.45 in chicken giblets (liver, heart and gizzard), respectively. All examined chilled samples, (liver, heart and gizzard) found to be contaminated with different types of microorganisms with the mean values of $3.49x10^4 \pm 1.06x10^4$, $4.28x10^4 \pm 1.54x10^4$ and $4.63x10^4$, respectively. For *Mesophilic* counts; $2.37x10^5 \pm 8.78x10^4$, $1.39x10^5 \pm 9.18x10^4$ and $2.19x10^5 \pm 9.66x10^5$ respectively, for *Enterobacteriacae* count; $1.24x10^5 \pm 5.46x10^4$, $5.69x10^4 \pm 2.57x10^4$ and $1.05x10^5 \pm 4.57x10^4$ respectively, for Coliforms counts; $4.60x10^2 \pm 2.70x10^2$, $7.18x10^2 \pm 6.69x10^2$ and $9.12x10^2 \pm 8.32x10^2$ respectively, for *Mould* counts and finally $3.94x10^3 \pm 2.59x10^3$, $1.68x10^3 \pm 1.19x10^3$ and $2.58x10^3 \pm 1.48x10^3$, respectively for Yeast count. The incidence of identified *Staph. aureus* in chilled samples chicken giblets (liver, heart, gizzard) was 7%, 10% and 7%, respectively while the incidence of identified *Salmonella spp* was 17%, 13% and 20%, respectively.

Key words: *Chicken giblet, Salmonella spp., Staph. aureas, Enterobacteriacae, coliform, Total Volatile and Thiobarbituric acid.*

INTRODUCTION

Poultry is a food that has been highly appreciated by man. It is an important, low cost, source of animal protein with low calories and cholesterol, rich in nutrients, phosphorus, other minerals, and B-complex vitamins (FAO 2010).

Chicken giblets contain amount of protein as other kinds of meat, and are a good source of vitamins as riboflavin, thiamine and ascorbic acid and minerals as sodium, potassium, calcium, iron, phosphorus, sulphur, chlorine and iodine (Mountney, 1966).

In small-scale slaughtering facilities, birds are slaughtered and then scalded in hot water. The carcasses are then plucked and eviscerated, mostly by hand. At evisceration, the vent is opened, the internal organsare removed, and the gizzard, liver and heart may be harvested. These edible organs can be contaminated through spillage of the contents of the intestines. After evisceration, they are often washed, which may contribute to the dissemination of bacteria on and among them (Arnold, 2007).

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Enzymatic and chemical reactions are usually responsible for the initial loss of freshness, whereas microbial activity is responsible for the overspoilage which thereby establishes product shelf life (Gram, L. and Huss, H. H. 1996).

Chemical analysis of further processed chicken meat products is greatly varied, so, testing of the final products is a common practice in cooked and uncooked chicken meat products and giblets and applied to ensure the compliance of such products with the legal and composition of standards written on the label (Beckers, 1998).

Therefore, the microbial content of these products should be minimized for consumption (Carvalho *et al.*, 2005). Processing of poultry products requires a severe microbiological quality control, considering they are one of the main sources of food borne infections.

Enterobacteriaceae family is a group of bacteria that is used to assess the general hygiene status of a food product (HPA, 2004). Where ever *Salmonella* was selected as the largest pathogenic microorganism because it is one of the most common causes of food poisoning, it present at varying frequencies on all types of poultry products (Rose *et al.*, 2002).

Therefore, this study is designed to assess the contamination of Chilled Chicken Giblets by *Enterobacteriaceae.* Also, total *staph.* count and *Staph.aureus* counts, which are present on hand, mucous membrane and skin of man, birds and animals, are good indicators of poor personal hygiene, poor handling and temperature control (Rindhe *et al.,* 2008).

Total bacterial, *Enterobacteriaceae* and fungal counts are considered as indices of quality, which give an idea about the hygienic measures during further processing and help in assessing the keeping quality of further processed chicken meat products (Aberle *et al.,* 2001).

So the present study aimed to determine Public health hazard of chicken giblets. Determine the prevalence of *Salmonella* in chicken giblets and determination degree of spoilage and deterioration of these giblets through determination of TVN and TBA.

MATERIALS AND METHODS

Collection of samples: A total of 45 random samples of chicken giblets including (liver, heart and gizzard) classified into samples of each organ. (15 of each) were collected from chilled poultry shops at El Bohiera governorate, where the collected samples were transferred directly to the laboratory of Food Hygiene in complete aseptic conditions without delay to be subjected for sensory, chemical and microbiological examination.

1. Sensory evaluation: (Morr-Marry 1970): The sensory evaluation was carried out on the poultry giblets using semi-trained panelists. The panelists were explained about the nature of experiment without disclosing the identity of the samples. The sensory evaluation of giblets was performed at room temperature, using white light. They were requested to record their preferences for color, odor, texture and overall acceptability.

2. Chemical examination:

2.1. Determination of Total Volatile Nitrogen (TVN) (FAO, 1980): By using GERHARDT apparatus.

2.2. Determination of Thiobarbituric acid (TBA) (Kirk and Sawyers, 1991)
By using SPECTROPHTOMETER. (Spectrouv-vis double beam pc.) Scanning SPECTROPHTOMETER uvd- 2950.

3. Microbiological examination:
3.1. Preparation of samples: (APHA, 1992)
Ten grams of each samples were weighted aseptically into sterile homogenizer flask containing 90 ml of sterile peptone water 0.1%. The contents of the the homogenizer flask were homogenized for 2.5 minutes at 2000 rpm room temperature. Subsequent 10th fold serial dilution of the homogenate was prepared up to 10^{-6} from the original dilution (1:10). The prepared dilutions were used for microbiological examination.

3.2. Procedures:
A.1.Determination of *Mesophilic* bacteria counts (ISO, 2007).
A.2.Determination of *Enterobacteriaceae* count (ISO, 2007).
A.3. Determination of *Coliforms* counts (ISO, 2007).

B. Isolation and identification of some pathogenic bacteria:
B.1.Isolation and identification of *Salmonella* (ISO, 2007).
B.2. Isolation and identification of *Staph.aureus* (ISO, 2007).

C. Mycological examination:
C.1. Determination of *Mould* and *Yeast* count (Cruickshank *et al.,* 1975).
C.2. Isolation and identification of *Mould* and *Yeast* count (Raper and Fennel, 1965, Samson *et al.,* 1976 and Refai, 1987).

RESULTS

Table 1: The percentage of normal, abnormal samples and the score of acceptability according to sensory examination based on color, odor and texture. (n=30)

Organs		Liver		Heart		Gizzard	
Parameter		No.	%	No.	%	No.	%
Color	Normal	18	60	22	73	24	80
	Abnormal	12	40	8	27	6	20
Odor	Normal	23	77	25	83	22	73
	Abnormal	7	23	5	17	8	27
Texture	Normal	24	80	21	70	23	77
	Abnormal	6	20	9	30	7	23
Quality & Acceptability	Excellent	17	57	24	80	26	87
	Very good	9	30	5	17	3	10
	Medium	3	10	1	3	1	3
	Fair	1	3	--	--	--	--

Table 2: Statistical analytical results of TBA (mg malonaldehyde/kg sample) in examined chilled samples of liver, heart and gizzard. (n= 15 for each)

Type of samples	Min.	Max.	S\
Liver	12.40	13.70	13.33 ± 0.09^{b}
Heart	13.90	15.50	14.61 ± 0.14^{a}
Gizzard	13.40	16.30	14.87 ± 0.22^{a}

Means within the column followed by different letters showed high significant difference (P< 0.05).
Min= Minimum
Max.=Maximum
S\= Standerd error

Table 3: Statistical analytical results of TBA (mg malonaldehyde/kg sample) in examined chilled samples of liver, heart and gizzard. (n= 15 for each)

Type of samples	Min.	Max.	S\
Liver	0.54	0.90	0.70 ± 0.03^{a}
Heart	0.41	0.94	0.80 ± 0.03^{a}
Gizzard	0.24	0.76	0.45 ± 0.03^{b}

Means within the column followed by different letters showed high significant difference (P< 0.05).

Table 4: Statistical analytical results of *Mesophilic* bacterial count (cfu/g) in the examined chilled samples of chicken giblets (Liver, Heart and Gizzard) (n=15).

Type of samples	Positive samples		Min.	Max.	S[1]
	No	%			
Liver	15	100	$2.80x10^{3}$	$1.14x10^{5}$	$3.40x10^{4} \pm 1.06x10^{4}$ a
Heart	14	93	$1.00x10^{3}$	$2.08x10^{5}$	$4.28x10^{4} \pm 1.54x10^{4}$ a
Gizzard	14	93	$1.70x10^{3}$	$1.36x10^{5}$	$4.63x10^{4} \pm 1.29x10^{4}$ a

Means within a column showing no significant difference ($P \geq 0.05$)

Table 5: Statistical analytical results of *Enterobacteriaceae* count (cfu/g) in the examined chilled samples of chicken giblets (Liver, Heart and Gizzard) (n=15).

Type of samples	Positive samples		Min.	Max.	S[1]
	No	%			
Liver	14	93	$1.00x10^{3}$	$8.10x10^{5}$	$2.37x10^{5} \pm 8.78x10^{4}$ a
Heart	14	93	$2.00x10^{2}$	$1.31x10^{6}$	$1.39x10^{5} \pm 9.18x10^{4}$ a
Gizzard	13	87	$3.10x10^{3}$	$9.40x10^{5}$	$2.19x10^{5} \pm 9.66x10^{4}$ a

Means within a column showing no significant difference ($P \geq 0.05$)

Table 6: Statistical analytical results of *Coliforms* count (cfu/g) in the examined chilled samples of chicken giblets (Liver, Heart and Gizzard) (n=15).

Type of samples	Positive samples		Min.	Max.	S[1]
	No	%			
Liver	13	87	$2.00x10^{2}$	$6.30x10^{5}$	$1.24x10^{5} \pm 5.46x10^{4}$ a
Heart	13	87	$3.00x10^{2}$	$2.70x10^{5}$	$5.69x10^{4} \pm 2.57x10^{4}$ a
Gizzard	15	100	$3.00x10^{2}$	$6.30x10^{5}$	$1.05x10^{5} \pm 4.57x10^{4}$ a

Means within a column showing no significant difference ($P \geq 0.05$)

Table 7: Incidence of *Salmonella* spp. isolated from the examined fresh and chilled samples of chicken giblets (Liver, Heart and Gizzard). (n=30).

Type of sample	No.	%
Liver	**5**	**16.67 [a] %**
Heart	**4**	**13.33 [a] %**
Gizzard	**6**	**20 [a] %**

Number of *salmonella* spp. incidence within the column showing no significant difference ($p \geq 0.05$)

Table 8: Incidence of *Staph.aureus* isolated from the examined fresh and chilled samples of chicken giblets (Liver, Heart and Gizzard) (n=30).

Type of sample	Staphylococci Coagulase +ve	
	No.	%
Liver	**2**	**6.67 [a] %**
Heart	**3**	**10 [a] %**
Gizzard	**2**	**6.67 [a] %**

Number of *Staph.aureus* incidence within the column showing no significant difference (p≥0.05)

Table 9: Statistical analytical results of *Mould* count (cfu/g) in the examined chilled samples of chicken giblets (Liver, Heart and Gizzard) (n=15).

Type of samples	Positive samples		Min.	Max.	S[1]
	No	%			
Liver	9	60	1.00x10	$3.60x10^3$	$4.60x10^2 \pm 2.70x10^{2\,a}$
Heart	9	60	1.00x10	$5.40x10^3$	$7.18x10^2 \pm 6.69x10^{2\,a}$
Gizzard	10	67	1.00x10	$8.40x10^3$	$9.12x10^2 \pm 8.32x10^{2\,a}$

Means within a column showing no significant difference (P ≥ 0.05)

Table 10: Statistical analytical results of *Yeast* count (cfu/g) in the examined chilled samples of chicken giblets (Liver, Heart and Gizzard) (n=15).

Type of samples	Positive samples		Min.	Max.	S[1]
	No	%			
Liver	15	100	5.00x10	$3.92x10^4$	$3.94x10^3 \pm 2.59x10^{3\,a}$
Heart	15	100	5.00x10	$1.82x10^4$	$1.68x10^3 \pm 1.19x10^{3\,a}$
Gizzard	15	100	2.00x10	$2.28x10^4$	$2.58x10^3 \pm 1.48x10^{3\,a}$

Means within a column showing no significant difference (P ≥ 0.05)

Table 11: Incidence of identified *Moulds* and *Yeast*s isolated from the examined fresh and chilled samples of chicken giblets (Liver, Heart and Gizzard). (n=30).

Type of sample	Mould			Yeast		
	Species	No.	%	Species	No.	%
Liver	1. Penicillium spp.	8	26 %	*1.Candida albicans*	21	70 %
	2. Fusarium spp.	4	13 %	*2.Candida tropicalis*	24	80 %
	3.A.flavus	3	10 %	3. Rhodotorulla spp.	10	33 %
	4.A.niger	5	17 %	*4.Trichosporum asahii*	5	17 %
	5.A.ochrachious	2	6 %	*5.Cryptococcus*	6	20 %
	6. Microsporum spp.	3	10 %	*neoformans*		
	7.alternaria	3	10%			
Heart	1. Penicillium spp.	15	50 %	*1.Candida albicans*	18	60 %
	2.A.flavus	2	6 %	*2.Candida tropicalis*	19	63 %
	3.A.niger	3	10 %	3. Rhodotorulla spp.	8	26 %
	4.A.ochrachious	4	13 %	*4.Trichosporum asahii*	3	10 %
	5. A.fumigatus.	2	6 %	*5.Cryptococcus*	5	17 %
	6. Microsporum spp.	2	6 %	*neoformans*		
	7.alternaria	4	13 %			
	8. Cladosporium spp.	5	17 %			
Gizzard	1. Penicillium spp.	5	17 %	*1.Candida albicans*	25	83 %
	2.A.flavus	3	10 %	*2.Candida tropicalis*	18	60 %
	3.A.niger	4	13 %	*3*. Rhodotorulla spp.	6	20 %
	4. Microsporum spp.	10	33 %	*4.Trichosporum asahii*	4	13 %
	5.alternaria	3	10 %	*5.Cryptococcus*	7	23 %
	6. Mucor spp.	5	17 %	*neoformans*		
	7. Monilinia spp.	2	6%			

= Minimum.Min.
Max. =Maximum
S\= Mean

DISCUSSION

During the last decade, the demand of ready to eat Chicken meat products and giblets has increased in Egyptian food markets and receive a real consumer preferability because they considered as quick easily prepared meat meals and solve the problem of shortage in fresh meat of high price which is not within the reach of large numbers of families with limited income. (Ibrahim *et al.,* 2014).

1. Sensory results:

Appearance, taste, aroma, and texture of meat can generally produce a consumer's decision to purchase meat. Flavor comprises mainly taste and aroma and involves in consumers' meat purchasing behavior and preferences even before the meat is eaten (Sitz *et al.,* 2005).

This examination illustrate the abnormalities in chicken giblets that appear on organs and seen by eye, smelled, and sensed by hand by means of physical examination. Table (1) showed that the percentage of normal, abnormal samples and the score of acceptability according to sensory examination based on color, odor and texture.

The results given in Table (1) revealed that the acceptable color in examined liver, heart and gizzard were 60%, 73% and 80%, respectively. The predominant color was the brownish color in examined organs as normal while yellowish, greenish, pale and presence of patches either hemorrhagic or white patches considered as abnormal one.

The acceptable odor was recorded in 77%, 83% and 73% of examined liver, heart and gizzard samples, respectively. The lively fresh characteristic odor of organs considered as normal, while fecal, offensive or any change in odor considered abnormal one. The normal texture of liver was firm, the data showed that 80% of examined liver had normal consistency, while 70% of examined heart had normal consistency and 77% of examined gizzard, while abnormal texture of liver was friable, soft consistency of gizzard and abnormalities in heart were fibrinousprecarditis or soft texture. Also Table (1) showed that the abnormalities in color in liver, heart and gizzard were 40%, 27% and 20%, respectively. While abnormal odor were 23%, 17% and 27% in liver, heart and gizzard, respectively. And finally abnormal texture obtained were 20%, 30% and 23% in liver, heart and gizzard, respectively. The higher results were obtained by (Morshdy and Hafez, 1986), while lower results obtained by (Morshdy *et al.,* 2015). Also it is obvious that 57%, 30%, 10% and 3% of examined liver samples, 80%, 17%, 3% and 0% of examined heart and 87%, 10%, 3% and 0% of examined gizzard samples have a score excellent, very good, medium and fair grades, respectively according to the quality system recommended by (Morr Marry 1970). According to these results examined samples were accepted organoleptically except 3% of examined liver samples which have fair score. These sensory factors of examination consider as indicators of spoilage which are noticeable on meat when bacterial numbers reached approximately 10^{-7}cfu/g (Nakagawa *et al.,* 1999).

2. Chemical examination:

2.1. Determination of Total volatile Nitrogen (TVN) value:

Regarding the results recorded in Table (2) TVN values (mg/100g) in examined chilled samples ranged from 12.40 to 13.70with a mean value of 13.33± 0.09 in Liver, in heart were ranged from 13.90 to 15.50 with a mean value of 14.61± 0.14 and in gizzard were ranged from 13.40 to 16.30 with a mean value of 14.87± 0.22, respectively.

There were high significant difference ($p<0.05$) between the examined chilled chicken giblets for TVN, while the examined samples were accepted according to (EOS, 2005) limits which should not exceed 30 mg/100gm in offals.

TVN could reflect important correlation between decomposition and meat products quality (Pearson, 1968). So increased percentage of TVN in meat products means increasing of decomposition. So table (2) show that all examined samples of chicken giblets were accepted according to (EOS, 2005) the TVN value reached more than 20/mg flesh, meat will be rejected, and edible offal should not exceed 30 mg/100g.

2.2. Determination of Thiobarbituric Acid (TBA) value:

Table (3) showed that, the Thiobarbituric acid value **(**mg malonaldehyde/kg sample) in chilled giblet samples were ranged from 0.54 to 0.90 with a mean value of 0.70 ± 0.03 in Liver, in Heart ranged from 0.41 to 0.94 with a mean value of 0.80± 0.03 and in Gizzard were ranged from 0.24 to 0.76 with a mean value of 0.45 ± 0.03, respectively.

There were high significant difference ($p<0.05$) between the examined chilled chicken giblets for TBA. While the examined samples were accepted according to (EOS, 2005) limits.

In table (3) showed that all examined chilled samples of chicken giblets were accepted based on their TBA content according to (EOS, 2005) which stated that the maximum permissible limit for TBA in edible offals should not exceed 0.9 mg malonaldehyde / kg of sample. While the results in this examined chilled

samples showed that TBA values were higher in examined heart samples than examined liver and gizzard samples. This may be attributed to the fact that heart surrounded by fatty cap, (coronary fat) however gizzard and liver low fat content.

The TBA test has become the most widely used chemical method for assessing the extent of oxidative deterioration in meat products. (Tarladgis *et al*., 1960) and the rancid flavor is initially detected in meat between TBA values of 0.5 and 2.0 (Gray and Pearson, 1987).

TBA is a good indicator of the quality of meat. TBA value is widely used as an indicator for the assessment of degree of lipid oxidation (Raharjo and Sofos, 1993).

3. Microbiological examination:

3.1. Determination of *mesophilic* bacterial count (cfu/g):

Chicken giblets are considered as a vehicle of most reported food poisoning outbreaks. So it's important to use the microbiological criteria to determine its acceptability for consumption. According to results showed in aerobic plate counts are acceptable measure of the general degree of bacterial contamination and the hygienic conditions of processing plants (Cohen *et al*., 2007).

Table (4) which indicated the *mesophilic* bacterial count (cfu/g) in the examined chilled samples varied from $2.80x10^3$ to $1.14\ x10^5$ with a mean value of $3.40\ x10^4 \pm 1.06\ x10^4$ for liver, $1.00x10^3$ to $2.08\ x10^5$ with a mean value of $4.28\ x10^4 \pm 1.54\ x10^4$ for heart and $1.70\ x10^3$ to $1.36x10^5$ with a mean value of $4.63\ x10^4 \pm 1.29\ x10^4$ for gizzard.

From this results, there were no significant differences (P<0.05) of APC between examined chilled chicken giblets, and it was indicated that all examined chilled samples were in accordance with permissible limit of (EOS, 2005) in which the maximum permissible limit for APC of raw poultry parts and heat treated poultry meat products was 10^5 and 10^4cfu/g according to (EOS, 2005).

Nearly similar results were obtained (Oumokhtar, 2000) who revealed that the mean value of APC in chicken parts was $2.9\ x\ 10^4$cfu/g. However, lower results in gizzards were obtained by (Mohamed *et al*., 2014) who reported that APC $1.3x10^3$cfu/g in gizzard. While higher results were obtained by (Saikia and Joshi, 2010) who mentioned that APC was 3×10^6 in liver and $5\ x\ 10^5$ in gizzard.

3.2. Determination of *Enterobacteriaceae* count (cfu/g):

It is evident from the results recorded in Table (5) that *Enterobacteriaceae* count (cfu/g) in the examined chilled chicken giblets ranged from $1.00x10^3$ to $8.10x10^5$ with a mean value of $2.37x10^5 \pm 8.78x10^4$ for liver, $2.00x10^2$ to $1.31x10^6$ with a mean value of $1.39x10^5 \pm 9.18x10^4$ for heart and $3.10x10^3$ to $9.40x10^5$ with a mean value of $2.19x10^5 \pm 9.66x10^4$ for gizzard, respectively.

From this results, there were no significant differences (P<0.05) of *Enterobacteriaceae* between examined chilled offal samples, and results from Table (5) showed that all examined samples of chicken giblets were unaccepted based on their *Enterobacteriaceae* count according to (EC, 2007) which stated that the maximum permissible limit for *Enterobacteriaceae* count in chicken giblets should not exceed $3.17x10^2$ cfu/g. Regarding to chicken giblets, no data available on higher results for *Enterobacteriaceae* count, while lower results obtained by (Saikia and Joshi, 2010) who mentioned that average of *Enterobacteriaceae* count was 1×10^4cfu/g in examined liver samples and was 2.3×10^3 cfu/g in examined gizzard. And increase the average of *Enterobacteriaceae* count in this study may be as evidence of bad hygienic status of giblets either from processing or handling of workers.

3.3. Determination of Coliforms counts (cfu/g):

Coliform is a group of organisms is used as indicators for public hygiene. From the obtained results recorded in Table (6) it was clear that the *Coliform* count (cfu/g) in the examined chilled samples varied from $2.00x10^2$ to $6.30x10^5$ with a mean value of $1.24x10^5 \pm 5.46x10^4$ for liver, $3.00x10^2$ to $2.70x10^5$ with a mean value of $5.69x10^4 \pm 2.57x10^4$ for heart and $3.00x10^2$ to $6.30x10^5$ with a mean value of $1.05x10^5 \pm 4.57x10^4$cfu/g for gizzard.

From this results, there were no significant differences (P<0.05) of *Coliform* count between examined chilled chicken giblets. According to the safe permissible limit obtained by (EOS, 2005) for *Coliform* count in chicken giblets (Not exceed 10^2 cfu/g), the obtained results of examined chicken giblets in this study were unaccepted with this limit.

It is evident that no similar data available to the results obtained in this study of *Coliforms* count, while (Mohamed *et al*., 2014) reported that, there was no growth of *Coliform* in all examined gizzard burger samples with exception to fresh gizzards which contained few cells ($\leq 10^2$).

Identification of *Salmonella* spp. in examined chilled and freshckicken giblet samples:

Although the incidence of *Salmonellosis* in that study have reduced but it still one of the major causes of out breaks of food poisoning. Table (7) showed that the incidence of the identified *Salmonella* spp. isolated from chilled and fresh giblet samples (Liver, Heart and Gizzard) was (5, 4 and 6) (16.67 %, 13.33 % and 20%), respectively.

There was no significant difference ($p \geq 0.05$) between chicken giblets for incidence of *Salmonella* spp.

Higher results of *Salmonella* spp. incidence in Giblets were obtained by (Molla and Mesfin, 2003) who reported a high level of Salmonella contamination, was found in chicken gizzard (41.1 %) and liver (34.5 %) followed by heart (23.7 %), and lower results obtained by (Chaiba Abdellah *et al.*, 2008) who reported that Salmonella spp. contamination was found in chicken gizzard (13.88 %) and liver (11.11%). While very low result of salmonella spp. obtained by (Korashy and Mohamed 2012) was 5.8 % in total poultry giblets, and (Morshdy *et al.*, 2015) who mention that salmonella in liver samples (10%) followed by gizzard and heart with percentage of (6.67%).

The prevalence of salmonellae on retail poultry carcasses remains a significant public health concern. Salmonellae are responsible for the majority of acute cases of human gastroenteritis (Mulder, 1995). Numerous strains of the salmonella's genus cause gastrointestinal illness worldwide, causing substantial morbidity, hospitalization and economic burden. The most common route of transmission of salmonellae is the fecal-oral route, where humans are infected from ingestion of the bacteria from contaminated food or water, or following direct or indirect contact with the feces of an infected human or animal. Common animal sources of Salmonellosis include poultry and other birds.

Identification of *Staphylococcus aureus* in examined chilled and fresh giblet samples:

Staph.aureus was causing food poisoning and if it grows in large numbers can leave toxins in the products. Also it lives on the skins of humans and animals and easily transferred to food products. Table (8) showed the incidence of identified *Staph.aureus* isolated from examined chilled and fresh chicken giblet samples (Liver, Heart, and Gizzard) and the positive Coagulase for *Staph.aureus* of the examined giblet samples was (2, 3 and 2) (6.67%, 10% and 6.67%), respectively.

There was no significant difference ($p \geq 0.05$) between offals for incidence of *Staph.aureus.* While the higher incidence of *Staph.aureus* may be due to very bad hygienic measures in many supermarkets (Hayes, 1992). Accordingly, *Staph.aureus* count can be taken as an indicator of sanitary conditions under which products were manufactured and handled (Potter, 2001). *Staph.aureus* enterotoxine are the predominant cause of gastrointestinal symptoms observed during intoxications. *Staph.aureus* is considered the third most important cause of disease in the world amongst the reported food borne illness (Tamarapu *et al.*, 2001).

Determination of *Mould* counts (cfu/g):

Moulds and *Yeasts* may play an important role in food spoilage; some *moulds* can also produce mycotoxins that can be harmful to humans. In Table (9), illustrates the *Moulds* count (cfu/g) of examined chilled chicken giblets samples ranged from 1.00x10 to $3.60x10^3$ with a mean value of $4.60x10^2 \pm 2.70 x10^2$ for liver, 1.00x10 to $5.40x10^3$ with a mean value of $7.18x10^2 \pm 6.69x10^2$ for heart and 1.00x10 to $8.40x10^3$ with a mean value of $9.12x10^2 \pm 8.32x10^2$cfu/g for gizzard.

From this results, there were no significant differences ($P<0.05$) of *Mould* count between examined chilled offal samples. It is evident that the average means of examined samples of edible offals were unaccepted based on *Mould* count according to (EOS, 2005) which stated that edible offals should be free from any fungal growth; this may be due to bad hygienic measures or handling by workers in contact with offals collection, while there are some separate samples, free from any fungal growth. No available data of *Mould* count similar to the data in the study, but higher results obtained by (Saikia and Joshi, 2010) who mentioned that average *Mould* count in liver was 1.3×10^4cfu/g, while mean value of *Mould* count in gizzard was zero, while lower results obtained by (Elkewaiey, 1997) who reported that average *Mould* count were 6.3x10, 5x 10 and 2.2x10 in liver, heart and gizzard, respectively.

Mould may grow over an extremely wide range of temperature. So, one find *mould* grows on particularly all food at almost any temperature under which foods are held. Besides, *Mould* can assist in the putrefactive processes and may produce toxic substances namely mycotoxins which are harmful to human and animals (Frazier and westhoff, 1983). Presence of *Mould* in the examined samples may be attributed to the fact that *Mould* need moisture to grow. So, they often found in environment as abattoir in which water is the base of the work (El- Shamy, 2011).

Determination of *Yeast* count (cfu/g):

It is evident from Table (10) that the *Yeast* count (cfu/g) of examined chilled samples ranged from 5.00x10 to 3.92×10^4 with a mean value of $3.94x10^3 \pm 2.59x10^3$ for liver, 5.00x10 to $1.82x10^4$ with a mean value of $1.68x10^3 \pm 1.19x10^3$ for heart and 2.00x10 to $2.28x10^4$ with a mean value of $2.58x10^3 \pm 1.48x10^3$ cfu/g for gizzard.

It is evident that, there were no significant differences ($P<0.05$) of *Yeast* count between examined chilled offal samples. However the average Yeast count was unaccepted according to (EOS, 2005) which stated that edible offals should be free from fungal growth. No available data on *Yeast* count in chicken giblets and this increase in count of Yeast was attributed to moisture content and chilling factor which have

important role in *yeast* contamination and growth. Nearly similar results obtained by (Elkewaiey, 1997) who reported that average results in liver, heart and gizzard were $3.1x10^3$, $1.8x10^3$ and $1.3x10^3$, respectively.

Identification of *Mould* and *Yeast spp*. in examined samples:

Table (11) showed that the incidence of identified *Mould* isolated from examined chilled and fresh chicken giblets (Liver, Heart, and Gizzard) were (26, 50 and 17) % for *Penicillium spp*., (10, 6 and 10) % for *A.flavus*, (17, 10 and 13) % for *A.niger*, (10, 6 and 33) % for *Microsporum spp*., (13, 0 and 0) % for *Fusarium spp.*, (6, 13 and 0) % for *A.ochrachious*, (10, 13 and 10) % for *alternaria*, (0, 6 and 0) % for *A.fumigatus*, (0, 17 and 0) % for *Cladosporium spp.*, (0, 0 and 17) % for *Mucor spp*. and (0, 0 and 6) % for *Monilinia spp*.

On the other hand, in Table (12) the incidence of identified *Yeast* isolated from examined chilled and fresh chicken giblets (liver, heart, and gizzard) were (70, 60 and 83) % for *Candida albicans*, (80, 63 and 60) % for *Candida tropicalis*, (33, 26and 20) % for *Rhodotorulla spp*., (17, 10 and 13) % for *Trichosporum asahii*, and (20, 17 and 23) % for *Cryptococcus neoformans*.

CONCLUSION AND RECOMMENDATIONS

The obtained results in this work, through the examined samples of chilled giblet samples (liver, heart and gizzard) were accepted organoleptically. For chemical examination, there were high significant differences ($P<0.05$) between the examined samples of chicken giblets for TVN and TBA. Moreover, all examined samples were accepted according to safe limit recommended by (EOS, 2005) for TVN and TBA. For bacteriological examination, examined chilled chicken giblets contaminated with a number of microorganism such as *mesophilic* bacteria, Enterobacteriaceae, Coliforms, Mould and *Yeast*, *Staph.aureus* and *Salmonella* spp. at different degree.

Therefore, to obtain chicken giblets (liver, heart and gizzard) with high quality to safeguard consumer's health, the following suggestions and recommendation should be taken into consideration:-

Inspection of chicken giblets: All poultry found in retail stores should be inspected by a state system which have standards equivalent to the federal government. At the time of slaughter each bird and its internal organs are inspected for signs of disease to ensure that the bird and giblets are free from visible signs of disease.

Handling of Giblets: Giblets packaged separately from poultry are kept cold during distribution to retail stores to prevent the growth of bacteria and to increase shelf life. Mixture of acetic acid and lactic acid "2.5 %" of each should be sprayed on poultry carcasses and giblets after evisceration to prevent pathogenic multiplication.

Safe cooking of giblets: chicken or turkey giblets are cooked by immersing in water for use in flavoring soups, gravies or poultry stuffing. Once cooked, the liver will become crumbly and the heart and gizzard will soften and become easy to shop. Cooked giblets should have a firm texture. Casseroles containing giblets should be cooked to 165 °F. Stuffing should also be cooked to 165 °F. Chicken giblets are commonly fried or broiled. Leftovers should be refrigerated within 2 hours.

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الأهمية الصحية لأحشاء الدواجن الصالحة للاستهلاك

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في هذه الدراسة تم تجميع عدد ٤٥ عينة عشوائية من أحشاء الدواجن المبردة الصالحة للاكل بما في ذلك الكبد والقلب والقوانص وتم تصنيفها ال ١٥ عينة من كل عضو وتم نقلها مباشرة إلي معمل الرقابة الصحية علي الاغذية بدمنهور تحت ظروف معقمة كاملة دون تاخير لكي تخضع للفحوص الظاهرية والكيميائية والفحص الميكروبيولوجي وكانت النتائج كالتالي :بالنسبة للفحص الكيميائي كانت القيم المتوسطة من مركبات النتيروجين الطيارة (TVN) (مجم / 100جم) في عينات الاحشاء المبردة 13.33 ، 13.90&14.87 في الكبد والقلب والقوانص علي التوالي. وكانت القيم المتوسطة لحامض الثيوباربتيوريك (TBA) (مجم مالونالدهايد / كجم عينة) في عينات الاحشاء المبردة .0.70 ، 0.80&0.45 في الكبد والقلب والقوانص علي التوالي اما بالنسبة للفحص الميكروبيولوجى: العد الكلي البكتيري: متوسط قيم العد البكتيري (Mesophilic) في العينات المبردة التي تمت دراستها , 4.63×10^4 &4.28×10^4 3.40×10^4 في الكبد والقلب والقوانص علي التوالى. اما العد الكلي للبكتيريا المعوية كانت القيم المتوسطة للعد في العينات المبردة التي تم دراستها 2.37×10^5 ، 2.19×10^5&1.39×10^5 في الكبد والقلب والقوانص علي التوالي. العد البكتيري للبكتيريا القولونية : القيم المتوسطة من البكتيريا القولونية في العينات المبردة فحصها كانت 1.24×10^5 ,4 5.69×10 & 1.05×10^5 في الكبد والقلب والقوانص علي التوالي. نسبة حدوث السالمونيلا من عينات الاحشاء المبردة والطازجة (الكبد والقلب والقوانص) كانت (20% & 17% , 13%) علي التوالي. نسبة حدوث المكورات العنقودية الذهبية المعزولة من عينات الاحشاء المبردة والطازجة (الكبد والقلب والقوانص) كانت (7% & 10% , 7%) علي التوالي. العد الفطري كانت القيم المتوسطة من العد الفطري في عينات الاحشاء المبردة فحصها كانت. (4.60×10^2, 7.18×10^2 & 9.12×10^2). عدد الخمائر: متوسط قيم عد الخمائر في عينات المبردة فحصها كانت (3.94×10^3, 1.68×10^3 & 2.58×10^3) في الكبد والقلب والقوانص علي التوالي. وقد انتهت هذه الدراسة إلي خطورة تلوث أحشاء الدواجن بالجراثيم المختلفة وتم مناقشة الأهمية الصحية لهذه الميكروبات ومدي تأثيرها علي الصحة العامة ، وخلصت النتائج إلي ضرورة توخي الحذر أثناء ذبح الدواجن وتجهيزها للحد من التلوث بميكروبات التسمم الغذائي وعلي المستهلك استخدام المعاملات الحرارية المختلفة الكافية للتخلص من الميكروبات التي تتواجد في احشاء الدواجن.