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HYGIENIC STATUS AND DETERMINATION OF SOME HEAVY METAL RESIDUES IN FROZEN CHICKEN IN ALEXANDRIA CITY

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ABSTRACT

Fifty frozen chicken samples were collected from markets located in Alexandria city, and were subjected to Microbiological and Chemical examination. Bacteriological examination recorded mean values of total Aerobic Plate Count, Total Enterobacteriaceae and total Coliform counts of frozen chicken were 1.6× 106, 3.3×104 and 1.3× 103 cfu/g respectively.

The incidence of Staph. aureus, Enteropathogenic E-coli and Salmonella species in frozen chicken samples were 20,16 and 6% respectively. The pH and TVB-N were within the permissible limits. The examined samples had a normal values of cadmium (cd), lead (pb), copper (cu) and Mercury (Hg) (the mean values were 0.005, 0.0022. 0.954 and 0.085 mg/g Respectively) and were analized by Atomic Absorption Spectrophotometers. The Public health hazard of bacteria and heavy metal residues were discussed.

INTRODUCTION

Poultry meat comprises a substantial protein of Egyptian diet. The physical meat inspection in markets is based on visual inspection, which does not identify pathogenic microorganisms such as Salmonella, Enteropathogenic E-coli, or Staph. aureus ***Edwards et al. (1997)***. To

improve the control of such pathogens via improvement in process hygiene we must apply the Hazard Analysis Critical Control Point (HACCP) system which has been promoted and implicated in the European union. This analysis allowed the identification in the process flow of the sensitive areas that might contribute to a hazard.

The slaughtering and dressing of broilers involve several different processes which influence the bacterial load of the carcasses ***(Sauter et al., 1968, Notermans et al., 1977)***. Aerobic plate count, Psychrotrophs, Coliform, Staphylococcus aureus and Yeasts and Moulds have been used in meat and poultry products to assess their microbiological safety, sanitation condition throughout processing and keeping quality ***(Tompkin, 1983; Lillard et al., 1984 and Lillard, 1990).***

Heavy metals are potential environmental contaminations with the capability of causing human health problems if present to excess in the food we eat. They are given special attention throughout the world due to their toxic effects even at very low concentration ***(Das, 1990)***. Lead (Pb) is neurotoxic with varying symptoms. It is particularly toxic to the brain, kidneys, reproductive system and cardiovascular system. Lead is used in many industrial processes, Lead paint, lead gasoline, It is a common material for spraying fruit tree. Exposure to it can cause kidney damage, infertility, miscarriage and hypertension ***(Silbergeld 1996)***. Exposure of children to high levels may cause encephalopathy and /or irreversible mental retardation ***(Go yer 1996)***.

Cadmium is used extensively in the mining and electroplating industries and found in fertilizes and fungicides. Cadmium poisoning may result in a case called Itai-Itai or ouch-ouch disease which characterized by severe pain, soft bones and the death may occur as a result of renal failure ***(peter, 1993)***. Copper (Cu) in an essential trace

element for animal and man. It is released into the environment primarily through mining, sewage, treatment plant, solid waste disposal, welding and electroplating processes. It is a common component of fungicides and algaecides.

Agricultural use of copper for these purposes can result in its presence in soil, ground, water, farm animal, ***(ATSDR 1990)***. Acute toxicity of ingested copper is characterized by abdominal pain, diarrhea, vomiting, tachycardia and metallic taste in the mouth. Continued ingestion of copper compounds can cause cirrhosis and other debilitating liver conditions ***(Mueller – Hoecker et al. 1988)***.

Mercury was used as fungicides, mercurial fungicides used for seed dressing. Toxic compounds of mercury accumulate in animal tissues, the alkymercuries are slowly metabolized and more evenly distributed in the body tissue ***(Underwood, 1977)***. Mercury caused redness of lips, throat and tangue, loss of teeth, swelling and redness of the skin with pink red finger tips. It affects the nervous system causing irritability ***(Mert, 1987)***.

MATERIALS AND METHODS

A- Sampling

Fifty frozen chicken samples were collected from markets located at Alexandria city. The samples were transferred to the laboratory in an ice box without undue delay to be examined.

B- Chemical examination

a- Determination of PH value according to ***ISO (1974)***.

b- Determination of Total Volatile Basic Nitrogen (TVB-N) according to ***FAO (1992)***.

C- Heavy metal analysis: Digestion: of samples was according to ***perez (1999)***, Determination of cadmium (cd), lead (Pb) and copper (cu) were conducted by using Atomic Absorption Spectrophotometer "AAS"(perkin Elmer 2380)according to ***Richard and Rubinshapiro (1986)***. In case of mercury, The analysis was conducted according to ***Honway and Donn (1985)*** using flameless atomic absorption spectrophotometer.

C- Bacteriological counts:

The samples were subjected to bacteriological examination through determination of:

a- Total Aerobic plate count by spreading technique using plate count agar incubated at 37°C for 24 hours according to European Union communities ***Commission (2001).***

b- Total Enumeration of coliform bacteria count using lauryl sulphate tryptose broth incubated at 37°C for 48 hours according to ***FAO (1992).***

C- Total Enterobacteriaceae count according to ***European Union Commumities Commission (2001)***.

D- Detection of some food- borne pathogens:

a- Isolation and identification of Staphylococcus aureus according to ***Bennett and Lancette (2001)***.

b- Isolation and Identification of salmonellae according to ***Health protection Agency (HPA) (2003 a)***.

c- Isolation and identification of Enteropathogenic Escherichia coli according to ***Health protection Agency (HPA) (2003 b).***

Seriological identification was done by using diagnostic sera, ***(Biotec, 1999).***

RESULTS

Table (1): Mean Values of Bacterial Counts of the Examined Frozen Chicken Samples. (n = 50).

Samples	Aerobic Plate	Enterobacteriaceace	Coliform
Frozen chicken	1.6×10^{6}	3.3×10^{4}	1.3×10^{3}

Table (2): Incidence of Food Borne Pathogens in the Examined Samples (n=50).

Isolated Microorganism	+VE	%
Staph. aureus	10	20
Enteropatogenic E-coli	8	16
Salmonella SPP	3	6

Table (3): Mean Values of the pH and TVB – N of The Examined Frozen Chicken Samples.

Samples	Test	
	PH	TVB-N mg/ 100gm
Forzen chicken	5.8	20

Table (4): Concentration of Heavy Metals in the Examined Frozen Chicken Samples (mg/g) (n = 50).

Metal	CD	Pb	Cu	Hg
Min	0.01	0.006	0.375	0.08
Max	0.04	0.045	2.000	0.1
Mean	0.005	0.0022	0.954	0.085
± SE	0.004	0.022	0.170	0.004

DISCUSSION

In table (1): showed that the mean values of Total Aerobic Plate Count, Enterobacteriaceae and coliform counts of frozen chicken were 1.6×10^6, 3.3×10^4 and 1.3×10^3 CFU/g respectively. ***Gill et al. (2005)*** reported that the aerobic plate and coliform counts of chicken were 10^3 and 20 respectively while ***hassouba et al. (2007)*** reported that aerobic plate, Enterobacteriaceae and coliform count, in frozen chicken were 2×10^6, 2×10^4 and 1.2×10^3 CFU/g.

Table (2): showed that the incidence of Staph. aureus, Enteropathogenic E.coli and Salmonella of the examined frozen chicken were 20,16 and 6% respectively. The high level of Staph. aureus growth indicate poor hygiene of handler during the processing stage as well as lack of sterilization of utensils and working surfaces. Staph. aureus produce enterotoxin which lead to food poisoning. ***Hassouba et al. (2007)*** recovered 6.7% Staph. aureus, 4% Enteropathogenic E.coli from frozen chicken samples examined. In conclusion, frozen chicken samples showed high bacterial loads beside a relatively high rate of the pathogens, this is due to miss-handling and processing as well as the negligence of hygienic aspects at the production level. Therefore, one can safely recommended the following, aiming to have meat with good quality: good hygiene of the meat poultry handlers during the processing stage as well as good sterilization of utensils and working surface. Thermostable of refrigerators and deep freezer is important for retarding the growth of both pathogenic and spoilage bacteria.

Table (3): showed that the mean values of the PH and TVB-N (mg/100g) of the examined frozen chicken were 5, 8 and 20 respectively. The obtained data are within the permissible limits according to the Egyptian standard, (1991, 2005) (PH is 5.6 – 6.2 and TVB-N is 20 Mg/100g).

Data presented in Table (4): showed that the examined samples had a normal values of Cd, Pb, Cu and Hg when compaired ***by FAO/WHO (1972)*** dietary intake limits (Cd 20-100mg/day, Pb 100mg/ day, cu 15 mg/kg and Hg 0.03 mg/day). Egyptian Organization for Standardization and Quality Control (E.O.S.Q.C 2360/1993) mentioned that the maximum provisional weekly intake from cadmium by human as 0.0067 – 0.0083 mg/kg of body weight and 2 mg/kg of sample weight and from lead by human as 0.05 mg/kg body weight.

Cadmium (Cd) concentration in frozen chicken in Table (2) ranged from 0.01 to 0.04 Mg/g with mean value 0.005. these results agree with those reported by ***Folandyez/and/Lorenc-Biala (1991)***, ***Salisbury et al. (1991) and Hassouba et al. (2007)***, but lower than that reported by ***Kienholz et al. (1974) and Daoud et al. (1998)***.

Lead (pb) concentration ranged from 0.006 to 0.045 mg/g there results agreed with the results, which reported by ***Spaulding (1975) and Salisboury et al. (1991)*** and lower than ***Folandyez and Lorenc-Biala (1991) and Schiilz-Schroeder (1991).***

Copper (Cu) concentration ranged from 0.375 to 2.000 Mg/g with amean value 0.954. According to the ***EOSQC (1993)*** the permissible limit for copper is 15 mg/kg. Copper is known to be essential at low concentrations but it is toxic at high levels. Accordingly, ingestion of an excessive dose of Cu may lead to severe nausea, bloody diarrhae, hypertension and jundice ***(Gosel and Bricker,1990).***

Mercury (Hg) concentration in chicken samples ranged form 0.08 to 0.1 Mg/g with mean value of 0.085. The recorded result of Hg agreed with those reported by ***Sell et al. (1975)***, ***National Bureau of Standards (1976) and Hassouba et al. (2007)***. Cd, Pb, Cu and Hg concentrations in the examined samples were within the permissible limits.

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الحالة الصحية وتحديد بعض بقايا المعادن الثقيلة فى الفراخ المجمدة فى مدينة الإسكندرية

آمال فهمى على منصور

معهد بحوث صحة الحيوان فرع الإسكندرية.

أجريت هذه الدراسة على عدد خمسون عينة فراخ مجمدة تم تجميعها من محلات أسواق مدينة الإسكندرية فى أماكن مختلفة وخضعت العينات للفحوص الكيميائية والبكتريولوجيه. وكان تركيز الأس الهيدورجينى ونسبة القواعد النيتروجينية الكلية المتصاعدة فى الحدود المسموح بها. وكان متوسط قيم المعادن الثقيلة مثل الكادميوم والرصاص والنحاس والزئبق 005،، 0022،، 954،، 85.، ميكرو جرام/كجم على الترتيب وهى فى الحدود المسموح بها.

وقد تم مناقشة الأهمية الصحية والتأثيرات السامة لهذه المعادن الثقيلة وكيفية الحد أو التحكم فى مصادر وصول هذه العناصر إلى الفراخ المجمدة. وكان متوسط العد البكتيرى الكلى للميكروبات الهوائية والميكروبات المعوية والميكروبات القولونية فى الدواجن المجمدة 1.6× 610، 3.3×410، 1.3×310 خلية بكتيرية/جرام من العينة على التوالى. وكان تواجد المكور العنقودى الذهبى والإيشيريشيا كولاى المرضية وميكروبات السالمونيلا فى عينات الفراخ المجمدة 20، 16،6% على التوالى حيث أمكن عزل 10 ميكروبات من المكور العنقودى الذهبى و 8 ميكروبات من الإيشيريشيا كولاى و 3 ميكروبات من السالمونيلا. هذا وقد تمت مناقشة الأهمية الصحية لهذه الميكروبات المرضية وخطورتها

على الصحة العامة والطرق الواجب إتباعها للحد من هذه الميكروبات والقضاء عليها وكذلك بقايا المعادن الثقيلة.