

AFLATOXINS RESIDUES IN SOME MARKTED POULTRY PRODUCTS

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ABSTRACT

This work was carried out to evaluate the mycological quality of chicken meat products sold in local markets at Zagazig City in EL-sherkia governorate, Egypt. Samples were subjected to mycological examination and detection of aflatoxins residues in chicken processed product samples, to evaluate their quality and safety. A total of One hundred samples of different chicken meat products represented by chicken luncheon, chicken burger, coated chicken fillet, chicken Fillet and chicken Liver (20 of each) which were collected from different localities of different sanitation levels at Zagazig City under different trade name. The obtained results showed that the average total mould counts in the examined samples of chicken meat products were $6.25 \times 10^2 \pm 1.85 \times 10^2$, $3.78 \times 10^2 \pm 1.14 \times 10^2$, $2.34 \times 10^2 \pm 0.78 \times 10^2$, $2.19 \times 10^2 \pm 0.43 \times 10^2$ and $2.01 \times 10^2 \pm 0.53 \times 10^2$ in chicken liver, chicken burger, coated chicken fillet, chicken fillet and chicken luncheon, respectively. In the examined samples, 9 mould genera were identified. The identified mould were *Aspergillus*, *Penicillium*, *Cladosporium*, *Rhizopus*, *Alternaria*, *Acremonium*, *Pacilomyces*, *Aurobasidium* and *Absidia* with incidence rate 58(58%), 19 (19%), 13(13%), 11(11%), 10 (10%), 9(9%), 6 (6%), 4 (4%) and *Absidia* 2 (2%), respectively. On other hand, *Aspergillus* species were further identified into five strains. The identified strains of *Aspergillus* could be isolated were *A. niger* had the highest incidence rate 28 (28%) followed by *A.flavus* 23 (23%), *A.fumigatus* 6 (6 %), *A. terreus*1 (1%) and at last *A .parasiticus* 3 (3%). The results revealed that the mean value of the total aflatoxin residues ($B_1 + B_2 + G_1 + G_2$) could be detected from the examined luncheon, burger, coated fillet , fillet and liver samples were 0.87 ± 0.14 , 1.12 ± 0.23 , 2.53 ± 0.31 , 0.20 ± 0.03 and 0.82 ± 0.19 ppb, respectively. The public health significance of isolated mould species and aflatoxin production as well as recommended hygienic measures to keep meat products safe were discussed.

INTRODUCTION

Chicken meat and chicken meat products are not only tasteful, economical, quick and easy to prepare food but also provide a unique well balanced source of minerals, vitamins, proteins and healthy fats for all ages. Moreover, their high quality, low caloric value and ease to digestability make chicken valuable in many therapeutic diets for adults.

Poultry industry suffers from greater economic losses due to greater susceptibility of species to fungal growth and toxin production which are considered challenges to food safety specially in tropical and subtropical regions where temperature and humidity conditions are optimum for growth of mould and production of toxin.

Fungi comprise a large group of microorganisms which are ubiquitous in nature due to easy dissemination and their vegetative spores, which are produced in large numbers and can

present in the environment for a long period. The contamination of chicken meat with fungi starts in the environment of the slaughter halls due to a lack of hygienic measures through air, wall, floor, utensils, hides and intestinal contents of the slaughtered birds (**Mansour, 1986**); also during handling procedures and processing of meat products through the use of contaminated additives and spices which are considered the most important source of mould contamination in meat products (**Abd El-Rahman, 1987**). Also **Gourama and Bullerman 1995** stated that mould contamination of some meat products indicated improper sanitary and hygienic conditions during handling, processing and storage, also the adding of bad or inferior quality of flavoring agents which may increase the load of contamination of such products with mould. Flavorings, especially spices, added to meat can considerably contribute % to the mould contamination of the final products.

Fungi are not only major spoilage agents of meat results in a reduction of quality with significant economic losses but also cause contamination of meat with poisonous fungal secondary metabolites called mycotoxins. The ingestion of such mycotoxins contaminated meat by human beings has enormous public health significance, because these toxins are capable of causing diseases in man and animals ranging from death to chronic interference with the function of the nervous, cardiovascular, pulmonary and endocrine systems as well as alimentary tract. Some mycotoxins are carcinogenic, mutagenic, teratogenic and immunosuppressive.

The most well-known among the mycotoxins are aflatoxins (AFs), which are a group of heterocyclic metabolites produced by the fungi of the genus *aspergillus*, particularly *Aspergillus flavus* and *Aspergillus parasiticus* that frequently contaminate animal feed and human food, causing illness and death to consumers (**Giambone et al., 1985** and **Magnussen and Parsi, 2013**). There are four naturally occurring AFs: aflatoxin B1, B2, G1 and G2, and all of them are toxic, mutagenic and carcinogenic compounds (**CAST, 2003**), having been classified by the International Agency for Research on Cancer as belonging to group 1 (substances that are carcinogenic for humans) (**IARC, 1993**). A potential immunosuppressant and nutritional interference effect has also been reported (**Williams et al., 2004**), as have mutagenic, teratogenic and hepatotoxic effects (**Kensler et al., 2011**).

Out of AFs group, AFB1 is the most toxic and is classified as human carcinogen (**Talebi et al., 2011**). AFB1 is usually the most predominant in foods and feeds and the most toxic, as well as the most potent hepatocarcinogen known in experimental animals and humans (**Lopez et al., 2002**). The most powerfully carcinogenic aflatoxin is considered to be aflatoxin B1 (**JECFA, 1999**). The toxic effects of AFB1 are both dose and time dependent. After aflatoxin B1 (AFB1) enters the cell, it is metabolized in the endoplasmic reticulum to an active epoxide and to hydroxylated forms and glucuronide and sulfate conjugates. The epoxide then undergoes spontaneous hydrolysis to AFB1-8,9-dihydrodiol, which can bind to essential proteins and enzymes and can react with DNA, forming DNA adducts. These cellular and molecular events can lead to the genesis of cancer, especially of the liver (**Rawal and Coulombe, 2011**) and (**Friedman and Rasooly, 2013**).

Human exposure to AFs is primarily from a consumption of contaminated food directly like cereals, seeds, fruits, etc., or indirectly by eating food products and subproducts obtained from animals consuming contaminated feeds (**Galvano et al., 2005**). The present study is planned to throw a light on the mould contamination of some chicken meat products with special attention to aflatoxigenic strains, *Aspergillus* species, and aflatoxins production in chicken meat products.

Material and Methods

I-Quantitative And Qualitative Estimation of Mould:

1-) Collection of Samples :

A total of one hundred samples represented by chicken luncheon, chicken burger, coated chicken fillet, chicken fillet and chicken liver (20 of each) were collected from different localities of different sanitation levels at Zagazig City under different trade name. The samples were taken aseptically in sterile polyethylene bags without undue delay; they were transferred to the laboratory in ice box for mycological examination and aflatoxin residues detection.

2-) Preparation of Samples (ICMSF, 1980):

Ten-fold dilutions up to 10^6 using sterile peptone water (0.1%) were prepared from each sample.

3-) Estimation of the Total Mould Count (APHA 1985):

Malt extract and Czapeck's-Dox agar (pH: 4.5) were used for isolation of fungi. The plates were incubated at 25°C for 5~7 days and the developing fungi were examined, counted and identified and the numbers were calculated per gram in each sample.

4-) Identification of Mould isolates:-

The identification of colonies was carried out by careful observation and measurements of the mould colonies macroscopically and microscopically

The identification of mould genera and species was carried out, in which the genus *Aspergillus* was identified according to **Rapper and Fennel (1965)** and **Samson (1979)**, the genus *Penicillium* according to **Rapper and Thom (1949)** and other mould genera according to **Arx Von (1967)**, **Zycha *et al.* (1969)**, **Barnett and Hunter (1972)** and **Shipper (1978)**.

II. Quantitative estimation of aflatoxins residues (B1, B2, G1 and G2) in some chicken meat products by HPLC :

1-) Materials

1-1. Standard Solutions:

Aflatoxins standards (B1,B2,G1 and G2) were purchased from Supelco (Bellefonte, PA, USA). The stock standard solution and working standard solutions were prepared according to the Association of Official Analytical Chemists (**AOAC**) method

1-2. Chemicals reagents:

Acetonitrile, methanol, dichloromethane, hexane, ether, acetone and trifluoroacetic acid from Sigma (St Louis, MO, USA).

2-) Method:

2-1. Extraction of Aflatoxins from the sample:

100 grams of the sample was homogenized. 10 mL of 20 % citric acid was added and mixed well. 200 mL of dichloromethane were added and kept in automatic shaker for 30 minutes. The mixture was filtered and the filtrated materials were evaporated under vacuum. Adding hexane to redissolve extracted material.

2-2. The Clean-Up:

The procedure for the extracts was performed through using Solid-phase extraction (SPE) columns which is made of porous silica modified to absorb impurities or mycotoxins.

2-3. Derivatization : (AOAC 1995):

Pre-column derivatization enhances the detection and recoveries of aflatoxin through treatment with TFA (trifluoroacetic acid) .

2-4. HPLC analysis Conditions:

Analysis of AF was performed by Agilent HPLC apparatus (Agilent quaternary gradient pump, auto sampler, fluorescence detector and HPLC 2D Chemstation software (Germany). Analytical column (a reversed-phase column (Extend-C18, Zorbax column, 4.6 mm i.d., 250 mm, 5 μ m, Agilent Co), kept in column oven at 30°C at flow rate of 1 mL/min. Isocratic mobile phase consisting of Deionized water: acetonitrile: methanol (60:20:20 v/v/v). The fluorescence detector is set at wave length 360 nm excitation and 440 nm emission. The injection volume (10 μ L).

Results and Discussion

Total mould count. The results in Table (1) show that mean values of total mould counts per gram (TMC/g) in the examined samples of chicken luncheon, chicken burger, coated chicken fillet, chicken fillet and chicken liver were $2.01 \times 10^2 \pm 0.53 \times 10^2$ CFU/g, $3.78 \times 10^2 \pm 1.14 \times 10^2$ CFU/g, $2.34 \times 10^2 \pm 0.78 \times 10^2$ CFU/g, $2.19 \times 10^2 \pm 0.43 \times 10^2$ CFU/g and $6.25 \times 10^2 \pm 1.85 \times 10^2$ CFU/g, respectively. Concerning the samples of chicken luncheon, the results achieved seems to be in agreement with that reported by **Hameida et al. (1986)**, **El-Gazzar (1995)**, **Farag (2000)**, **Mohamed (2004)**, **Hussein (2008)**, **El-Diasty et al. (2013)** and **Gamal (2013)**. Higher values were mentioned by **Abdel-Rhaman et al. (1984)**, **Shaltout (1996)**, **Zayed (1999)** and **Saleh et al. (2013)**, meanwhile lower counts were obtained by **Wadee (2010)**. These variations were attributed to the variations in the amount and types of additives used for the manufacturing of chicken luncheon; the time /temperature exposure of the products and the hygienic measure adopted during processing. The obtained results obtained from the chicken burger seem to be in agreement with that reported by **Brr (2004)** and **Hussein (2008)**. Higher values were mentioned by **Zayed (1999)** and **Hegazy et al. (1992)**, meanwhile lower counts were obtained by **Edris et al. (1992)**. Concerning the samples of coated chicken fillet, the results were nearly similar to what has been obtained by **Mohamed (2004)**. Higher values were mentioned by **Agamy and Hegazy (2011)** and **Saleh et al. (2013)**, meanwhile lower counts were obtained by **Maamoun (2010)** and **Wadee (2010)**. results were nearly similar to that obtained by **Eldaly et al. (2002)**, **Mohamed (2004)** and **El-Diasty et al. (2013)**. Higher values were mentioned by **Hegazy et al. (1992)**, **Gamal (2013)** and **Saleh et al. (2013)**, meanwhile lower counts were obtained by **Saleh et al. (1990)**. Regarding the results recorded for chicken fillet samples seem to be nearly similar to that obtained by **Eldaly et al. (2002)**, **Mohamed (2004)** and **El-Diasty et al. (2013)**. Higher values were mentioned by **Hegazy et al. (1992)**, **Gamal (2013)** and **Saleh et al. (2013)**, meanwhile lower counts were obtained by **Saleh et al. (1990)**. Concerning the samples of chicken liver, the results were nearly similar to that obtained by **Morshdy (1992)**,

Eldaly and Neveen (2004), Mohamed (2004) and Gamal (2013) . Meanwhile lower counts were obtained by **Saleh *et al.* (1990)** . The obtained results declared that the examined chicken liver samples had the highest mould count, this may be due to contamination from the slaughter unite environment beside the hygienic level of equipments, followed by burger samples, then coated chicken fillet, chicken fillet and luncheon, while luncheon samples had the lowest count. These findings may be attributed to the heat treatment of luncheon which affect the fungal

Examined samples	chicken Luncheon		chicken burger		Coated chicken fillet		chicken fillet		chicken liver	
Positive sample	No	%	No	%	No	%	No	%	No	%
	11	55	14	70	13	65	15	75	16	80
Min	30		10		20		30		1×10^2	
Max	0.6×10^3		2×10^3		1.1×10^3		0.7×10^3		3×10^3	
Mean	2.01×10^2		3.78×10^2		2.34×10^2		2.19×10^2		6.25×10^2	
$\pm$ SE	0.53×10^2		1.14×10^2		0.78×10^2		0.43×10^2		1.85×10^2	

spore, while other products were processed and dispatched without any heat treatment. Also the variation of mould count in samples may be due to different levels of hygiene during manufacturing and storage.

Table (1) : Statistical analytical results of total mold count / g of examined chicken meat products (N= 20 of each).

Min, Max, Mean and SE were calculated according to positive samples.

Isolated mould species : The results given in table (2) showed that *Aspergillus*; *Pencillium*; *Alternaria*; *Cladosporium*; *Rhizopus*; *Acremonium* and *Pacilomyces* could be isolated from 8(40%); 3 (15%); 2 (10%); 4 (20%); 3 (15%); 2 (10%) and 1(5%) of luncheon samples, respectively. Nearly similar isolates obtained by **Zayed (1999), Mohamed (2004) , Hussein (2008) and Gamal (2013)** .

Aspergillus; *Pencillium*; *Cladosporium*; *Rhizopus*; *Aurobasidium* and *Absidia* could be isolated from 11 (55%); 5 (25%); 3 (15%); 2 (10%); 2 (10%) and 1(5%) of examined chicken burger samples, respectively. Such moulds genera could be isolated by **Edris *et al.* (1992), Zayed (1999) and Hussein (2008)** .

On the other hand *Aspergillus*; *Pencillium*; *Alternaria*; *Cladosporium*; *Acremonium* and *Pacilomyces* could be identified from 10(50%); 4(20%); 3 (15%); 4 (20%); 2(10%) and 3(15%) of the examined coated chicken fillet samples, respectively. These isolates nearly similar to that obtained by **Mohamed (2004) , Maamoun (2010) and Agamy and Hegazy (2011)**.

Aspergillus; *Pencillium*; *Alternaria*; *Rhizopus*; *Acremonium* and *Aurobasidium* could be isolated from 14 (70%); 4 (20%); 2 (10%); 3(15%); 3 (15%) and 2 (10%) of examined chicken

fillet samples, respectively. These results substantiate what have been reported by **Saleh *et al.*(1990), Wafaa (1995), Eldaly *et al.* (2002) , Mohamed (2004) and Gamal (2013).**

At the same time, *Aspergillus*; *Pencillium*; *Alternaria*; *Cladosporium*; *Rhizopus*; *Acremonium*; *Paecilomyces* and *Absidia* could be isolated from 15(75%); 3 (15%); 3 (15%); 2 (10%); 3 (15%); 2(10%); 2(10%) and 1(5%) of examined chicken liver samples, respectively. Nearly similar isolates obtained by **Saleh *et al.* (1990), Morshdy (1992), Eldaly and Neveen (2004), Mohamed (2004) and Gamal (2013).** The arrangement of isolated and identified mould genera from the forementioned results, cleared that *Aspergillus* had the highest incidence 58 (58%) followed by *Pencillium* 19 (19%), *Cladosporium* 13 (13%), *Rhizopus* 11(11%), *Alternaria* 10 (10%), *Acremonium* 9 (9 %) then *Paecilomyces* 6 (6%), *Aurobasidium* 4 (4%), and *Absidia* 2 (2%) in descending manner from all examined samples.

Table (2): Incidence of isolated mould genera in examined chicken meat products (N=20).

	luncheon		burger		Coated fillet		fillet		liver		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
<i>Aspergillus</i>	8	40	11	55	10	50	14	70	15	75	58	58
<i>Penicillium</i>	3	15	5	25	4	20	4	20	3	15	19	19
<i>Alternaria</i>	2	10	-	-	3	15	2	10	3	15	10	10
<i>Cladosporium</i>	4	20	3	15	4	20	-	-	2	10	13	13
<i>Rhizopus</i>	3	15	2	10	-	-	3	15	3	15	11	11
<i>Acremonium</i>	2	10	-	-	2	10	3	15	2	10	9	9
<i>Paecilomyces</i>	1	5	-	-	3	15	-	-	2	10	6	6
<i>Aurobasidium</i>	-	-	2	10	-	-	2	10	-	-	4	4
<i>Absidia</i>	-	-	1	5	-	-	-	-	1	5	2	2

No → number of positive samples

% → were calculated in relation to the total number of examined samples

Identified *Aspergillus* species: The results presented in table (3) showed that incidence of identified *Aspergillus* species in the examined chicken meat and chicken meat product samples and declared that *A. niger* could be isolated from 3 (15%), 5 (25%), 5 (25%),7 (35%) and 8 (40%) of the examined samples of chicken luncheon, chicken burger, coated chicken fillet, chicken fillet and chicken liver, respectively followed by *A. flavus* could be isolated from 3 (15%), 5(25%), 4(20%), 5 (25%) and 6(30%) , of the same examined sample, respectively.

A. fumigatus could be isolated from 2(10%) from each chicken luncheon, chicken fillet and chicken liver samples. On the other hand *A. terreus* could be identified only from luncheon 1(5%) . Meanwhile *A. parasiticus* could be isolated from 2 (10%) of chicken burger and 1(5%)

of coated chicken fillet. These findings are nearly similar to those obtained by **Saleh et al. (1990)**, **Zayed (1999)**, **Mohamed (2004)**, **Hussein (2008)**, **Maamoun (2010)** and **Wadee (2010)**.

Table (3): Incidence of identified *Aspergillus* species in examined chicken meat products (N= 20).

	luncheon		burger		Coated fillet		fillet		liver		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
<i>A. niger</i>	3	15	5	25	5	25	7	35	8	40	28	28
<i>A. flavus</i>	3	15	5	25	4	20	5	25	6	30	23	23
<i>A. fumigatus</i>	2	10	-	-	-	-	2	10	2	10	6	6
<i>A. terreus</i>	1	5	-	-	-	-	-	-	-	-	1	1
<i>A. parasiticus</i>	-	-	2	10	1	5	-	-	-	-	3	3

No → number of positive samples

% → were calculated in relation to the total number of examined samples

Aspergillus is a ubiquitous soil-dwelling fungus. Human infections are usually acquired by inhalation of airborne spores from inanimate sources. Pulmonary aspergillosis can present as different forms, including pulmonary aspergilloma, chronic necrotizing pulmonary aspergillosis, invasive pulmonary aspergillosis and allergic bronchopulmonary aspergillosis, depending on the atopic and immune status of the host and the site of involvement within the respiratory system (**Wong et al., 2008**).

Aspergillus has been implicated in allergen- mediated disease such as asthma and hypersensitivity reactions (**Roilides et al., 1993**). *Aspergillus* species may induce pulmonary aspergillosis, pulmonary allergy, skin infection, nasal infection (sinusitis) as well as nail and external ear infection, furthermore; cutaneous aspergillosis has been encountered in neonates (**Papouli and Roilides, 1996**).

Aspergillus flavus and *Aspergillus niger* caused lung disease when they grow and produce spores in the lungs. They were opportunistic and invade wounds, cornea and external ear in immuno-suppressed patients, it could cause pneumonia (**Jacquelum, 1999**).

The total aflatoxin residues ($B_1 + B_2 + G_1 + G_2$): It is evident from the results presented in table (4) the total aflatoxin residues($B_1 + B_2 + G_1 + G_2$) could be detected from the examined chicken luncheon, chicken burger, coated chicken fillet , chicken fillet and chicken liver samples with a mean value of 0.87 ± 0.14 , 1.12 ± 0.23 , 2.53 ± 0.31 , 0.20 ± 0.03 and 0.82 ± 0.19 ppb, respectively. The obtained results declared that examined coated chicken fillet samples have the highest level of toxins followed by burger then luncheon and liver while the lowest level found in fillet samples. These may be related to the amount of additives used in processing . The higher values were found by **Asim (1990)**, **Shabana (1999)**, **Mohamed (2004)** and **Wadee (2010)**. At

the same time, the mean values of detected aflatoxins in the examined samples were lower than the maximum permissible limit recommended by the United States federal government (20ppb).

Table (4): Statistical analytical results of total aflatoxin residues ($B_1+B_2+G_1+G_2$) in PPb of some chicken meat products.

Samples	Minimum	Maximum	Mean	S.E
Chicken Luncheon	0.48	1.26	0.87	0.14
Chicken burger	0.47	1.78	1.12	0.23
Coated chicken fillet	1.64	3.44	2.53	0.31
Chicken Fillet	0.09	0.31	0.202	0.03
Chicken liver	0.30	1.38	0.82	0.19

The types of aflatoxin residues (B_1 , B_2 , G_1 , G_2): In coated chicken fillet samples, the results achieved in table (5) revealed that the highest level of aflatoxin residues detected from coated chicken fillet samples were AFB_2 (with a mean value of 0.95 ± 0.1 ppb), followed by AFB_1 (with a mean value of 0.8 ± 0.2 ppb), then AFG_1 (with a mean value of 0.69 ± 0.3 ppb) and AFG_2 (with a mean value of 0.09 ± 0.007 ppb).

In chicken burger samples:

The results achieved in table (5) revealed that the highest level of aflatoxin residues detected from examined burger samples were AFG_1 (with a mean value of 0.64 ± 0.32 ppb) followed by AFB_1 (with a mean value of 0.43 ± 0.14 ppb) then AFB_2 and AFG_2 (with a mean value of 0.02 ± 0.003 ppb) for each.

In chicken luncheon samples:

The results achieved in table (5) revealed that highest level of aflatoxin residues detected from examined luncheon samples were AFB_2 (with a mean value of 0.40 ± 0.08 ppb) followed by AFB_1 (with a mean value of 0.36 ± 0.05 ppb), AFG_1 (with a mean value of 0.09 ± 0.01 ppb) and AFG_2 (with a mean value of 0.01 ± 0.003 ppb).

In chicken liver samples :

The results of liver samples achieved in table (5) revealed that AFB_1 had the highest level (with a mean value of 0.48 ± 0.1 ppb) followed by AFG_1 (with a mean value of 0.31 ± 0.2 ppb) then AFG_2 (with a mean value of 0.03 ± 0.01 ppb), meanwhile AFB_2 was not detected.

In chicken fillet samples :

Concerning to the results of chicken fillet samples achieved in table (5) revealed that AFB₁ had the highest level (with a mean value of 0.09±0.02 ppb) followed by AFG₁(with a mean value of 0.07±0.04 ppb) then AFB₂ and AFG₂ (with a mean value of 0.02 ±0.008 ppb) for each .

Table (5): Statistical analytical results of different types of aflatoxin residues(B₁,B₂,G₁,G₂) in PPb of some chicken meat product

Examined samples	Min				Max				Mean ± S.E			
	B ₁	B ₂	G ₁	G ₂	B ₁	B ₂	G ₁	G ₂	B ₁	B ₂	G ₁	G ₂
Chicken Luncheon	0.24	0.29	0.21	0.03	0.53	0.73	0.26	0.04	0.36 ±0.05	0.40 ±0.08	0.09 ±0.01	0.01 ±0.003
Chicken burger	0.40	0.02	0.03	0.02	1.07	0.04	1.73	0.04	0.43 ±0.14	0.02 ±0.003	0.64 ±0.3	0.02 ±0.004
Coated chicken fillet	0.07	0.77	0.05	0.09	1.53	1.58	1.6	0.13	0.80 ±0.2	0.95 ±0.1	0.69 ±0.3	0.09 ±0.007
Chicken Fillet	0.05	0.02	0.02	0.02	0.18	0.06	0.22	0.06	0.09 ±0.02	0.02 ±0.008	0.07 ±0.04	0.02 ±0.009
Chicken liver	0.03	-	0.06	0.02	1	-	1.26 ,	0.09	0.48 ±0.1	-	0.31 ±0.2	0.03 ±0.01

From the achieved results, it is clear that the highest levels of AFB₁ , AFB₂ , AFG₁ and AFG₂ were in coated chicken fillet samples while the lowest level found in fillet samples. These may be related to the amount of contaminated additives used in processing of such products , most of meat additive and spices used in Egypt in meat processing factory imported by shipping which provide suitable condition for mould growth and production of aflatoxins as: presence of oxygen, temperature between 4°C and 40°C, pH-value between 2.5 and 8 (with an optimum between 5 and 8), minimum water activity of 0.80, maximum salt concentration of 14% (**Ostry , 2001**).

Food and Drug Administration (FDA) established regulatory working guidelines on the acceptable levels of aflatoxins in human foods set at 20 ppb for total aflatoxins, with the exception of milk which has an action level of 0.5 ppb of aflatoxins (**Bullerman, 1979**). At the same time, the mean values of detected aflatoxins in the examined samples were lower than the maximum permissible limit recommended by European community (EC) No 1881/2006 in food for human consumption of 10 µg/kg for total aflatoxins B₁, B₂, G₁ and G₂, and 5 µg/kg for aflatoxin B₁. but it should be noted that the production of aflatoxins may be accelerated by improper production and handling of foods.

The most effective mean to prevent aflatoxigenic mould contamination of meat products is through application of strict hygienic measures during the processing of meat products and using a good quality flavoring agents as spices, as well as application of HACCP system in handling

during the production stages of the products. Educational programs and training courses must be applied for meat handlers and workers.

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الملخص العربي

بقايا السموم الفطرية في بعض مصنعات الدواجن المسوقة

تتعرض مصنعات الدواجن للتلوث بالفطريات المنتشرة في أماكن إعدادها كما أن هذه الفطريات لها القدرة على إنتاج السموم الفطرية التي تتسبب في خسائر إقتصادية فادحة في صناعة الدواجن فضلا عن تأثيرها الخطير على صحة كلا من الإنسان والحيوان . لذلك تم فحص عدد ١٠٠ عينة ميكولوجيا من لنشون و برجر الدجاج و شرائح صدور الدجاج المغطاة بطبقة من إضافات اللحوم والتوابل و شرائح صدور الدجاج المخلية و غير المغطاة وأكباد الدجاج بواقع عدد ٢٠ عينة من كلا منهم تم تجميعها عشوائياً من أماكن بيع مختلفة بمدينة الزقازيق محافظة الشرقية. ولقد أوضحت النتائج أيضاً أن عينات أكباد الدجاج اعلى العينات في نسبة الفطريات يليها عينات بيرجر الدجاج ، و شرائح صدور الدجاج المغطاة بطبقة من إضافات اللحوم والتوابل ، و شرائح صدور الدجاج المخلية و الغير مغطاة ، و أخيراً لنشون الدجاج . و أظهرت النتائج انه تم عزل تسعة انواع من الفطريات ووجد ان فطر الاسبراجليس هو الاعلى انتشارا يليه البنسليوم ثم الكلادوسبوريوم ثم الريزوبس ثم الترناريا ثم الأكرمنيوم يليه الباسيلوميسس ثم الاورباسيديوم و أخيراً الابسيديا . و أظهرت النتائج أيضاً أن هناك خمسة أنواع من فطر الاسبراجليس تم عزلها من العينات وقد تبين من النتائج ان أسبراجليس نيجر هو الأكثر تكرار و يليه أسبراجليس فلافيس ، و أسبراجليس فيميجيتس ، و أسبراجليس تيريس و اسبراجليس برازيتكس . ولقد أوضحت النتائج تلوث العينات بأنواع مختلفة ونسب متفاوتة من بقايا سموم الأفلاتوكسين ب١، ب٢، ج١ و ج٢. ووجد أن جميع هذه العينات لم تتعد الحد الأقصى المسموح به وهو ٢٠ جزء في البليون . وتمت مناقشة الأهمية الصحية لأنواع الفطريات المعزولة وبقايا سموم الأفلاتوكسين على صحة الإنسان