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Detection of aflatoxins in some meat products

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A B S T R A C T

This study was conducted to detection of aflatoxins in some meat product, and its hazards on public health. Hundred samples of different meat products represented by (kofta, sausage, luncheon and basterma) were collected randomly from different supermarkets in kaliobia governorates and examined for detection of aflatoxins concentration by using high performance liquid chromatography (HPLC). The average concentration of aflatoxin B1 (µg/kg) in kofta, sausage, luncheon and basterma were 13.38± 1.52, 9.03± 1.17, 8.8±0.95 and 4.53±0. 61 respectively. The average concentration of B2(µg/kg) in kofta , sausage, luncheon and basterma were 8.50 ± 0.7 , 5.20±0.69 ,5.57±0.72and 2.33±0.15 respectively, the average concentration of aflatoxin G1(µg/ kg in kofta, sausage, luncheon and basterma were 4.76±0.83 ,3.35±0.49 ,3.84±0.58 and1.85 ± 0. 22 respectively. The average concentration of aflatoxin G2 (µg/kg) in kofta, sausage, luncheon and basterma were 3.18±0.52, 2.33± 0.29 and2.50± 0.03 respectively. The public health importance of the aflatoxins and the recommended points were discussed.

Keywords: meat products, aflatoxins, HPLC

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1. INTRODUCTION

Recent year the rapid expansion of meat products processing plants due to continuous increasing demand of meat product with low cast and high in nutritive value.

Many strains of moulds are widely distributed in nature, and may affect our food supply as a result of its contamination due to lack of sanitation and handling procedures. Contaminated feed is the main source for mvcotoxin infection of farm animal. (Sayedetal. 2000). Many strains of mould affected meat especially with Aspergillus flavus, Aspergillus parasiticus and Penicillium. These moulds which have been implicated as causative agents in a number of disease syndromes "mycotoxicosis" because of the ability of their toxic strains in production of highly toxic chemical substances referred as mycotoxins, in many cases such as constitute potential and a real risk to public health due to the possibility of causing tumors or inducing organ damage clue to repeated ingestion of subacute levels of mycotoxins (Hoogetal. 1986, Varman and Evans 1991 , Varshneyetal. 1991 and Giradin1997). The presence of toxin producing moulds in meat does not necessarily mean that aflatoxins are present. Both combination of aflatoxins contamination and fungal growth can determine the colonization of She substrate and the type and amount of aflatoxins produced. Knowledge of contamination of meat with these types of moulds is of interest and can be significant

when making an assessment of potential: public health hazards associated with it (Girdain, 1997). Mycotoxins have direct potential health hazards to "human health and animals even with its low levels, and severe economic losses (Varman and Evans, 1991 EL-Shinawy et al. 1994 and Ramasastry et al. 2000). These aflatoxins are considered the most important and prevalent mycotoxins in food leading to the possibility of hepatocarcinogens, teratogenic, mutagen effect and/or delayed organ damage in human being, due to repeated ingestion of subacute levels of mycotoxins (Ueno and Ueno 1978, Olufemi et al. 1983 and Mori et al. 1998). Aflatoxins are secondary metabolites regarded as a quadruple threat, highly mutagenic, teratogenic, carcinogenic and potent toxins (Hayes 1980 and Gourama and Bullerman 1995). Different type These aflatoxins are occur naturally as AFB1, AFB2, AFG1 and AFG2So we aimed to detect the safety of consuming of these product (kofta, sausage, luncheon and basterma) on public health.

2. MATERIALS AND METHODS

2.1. Samples:

Hundred samples of meat product (kofta, sausages luncheon and basterma) 25 from each were randomly collected from different localities.

2.2. Detection of aflatoxins

Extraction of aflatoxin from meat samples were performed according to Roybulet al. (1988) and Ahmed (2004) then detection of shigh aflatoxin performance liquid chromatography (HPLC).

3. RESULTS

Table (1) shows the average concentration of aflatoxin B1 (µg/kg) in the examined samples of meat products (n =25) of each it was varied from 4.9 to 26.1 with an average of 13.38 ±1.52 for kofta, 2.3 to 21.7 with an average 9.03± 1.17 for sausage, 2.2 to 18.9 with an average 8.8±0.95 for lunch eon and 1.6 to 7.4 with an average 4.53±0. 61 for basterma respectively. The difference associated with the examined sample of meat products were highly significant ($p< 0.1$) as a result of average concentration of aflatoxin B1 (µg/ kg) as shown in table (2). Table (3) shows the average concentration of aflatoxin B2 (µg/ kg) in the examined sample of meat products(n =25) of each .It was varied from 3.3 to 15.5 with an average 8.50 ± 0.7 for Kofta; 1.8 to 9.3 with an average 5.20±0.69 for sausage , 1.9 to 11.8 with an average 5.57±0.72 for luncheonand1.1to3.8with an average 2.33±.15for basterma respectively. The difference associated with the examined sample of meat product were highly significant ($p< 0,01$) as a result of average concentration of B2 (µg/ Kg) as shown in table (4). Table (5) shows the average concentration of aflatoxin G1(µg/ kg) in the examined sample of meat products(n = 25) of each it was varied from 1.5to 8.9 with average 4.76±0.83 for Kofta; 1.2 to 5.6 with an average 3,35±0,49 for sausage , 1.4 to 7.5 with an average 3.84±0.58 for luncheon and 1.0 to 2.7 with an average 1.85 ± 0. 22 for Basterma respectively. The difference associated with the examined sample of meat product were less significant ($p<0.05$) as a result of average concentration of G1 (µg/kg) as shown in Table (6).

Table (7) shows the average concentration of aflatoxin G2 (µg/kg) in the examined sample of meat products (n = 25) of each. It was varied from 1.3 to 5.03 with an average 3.18±0.52 for kofta, 1 to 3.5 with an average 2.33± 0.29 for sausage and 1.3 to 4.1 with a an average 2.50± 0.03 fro luncheon respectively. The difference associated with the examined samples of Meat product were less significant ($p< 0,05$) as a result of average concentration of G2 (µg/ kg)as shown in Table (8).

Table (1): Average concentrations of aflatoxin B1 (µg/kg) in the examined samples of meat products (n=25).

Meat products	Negative Samples No.	%	Positive samples No.	%	Min.	Max.	Mean ± S.E*	Acceptable** sample	Non acceptable** sample
Kofta16	16	64	9	36	4.9	26.1	13.38± 1.52	25	0
Sausage	19	76	6	24	2.3	21.7	9.03± 1.14	25	0
Luncheon	17	68	8	32	2.2	18.9	8.80± 0.95	25	0
Basterma	22	88	3	12	1.6	7.4	4.53± 0.61	25	0

S.E* = standard error of mean, **Permissible limit according to WHO "15 ppb" (Jelinek et al., 1989) and FAD limit "20 ppb" FAO (2004). In food stuff

Table (2): Analysis of variance (ANOVA) of aflatoxin B1 levels in the examined samples of meat products.

Source of variance	D.F	S.S	M.S	F. value
Total	99	17.2163		
Between Products (P)	3	7.7891	2.5939	26.44^{++}
Error	96	9.4272	0.0982	

D.F = Degrees of freedom, M.S = Mean squares, S.S = Sum squares, ++= High significant differences ($p<0.01$)

Table (3): Average concentrations of aflatoxin B2 (µg/kg) in the examined samples of meat products (n=25).

Meat products	Negative Samples No.	%	Positive samples No.	%	Min.	Max.	Mean ± S.E*	Acceptable** sample	Nonacceptable** sample
Kofta	17	68	8	32	3.3	15.5	8.50± 1.07	25	0
Sausage	20	80	5	20	1.8	9.3	5.20± 0.69	25	0
Luncheon	18	72	7	28	1.9	11.8	5.57± 0.72	25	0
Basterma	22	88	3	12	1.1	3.8	2.33± 0.15	25	0

S.E* = standard error of mean, **Permissible limit according to WHO "15 ppb" (Jelinek et al., 1989) and FAD limit "20 ppb" FAO (2004). In food stuff

Table (4): Analysis of variance (ANOVA) of aflatoxin B2 levels in the examined samples of meat products

Source of variance	D.F	S.S	M.S	F. value
Total	99	11.4606		
Between Products (P)	3	4.6159	1.5386	21.58^{++}
Error	96	6.8447	0.0713	

D.F = Degrees of freedom, M.S = Mean squares, S.S = Sum squares, ++= High significant differences ($p<0.01$)

Table (5): Average concentrations of aflatoxin G1 (µg/kg) in the examined samples of meat products (n=25).

Meat products	Negative Samples		Positive samples		Min.	Max.	Mean ± S.E*	Acceptable**	Nonacceptable**
	No.	%	No.	%				sample	sample
Kofta	17	68	8	32	1.5	8.9	4.76± 0.83	25	0
Sausage	21	84	4	16	1.2	5.6	3.35± 0.49	25	0
Luncheon	20	80	5	20	1.4	7.5	3.84± 0.58	25	0
Basterma	23	92	2	8	1.0	2.7	1.85± 0.22	25	0

S.E* = standard error of mean, **Permissible limit according to WHO "15 ppb" (Jelinek et al., 1989) and FAD limit "20 ppb" FAO (2004). In food stuff

Table (6): Analysis of variance (ANOVA) of aflatoxin G1 levels in the examined samples of meat products.

Source of variance	D.F	S.S	M.S	F. value
Total	99	3.9310		
Between Products (P)	3	0.5229	0.1743	4.91^{+}
Error	96	3.4081	0.0355	

D.F = Degrees of freedom, M.S = Mean squares, S.S = Sum squares, ++= High significant differences (p<0.05).

Table (7): Average concentrations of aflatoxin G2 (µg/kg) in the examined samples of meat products (n=25)

Meat products	Negative Samples		Positive samples		Min.	Max.	Mean ± S.E*	Acceptable**	Nonacceptable**
	No.	%	No.	%				sample	sample
Kofta	19	76	6	24	1.3	5.3	3.18± 0.52	25	0
Sausage	22	88	3	12	1.0	3.5	2.23± 0.29	25	0
Luncheon	21	84	4	16	1.3	4.1	2.50± 0.37	25	0
Basterma	25	100	-	-	-	-	-	25	0

S.E* = standard error of mean, **Permissible limit according to WHO "15 ppb" (Jelinek et al., 1989) and FAD limit "20 ppb" FAO (2004). In food stuff

Table (8): Analysis of variance (ANOVA) of aflatoxin G2 levels in the examined samples of meat products

Source of variance	D.F	S.S	M.S	F. value
Total	99	3.0029		
Between Products (P)	3	0.4205	0.1402	5.21^{+}
Error	96	2.5824	0.0269	

D.F = Degrees of freedom, M.S = Mean squares, S.S = Sum squares, ++= High significant differences (p<0.05).

4. DISCUSSION

These result nearly similar to Ismail and Zaki (1999) who reported that AFB1 in luncheon was 11.1 pp and Ismail et al (2013) who reported AFB1was 10.4 ±5.1 in luncheon but were higher than reported that by shabana et al (2008) who reported that AFB1was 6.70 ±0.89 in Kofta, Harzallah (2009) who reported AFB1was 0. 15 to 6.36 in beef product, Aziz and Youssef (1991) who reported AFB1was 7 µg/ kg in sausage

while result of sausage lower than Hamed et al (1994)

AFB2 were higher than reported by Aziz and Youssef (1991) who found AFB2 (2µg/ kg) in luncheon and32µg/ kg in but were lower than Abd El – Motalab (2012) who detected higher concentration of AFB2 in frozen Meat. This result of AFG1were higher than, Shabana et al (2008) who reported lower concentration AFG1 4.76 in kofta and lower than Abd El- Motalab (2012)

Aflatoxin may be introduced to the meat product through the use of contaminated additives and spices which used to the meat product quality (El-Bouhyetal. 1994)

It is great magnitude to mention that aflatoxinB1 is the most potent carcinogenic even at very low concentration as compared with other types of aflatoxins (WHO2002).

Human exposure to myccotoxins occurs frequently due to consumption of mould contaminated agriculture products or transmition from feed to meat (Wafia and Hassan, 2000)

Food and drug administration (1999) Stated that aflatoxins especially B1, B2 and G1 were the most common toxin found in human food stuffs its health effect include acute toxicity and impaired mental development.

Conclusion: Meat products in this study were subjected to various degree of contamination through meat processing. Therefore, a concerted effort should be made to maintain sanitary condition in processing, preparation and handling. This can be controlled by applying Hygienic measures during slaughtering, struggling as well as efficient bleeding should be considered. All meat and establishments develop and implement a system of preventive control designed to improve the safety of their products, known as HACCP (Hazard Analysis and Critical Control Points.

kofta showed the higher level (B1,B2,G1,G2)while basterma reveled the lowest level.

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الكشف عن الأفلاتوكسين في بعض منتجات اللحوم.

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الملخص العربي

تعتبر منتجات اللحوم مصدر من مصادر البروتين الحيوانى ذوالقيمة الحيوية العالية ومصدر لطاقة لاحتوائه على نسب متفاوتة من الدهون بالإضافة إلى انها تستهلك بشكل كبير وخصوصا عند الطبقات محدودة الدخل نتيجة لرخص ثمنها مقارنة باللحوم.
ولما كانتهذة المنتجات قد تحتوى على السموم الفطرية نتيجة تغذية الحيوانات على اعلاف ملوثة بالاعفان السامة التى يمكنها إفراز سموم فطرية بكميات كبيرة مما يجعلها تنتقل للانسان عن طريق هذه المنتجات وتسبب ا لتسمم بنوعية الحاد والمزمن وسرطانات وتشوة الاجنة وتكسير فى خلايا الانسجة المختلفة وخاصة الكبد والكلى كما تقلل من مناعة الجسم مما يجعلة عرضة للاصابة بالعديد من الامراض وقد تودى بحياتة للموت. لذا اجريت هذه الدراسة للكشف عن الافلاتوكسين فى منتجات اللحوم بإستخدام جهاز الفصل الكروماتجرافى(HPLC)ولهذا فقد تم تجميع عدد100 عينة من منتجات اللحوم ممثله على النحو التالى25عينة من كل من(كفتة-سجق -لانشون-بسطرمة)تجميعا عشوائيا من اماكن مختلفة من محافظة القليوبية حيث اظهرت النتائج ان تواجد افلاتوكسين ب1 فى (الكفتة،السجق ،الانشون والبسطرمة) وكانت9(36%)،6(24%)،8(32%)3(12%) بكميات كانت متوسطها13.38±1.52 ،9.03±1.14‘ 8.80 ±0.95، 5.43±0.61 ميكروجرام لكل كيلو جرام على التوالى
وقد دلت النتائج على ان تواجد الافلاتوكسين ب2 فى (الكفتة‘السجق ‘الانشون والبسطرمة) وكانت8 (32%) ،5(20%) ،7(28%) 3(12%) بكميات كانت متوسطها8.50±1.07 ،5.20±0.69‘ 5.57 ±0.72، 2.33±0.72 ميكروجرام لكل كيلو جرام على التوالى على الجانب الاخر تواجد الافلاتوكسين ج1 فى (الكفتة‘السجق ‘الانشون والبسطرمة) وكانت 8(32%) ،4(16%) 5، (20%) 2(8%) بكميات كانت متوسطها4.76±0.83 ،3.35±0.49‘ 3.84 ±0.58، 1.85±0.22 ميكروجرام لكل كيلو جرام على التوالى بالإضافة الى ذلك تواجد الافلاتوكسين ج2 فى (الكفتة‘السجق ‘الانشون والبسطرمة) وكانت 6(24%)،3(12%)،4 (16%) بكميات كانت متوسطها8.50±1.07 ،8.13±0.52‘ 2.23 ±0.29، 2.50 ±0.37ميكروجرام لكل كيلو جرام على التوالى وقد تم دراسة ومناقشة الأهمية الصحيةللافلاتوكسين ومصادر تلوث منتجات اللحوم التي تم فحصها بالإضافة إلي اقتراح التوصيات اللازمة لجودة هذه المنتجات وسلا متها.

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