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MYCOTOXINS RESIDUES IN SOME EGYPTIAN POULTRY MEAT PRODUCTS

SAMIA EL- ZEINI

Animal Health Research Institute- Doki- Giza.

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SUMMARY

The objective of the present study is to determine the aflatoxin B_1 (AFB_1) and ochratoxin A (OCHA) level in some chicken meat products. AFB_1 and OCHA were evaluated in 68 samples of chicken meat products collected from different companies in Giza city. The tested processed chicken meat products were chicken burger, grilled shish, pre-fried pate, chicken kebbeh balls, chicken nuggets, sesam fillet chicken, chicken luncheon and smoked chicken luncheon. Highest incidence of AFB_1 was detected in chicken kebbeh balls (70%), while lowest incidence was reported in chicken nuggets (8.34%). No AFB_1 was detected in grilled shish, chicken luncheon and smoked chicken luncheon. All positive samples contained more than 5 ppb AFB_1 except chicken nuggets which contained 3.1 ppb. Frying decreased the level of AFB_1 and roasting was more effective in this respect. Highest incidence of OCHA was detected in grilled shish (71.43%) , while lowest incidence was reported in chicken nuggets (25%). No OCHA was detected in chicken luncheon and smoked chicken luncheon. All positive samples contained more than 10 ppb OCHA. Frying and roasting decreased the level of OCHA but its level is still above the permissible limits (10 ppb).

INTRODUCTION

Mycotoxins are toxic metabolites produced by certain toxigenic microscopic fungi in or on foods. Some mycotoxins are carcinogenic and others cause pathological effects on the body. Mycotoxin containing foods have been found all over the world: Africa, Asia, North and South America, Australia and Europe (Ostr, 1999). Natural contamination of foods and feeds by

mycotoxins has been widely reported. Such contamination has been reported mainly in relatively warm agricultural countries and in countries importing food and feed stuffs. The most major carcinogenic mycotoxins affecting both human and animals are aflatoxin and ochratoxin. There are many types of aflatoxins as B_1, B_2, G_1, G_2, M_1, and M2 of which B_1 is the most dangerous one. The ochratoxin have been designated A, B, C and D. Ochratoxins A is the major metabolite in respect to occurrence and toxicity (Schuller & Egmond 1981).

The risk of mycotoxin is related to the way of its entry into human and animal body within dietary systems, mainly by ingestion and increasing by inhalation (Smith et al., 1995). Signs and symptoms of diseases caused by mycotoxins vary and depend on the animal species, the organ or system involved and the dose and type of mycotoxin (s) ingested. The symptoms can range from skin lesions, or signs of hepatotoxicity, nephrotoxicity, neurotoxicity, genotoxicity to acute death, (Hollinger & Ekperigin, 1999).

In recent years there has been a rapid expansion in commercial processing of poultry products, raw and ready to-cook. In Egypt, information concerning human exposure to aflatoxin B_1 and ochratoxin A from poultry meat products is relatively incomplete. Therefore, this work was initiated to evaluate the presence of aflatoxin B_1 and ochratoxin A in some chicken meat products namely, chicken burger, grilled shish, pre-fried pate, chicken kebbeh balls, chicken nuggets, sesam fillet chickens, chicken luncheon and smoked chicken luncheon. The influence of the common cooking methods namely frying and roasting on the AF B_1 and OCHA in the tested materials was carried out.

MATERIALS AND METHODS

Samples:

Sixty-eight samples of frozen chicken meat products were collected randomly from different supermarkets of Giza city. Samples were collected from the following products: chicken burger (12), grilled shish (7), pre-fried pate (10), chicken kebbeh balls (10), chicken nuggets (12), sesam fillet chicken (7), chicken luncheon (5) and smoked chicken luncheon (5). The samples were subjected to the following procedures.

Preparation of the samples:

Fifty grams from each sample subjected to aflatoxin B_1 and ochratoxin A determination.

Aflatoxin B_1 (AFB_1) and ochratoxin A (OCHA) were firstly recognized semiquantitatively by thin layer chromatography. The positive samples for AFB_1 and OCHA were estimated quantitatively by a fluorometric method before and after cooking. The positive samples were cooked by frying or roasting. Samples were subjected to frying in boiling oil (free from mycotoxins) for 10 min.

hen cooled, weighed and subjected to reexamination. Roasting was carried out by subjecting samples to direct flame for 10 minutes, then cooled, weighed and subjected to further examination to evaluate the level of AFB_1 and OCHA.

Methods:

Semiquantitative estimation of AFB_1 and OCHA was carried out by thin layer chromatography according to Schuller and Egmond (1981). AFB_1 and OCHA in sample extracts were separated and resolved on glass plates coated with silica gel. Developed plates were examined with the aid of ultraviolet light (365 nm). AFB_1 and OCHA concentrations were determined visually by comparing the intensities of fluorescence of spots in the sample with those of appropriate standards.

Quantitative estimation was carried out fluorometrically according to AOAC (1990). To measure AFB_1 and OCHA levels, samples were prepared by mixing with an extraction solution (methyl alcohol: water; 80:20 v/v) followed by blending and filtering. The extract is then applied to the Afla and ochra test columns which contains specific antibodies to Afla and ochratoxin. At this stage, the afla and ochratoxin are bound to the antibodies on the column. The column is then washed to rid the immunoaffinity column of impurities. By passing an eluting solution (10 c.c. methyl) through the column, the afla and ochratoxin are removed from the antibodies. This eluting solution was then measured in a fluorometer vicam V_1. Series 4 (Scince Vicam Technology, WATERTOWN, MA, USA).

RESULTS AND DISCUSSION

Table 1 presents the results of the occurrence of AFB_1 in some chicken meat products. The highest AFB_1 incidence was observed in chicken kebbeh balls (70% contaminated samples) followed by chicken burger (66.67%), pre-fried pate (40%), sesam fillet (28.57%) and chicken nuggets (8.34%). All contaminated samples contained more than 5 ppb AFB_1 except chicken nuggets which contained lower levels. Grilled shish chickens, chicken luncheon and smoked chicken luncheon, were free from AFB_1

Table 2 shows the incidence of OCHA in chicken meat products. The results showed that 71.43% of grilled shish samples were contaminated with OCHA, while lower incidence was recorded in the other products: chicken Kebbeh balls (70%), chicken burger (66.67%), pre-fried pate (40%), sesam fillet (28.57%) and chicken nuggets (25%). All contaminated samples contained more than 10 ppb OCHA. The present results referred that only chicken luncheon and smoked chicken luncheon were free from OCHA.

Table 3 shows the levels of AFB_1 (ppb) in positive chicken meat products before and after cooking. The highest levels of AFB_1 was recorded in chicken burger (12.6 ppb) while the lowest level

Table 1: Incidence of aflatoxin B_1 in chicken meat products.

Samples	No. of contam. samples/total exam. sample.	% of contaminated samples	Samples more than *5 ppb/total contam. sampels	% of contam. sampels more than 5ppb
Chicken burger	8/12	66.67	8/8	100
Grilled shish	0/7	0.0	0	0
Pre. Fried pate	4/10	40	4/4	100
Chicken kebbeh balls	7/10	70	7/7	100
Chicken nuggests	1/12	8.34	0/1	0
Sesam fillet	2/7	28.57	2/2	100
Chicken luncheon	0/5	0	0	0
Smoked luncheon	0/5	0	0	0

* Permissible limits according to FAO (1997) AFB_1 5 ppb

Table 2: Incidence of ochratoxin A in chicken meat products.

Samples	No. of contam. samples/total exam. sample.	% of contaminated samples	Samples more than *10 ppb/total contam. sampels	% of contam. sampels more than 10ppb
Chicken burger	8/12	66.67	8/8	100
Grilled shish	5/7	71.43	5/5	100
Pre. Fried pate	4/10	40	4/4	100
Chicken kebbeh balls	7/10	70	7/7	100
Chicken nuggests	3/12	25	3/3	100
Sesam fillet	2/7	28.57	2/2	100
Chicken luncheon	0/5	0	0	0
Smoked luncheon	0/5	0	0	0

* Permissible limits according to FAO (1997) OCHA 10 ppb

Table 3: Levels of aflatoxin B1 (ppb) in chicken meat products before and after cooking.

Samples (No.)	Before cooking			After cooking					
				Frying			Roasting		
	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
Chicken burger (8)	7.4	19.0	12.6	3.9	10.0	7.47	2.08	5.33	4.1
Pre. fried pate (4)	5.6	8.3	5.65	2.95	4.37	3.74	1.57	2.33	1.97
Chicken kebbeh balls (7)	7.9	12	9.67	4.16	6.32	5.49	2.22	3.37	2.86
Chicken nuggets (1)	3.1	0	0	1.63	0	0	0.87	0	0
Sesam fillet (2)	6.5	6.94	6.72	3.4	3.65	3.525	1.82	1.94	1.88

was recorded in chicken nuggets (3.1 ppb). The permissible limit of AFB_1 according to FAO (1997) was 5 ppb. Accordingly, all positive samples in this work are contaminated by AFB_1 in an abnormal levels except chicken nuggets sample (3.1 ppb).

Moreover, Teleb et al. (1988) recorded AFB_1 in breast muscles of broiler chickens. The results of the present work as well as those of Refai (1988) indicates that AFB_1 can easily contaminate poultry and meat products originated from other additives (especially spices) than chicken tissues or during processing and storage. Rodriguez et al. (1981) found that 36 out of 71 samples of feed stuffs and raw materials contained AFB_1 with other mycotoxins. The meat industry uses the largest quantities of spices. Aziz & Youssef (1991) stated that the spices which are used in meat products may be a potential source of food contamination and mycotoxins.

The present results showed that frying decreased the level of AFB_1 from 12.6 to 7.47 ppb and from 3.1 to 1.63 ppb in chicken burger and chicken nuggets respectively. The decreased level of AFB_1 may be due to losses during preparation and or frying process of the samples. Nearly similar results were recorded by Shabana (1999).

The present data revealed that roasting decreased AFB_1 levels in the positive samples of chicken burger from 12.6 to 4.1 Ppb. and of chicken nuggets from 3.1 to 0.87 ppb. The present data nearly agree with those of Bullerman (1979) and Stoloff (1977). They recorded that roasting reduced the

levels of aflatoxin by 40 to 60%. Also Shabana (1999) recorded that roasting caused a reduction of the toxin present between 25.98 to 49.01%.

However, it is important to emphasize that Luter et al. (1982) and Bulferman (1987) recorded that AFB_1 is heat stable and is not destroyed by heating to ordinary cooking temperature of food.

Table 4 showed the effect of cooking on the average values of OCHA (ppb) in contaminated chicken meat products. The results of this work showed that OCHA was detected in high level in sesam fillet (32.85 ppb) followed by chicken kebbeh balls (27.17 ppb), chicken burger (25.16 ppb), chicken nuggets (21.8 ppb), prefried pate (18.8 ppb) and grilled shish (18.27 ppb).

Table 4: Levels of ochratoxin A (ppb) in chicken meat products before and after cooking.

Samples (No.)	Before cooking			After cooking					
				Frying			Roasting		
	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
Chicken burger (8)	15	32	25.16	12.67	27.02	21.56	10.49	22.37	17.62
Grilled shish (5)	14	22.1	18.27	11.82	18.66	15.49	9.79	15.45	11.75
Pre. fried pate (4)	14.6	23	18.8	12.33	19.42	16.58	10.21	16.08	13.15
Chicken kebbeh balls (7)	14.78	33.61	27.17	12.48	28.38	22.29	10.33	23.5	18.61
Chicken nuggets (1)	20.1	23.5	21.8	16.97	19.84	18.27	14.05	16.43	14.24
Sesam fillet (2)	30.2	35.5	32.85	25.5	29.98	27.74	21.11	24.82	22.97

The occurrence of OCHA residues in tissues has been investigated by many workers. El Gazzar (1998) detected OCHA residues in broilers and hens muscles in a range of 6-10 ppb., while El-Bagoury & Abd El-khalek. (1997) determined OCHA in muscles of Egyptian broilers at a level of 12 ppb.

Meanwhile Jorgensen (1998) recorded a maximum level of OCHA in chicken meat of 0.18 ppb. in Denmark, where as Schuller & Egmond (1981) reported that OCHA is known to be carried over into meat and other animal products from feeds. However residues of OCHA in chicken meat products may also be related to spices which are used for chicken meat products Aziz & Youssef (1991),

Frying reduced OCHA levels from 32.85 to 27.74 ppb in sesam fillet and from 18.27 to

15.49 ppb in grilled shish samples. Similar data have been reported in previous surveys by Shabana (1999) who found that frying caused a reduction of 33.85% of OCHA present.

OCHA levels in positive samples were decreased by roasting from 32.85 to 22.97 ppb in sesam fillet and from 18.27 to 11.75 in grilled shish samples. However, it is well known that OCHA is a fairly stable compound but some loss was recorded under roasting procedure in the processing of coffee beans (Schuller et al., 1981). Moreover Shabana (1999) reported that roasting caused a reduction of OCHA level by 26.91%.

Conclusion and Recommendations:

From the previous data, it is clear that AFB_1 and OCHA were present in chicken meat products before and after cooking either by frying or roasting. The detected limits were higher than the maximum tolerated levels: 5 ppb for AFB_1 and 10 ppb for OCHA (FAO, 1997). The regulations concerned with different mycotoxins permissible limits still variable in various countries for different food and food products. In Egypt it is necessary to assure of the recommendations and other statements for food safety, integrity, or wholesomeness.

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