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STUDIES OF FUNGAL AND AFLATOXINS CONTAMINATION OF MEAT,MEAT PRODUCTS AND FOOD ADDITIVES

BY

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INTRODUCTION

Mycotoxins, as metabolites produced by many strains of moulds in different food and food products are highly toxic, potent carcinogens and constitute a potential hazard to human health (Bullerman, 1979; Dietert et al., 1983 and Youssef et al., 1986).

The contamination of fresh meat by species of the Aspergillus, Penicillium, Penicillium, Fusarium, Mucor and Cladosporium was reported by some investigators (Hechelman, 1981 and Yassien et al., 1990). Also, the refrigerated meat & some meat products were reported to be contaminated by species of Penicillium and Aspergillus (Torrey and Marth, 1977 and El-Naggar, 1990). The ability of Aspergillus flavus to produce aflatoxins was greatly influenced by the compositional and structural properties of substrates and storage conditions (Obioha, 1979).

Spices and some food additives were investigated as the main important source of toxigenic moulds and mycotoxins (Scott and Kennedy, 1973; Flanniga and Hui, 1976 and Misra, 1981).

Therefore, the present study was planned to shed a light on fungal contamination and the ability of the aflatoxigenic strains isolated from meat, meat products and some food additives to produce aflatoxins. The aflatoxins contamination was determinaed in all samples in composite.

MATERIAL AND METHODS

Samples:

A total of 80 samples of meat and meat products were collected from meat manufacturing plants in Cairo, Egypt. The samples represented fresh and frozen meats (10 of each) as well as canned meat, sausage, minced meat and beef burger (15 of each). Eighty samples of food additives including 15 samples of each of white pepper, black pepper and 10 samples of each of capsicum, Kaff El-dop, Chinese copaiba, soy protein and starch were examined.

Mycological examination:

Enumeration of fungi (moulds

and yeasts) in the examined samples, isolation and identification of fungal isolates were carried out according to Raper and Fennel (1965) and Refai (1987).

Aflatoxins determiantion:

Aflatoxins were determined in the samples of meat and meat products according to Bullerman (1969) and Obioha (1979). Also, determination of aflatoxin from food additives was done according to Stahr (1980) and Gabal (1987). The qualitative and guantitative tests for aflatoxins-producing strains of A. flavus were carried out according to Gimeno (1979).

RESULTS AND DISCUSSION

In the present investigation, Table (1) revealed that meat and meat products were contaminated with many fungal species (Aspergillus, Penicillium, Mucor, Trichospron, Cryptococcus, Rhodotorula and Candida). A. flavus, A. niger and A. ochraceus were only identified among Aspergillus species. The total fungal counts varied according to the type of meat product under examination, the highest counts were recorded in beef burfer (4.15×10^4/gm). Nearly similar results were reported by Abd El-Rahman et al. (1984), Edreis (1986), El-Khateib and Abd El-Rahman (1989), Yassien et al. (1990) and Salem (1991).

The data recorded in Table (2) indicated the occurrence of the fungi in samples of some food additives used in meat industry Aspergillus, Penicillium, Mucor Scopulariopsis and Rhodorula were the main fungal genera isolated from all examined samples. These observations were in agreement with data recorded by Flannig and Hui (1976) and Youssef et a (1986) who stated that Aspergillu Penicillium and other genera we the main components of grou

Table (1): Mean values of total fungal counts and the most important fungal species recovered from meat and meat products.

Types of examined samples	No of Samples in composite	Mean value of total fungal count /gm.*	Isolated Fungi
Fresh meat	10	1.00×10^2	Aspergillus flavus, A.niger Penicillum sp.& Trichosporon
Frozen meat	10	9.50×10^2	Mucor sp. & Trichosporon sp.
Canned meat	15	1.07×10^2	Cryptococcus sp.
Sausage	15	9.50×10^3	A.flavus , A. niger , A.ochraceous & cryptococcus sp.
Minced meat with spices	15	1.75×10^3	A.flavus , A. niger & Penicillium sp.
Beef burger	15	4.15×10^4	A.flavus, A.niger, A.ochraceous, Mucor sp., Candida sp. & Rhodotorula sp.

Table (2): Mean values of total fungal counts and the most important fungal species recovered from food additives

Types of examined samples	No of Samples in composite	Mean value of total fungal count /gm.*	Isolated Fungi
White pepper	15	3.40×10^6	Aspergillus flavus, A.caddidus & Scopulariopsis sp.
Black pepper	15	8.60×10^5	A.fumigatus, A.niger & A. ustus
Capsicum	10	1.20×10^4	A.flavus & Mucor sp.
Kaff El-dop	10	6.40×10^3	A.flavus,
Chinese copaiba	10	6.80×10^4	A.flavus & A. fumigatus
Soy protein	10	1.20×10^3	A.flavus, A.fumigatus, Mucor sp., Penicillum sp. & Scopulariopsis sp.
starch	10	6.10×10^3	A.flavus, Piricillum sp., Mucor sp. & Rhodotorual sp.

spices (black, white and red pepper, caraway, cumin, fennel, coriander and aniseed). The obtained results indicated that the total fungal flora of food additives varied greatly, the highest counts of fungi was observed in white and black pepper, which ranged from 8.6 X 10^5 to 3.4 X 10^6/gm.

Flanniga and Hui (1976), in Scotland, recorded that the mean mould counts of ground spices ranged from 1.5 X 10^3/gm in cumin to 6.5 X 10^5/gm in black pepper. In Egypt, Youssef et al. (1986) reported that the total spores of

Table (3): Levels of aflatoxins detected in meat, meat products & food additives.

Type of samples	No.of Examined samples	No. of positive samples	% Of positive samples	Detected aflatoxins mg/Kg *			
				B_1	B_2	G_1	G_2
I.Meat samples							
Fresh meat	10	0	0	ND	ND	ND	ND
Frozen meat	10	0	0	ND	ND	ND	ND
Canned meat	15	0	0	ND	ND	ND	ND
Sausage	15	6	40	0.75	ND	0.60	ND
Minced meat with spices	15	5	33	0.30	ND	2.15	ND
Beef burger	15	3	20	0.60	ND	1.20	ND
II.Spices & food additives samples.							
White pepper	15	6	40	100±12	ND	ND	ND
Black pepper	15	9	60	110±18	ND	ND	ND
Capsicum	10	10	10	200±22	ND	ND	ND
Kaff El-dop	10	6	60	108±21	ND	ND	ND
Chinese copaiba	10	7	70	300±45	ND	ND	ND
Soya protein	10	3	30	15	ND	ND	ND
Starch	10	0	0	ND	ND	ND	ND

ND = Not detected
* = Mean of ten tested samples ± S.E.M.

Table(4): Frequancy distribution of aflatoxins produced by *Aspergillus flavus* isolated from meat and meat product samples.

Type of Sample	Number of screened strains	+ve. strains for aflatoxin production	Type of aflatoxins produced			
			B_1	B_1&B_2	G_1	B_1&B_2&G_1
Fresh meat	2	2	2	-	-	-
Frozen meat	0	0	0	0	0	0
Canned meat	0	0	0	0	-	0
Sausage	6	5	2	1	1	1
Minced meat with spices	6	4	1	1	1	1
Beef burger	5	4	3	1	-	-
TOTAL	19	15	8	3	2	2

fungi in ground black pepper was 1.6×10^4/gm. Whereas, Abd El-Rahman (1987) reported that all spices examined were highly contamined with moulds with a total count ranged from 5×10^4 to 3.4×10^6/gm.

The resutls of the present study indicated that (100%) of samples of meat, meat products and food additives had fungal contamination. In all instances, the species of A. flavus was the predominant one with the exception of frozen and canned meat samples. The results reported here in agree with those reported by El-Khateib and Abd El-Rahman (1989) for meat products and Misra (1981) and Youssef et al. (1986) for spices.

The detection of Aspergillus flavus and closely related species in food and feed stuffs indicates the possibility of aflatoxin contamination which is highly toxic, carcinogenic, mutagenic and teratogenic (Hayes, 1980).

In the present study, a variety of different meat, meat products and food additives were analyzed for aflatoxins contamination. Table (3) showed that aflatoxin was not detected in any of fresh, frozen, canned meat and starch. Aflatoxins B_1 and G_1 were detected in 14 (31%) out of 45 samples of sausage, minced meat and beef burger at level below 5 ug/kg. Of the 80

Table(5): Frequancy distribution of aflatoxins produced by *Aspergillus flavus* isolated from food additaves.

Type of sample	Number of screened strains	+ve. strains for aflatoxin productioo	Type of aflatoxins produced			
			B_1&B_2	B_1&G_1	B_1&B_2&G_1	B_1&B_2&G_1&G_2
White papper	6	6	2	2	-	2
Black pepper	8	6	2	1	1	2
Capsicum	4	3	1	-	-	2
Kalf El-dop	4	2	-	1	1	-
Chinese copalba	3	1	-	-	1	-
Soy protein	3	-	-	-	-	-
Starch	3	-	-	-	-	-
TOTAL	31	18	5	4	3	6

samples of food additives, only 41 (52%) samples were contaminated with aflatoxin B_1 with a maximum level of 300 ug/kg.

The present results agree with those recorded by Bullerman (1969) for fresh meat, Obioha (1979) for meat products, Salem (1991) for frozen meat and Girgis (1977) for food additives.

In achived results, the detection of aflatoxin in different meat products may be attributed to the addition of spices which were highly contaminated with aflatoxins and moulds especially aflatoxin producing strains of Aspergillus flavus. This conclusion was supported by Raper et al. (1985) who reported that most members of A. flavus group were considered as source of aflatoxins in different food and feed products.

The presence of moulds belonging to the species of A. flavus may constitute a potential health hazard. Hence the isolated strains of A. flavus were screened for production of aflatoxins.

It is evident from the results obtained in Tables (4 & 5) that the meat products and food additives were the most frequently contaminated samples with aflatoxigenic strains.

The results of this survey reflected a rather low incidence of aflatoxin contamination in the positive samples of ratail minced meat, sausage, and beef burger for human consumption justifies the adoption of measures. Egyptian standards limits and imported spices as well as meat products should be formulated and imposed.

SUMMARY

A survey was carried out to obtain data on the occurrence of aflatoxins and aflatoxigenic mould contamination of meat and meat products as well as some food additives used in meat industry.

The results revealed that all samples had fungal contamination (100%). The most common isolated fungal flora were: Aspergillus, Penicillium, Mucor, Trichosporon, Scopulariopsis, Cryptococcus, Rhodotorula and Candida. In all instances, Aspergillus flavus was the predominant one with the exception of frozen and canned meats.

Aflatoxins were detected in 17.5% of 80 samples of meat and meat products at a level below 5 ug/kg. Also, 51.25% of 80 food additive samples were positive for aflatoxin B_1 with a maximum level of 300 ug/kg. Furthermore, 50 isolates of A. flavus were checked for toxicity. Of the examined isolates 66% were positive for aflatoxins. The contamination of meat products as sausages, minced meat and beef burger with aflatoxins and aflatoxigenic moulds may be due to the addition of spices and other additives to fresh meat.

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