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**ISOLATION OF SOME MOULD AND YEAST
FROM THE FROZEN GROUND BEEF
OF ZOONOTIC IMPORTANCE**
(With 4 Tables)

By

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(Received at 19/5/1992)

عزل بعض الفطريات والخمائر المتواجدة في اللحم البقريّة
المفرومة ذات الأهمية المشتركة

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تتميز الفطريات بقدرتها على تحمل الظروف البيئية المختلفة والتي لها تأثير كبير فيما تسببه من مشاكل في منتجات اللحم سواء ما تسببه من فساد للمنتج أو الإضرار بصحة الإنسان . ولذا أجريت هذه الدراسة على ٦٠ عينة من اللحم البقريّة المفرومة والتي تم جمعها من محلات السوبر ماركت في محافظة الإسكندرية بهدف عزل وتصنيف الفطريات والخمائر المحتمل وجودها في الجرام الواحد في هذه المنتجات وكان متوسط العدد الكلي للفطريات المعزولة $٩٦ \times ١٠^٤ + ١٠^٤$ بينما كان متوسط العدد الكلي للخمائر المعزولة $٩٠ \times ١٠^٤ + ٩٠ \times ١٠^٤$ وأيضاً تم دراسة قسماً من الإيسبريجيلس فلافس على إنتاج سموم الأفلاتوكسين في الأرز المتخمر وقد وجدت بنسبة ١٨٨ مللي جرام لكل جرام . ولقد تمت مناقشة النتائج وتأثير تلك الفطريات والخمائر المعزولة على المنتج وكذلك مناقشة أهمية تلك الفطريات والخمائر على الصحة العامّة للإنسان .

SUMMARY

60 random samples of retail packages of frozen ground beef were subjected to mycological examination. The total mould count per gram ranged from 3×10^2 to 4×10^5 with an average of $9.6 \times 10^4 \pm 1.5 \times 10^5$ and yeast count from 2×10^2 to 1.7×10^6 with a mean value of $5.3 \times 10^4 \pm 1.4 \times 10^5$. The following mould and yeast genera were isolated and identified. Penicillium, Mucour, Aspergillus, Cladosporium, Geotrichum, Alternaria, Torulopsis, Rhodotorula, Candida, Debaryomyces, Saccharomyces, Trichosporon and Cryptococcus. Also the ability of A.flavus to produce aflatoxin in fermented rice was found to be 1.88 ug/gm. The hygienic and public health significance of the isolated strains were discussed.

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INTRODUCTION

Contamination of meat and meat products by mould and yeast are common due to ubiquitous distribution of such microorganisms which lead to spoilage and/or of food borne mycotoxicosis.

The significance of such contamination in relation to meat and meat products is intensively discussed by various authors. BOJARSKI (1974); MOSSEL (1977); BEUCHAT (1978); BUSBY & WOGAN (1979); ABDEL RAHMAN (1981) and EL-KHATEIB & ABDEL RAHMAN (1989).

The aim of this work is to throw light on the mycoflora of the frozen ground beef of public health importance and the ability of some strains of *Aspergillus* to produce Aflatoxin.

MATERIAL and METHODS

60 random samples of frozen ground beef were collected from different supermarkets at Alexandria Governorete. 500 gm of each samples were obtained and transferred directly to the laboratory with a minimum of delay.

5 grams of the thawed ground beef were and aseptically homogenized in a sterile homogenizer flask with 45 ml sterile peptone water 1% to give 0.1 dilution from which ten fold serial dilutions were made up to 10^6 . Duplicate plates of Sabaroudes dextrose agar media were used for counting and isolation of both moulds and yeasts. (A.O.A.C., 1975).

A- Isolation and Identification of the Isolates:

a- Moulds:

Isolation and identification of moulds were carried out according to RAPER & THOM (1949); RAPER & FENNELL (1965); FRANK (1967); ZYCHA et al. (1969); LODDER (1971); BARNETT & HUNTER (1972); SAMSON et al. (1976) and SAMSON (1979).

b- Yeasts:

Detection and identification of yeast were carried out according to LODDER & KREGER (1952); LODDER (1971) and ARX et al. (1977).

B- Production of Aflatoxin:

Liability of the isolated *Aspergillus flavus* to produce Aflatoxins. The production of aflatoxins in fermented rice was carried out according to the method of WEST et al. (1973).

The total aflatoxin content of the fermented rice was determined by the method of NABNEY and NESBITT (1965).

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RESULTS

The results are tabulated in tables (1, 2, 3 and 4).

Table 1 : Mould and yeast count / gm of the examined samples of frozen ground beef.

	Mould	Yeast
Min.	3×10^2	2×10^2
Max.	4×10^5	1.7×10^6
Mean \pm SEM	$9.6 \times 10^4 \pm 1.5 \times 10^4$	$5.3 \times 10^5 \pm 1.4 \times 10^5$

Table (2) : Frequency percentage of isolated mould genera .

Mould genera	Frequency	percentage
Penicillium	130	36.7
Mucor	68	19.2
Aspergillus	56	15.8
Cladosporium	30	8.5
Geotrichum	22	6.2
Alternaria	16	4.6
other genera	32	9.0
Total	354	100.0

Table (3) : Frequency percentage of isolated yeast genera.

Yeast genera	frequency	percentage
Torulopsis	76	21.0
Rhodotorula	68	18.8
Candida	74	20.4
Debaryomyces	52	14.4
Saccharomyces	29	8.0
Trichosporon	8	2.2
Cryptococcus	5	1.4
Other genera	50	13.8
Total	362	100.0

Table (4): Frequency percentage of identified mould species in frozen ground beef.

Mould species	Frequency	percentage,
Penicillium species		
<i>P. verrucosum</i> var <i>cyclopium</i>	42	11.9
<i>P. verrucosum</i> var <i>verrucosum</i>	30	8.5
<i>P. digitatum</i>	21	5.9
<i>P. citrinum</i>	17	4.6
<i>P. funiculosum</i>	7	1.9
<i>P. capsulatum</i>	9	2.6
<i>P. roquefortum</i>	4	1.1
<i>Mucor attenuatus</i>	68	19.2
Aspergillus species		
<i>A. niger</i>	24	6.8
<i>A. flavus</i>	14	4.0
<i>A. terreus</i>	10	2.8
<i>A. fumigatus</i>	8	2.3
<i>Cladosporium herbarium</i>	30	8.5
<i>Geotrichum candidum</i>	22	6.2
<i>Alternaria alternaria</i>	16	4.5
Other genera	32	9.0
Total	354	100.0

DISCUSSION

The results listed in table (1) revealed that the total mould count/g sample lies between 3×10^2 and 4×10^5 with an average of $9.6 \times 10^4 \pm 1.5 \times 10^4$, while the yeast count lies between 2×10^2 and $1.7 \times 10^6 \pm 1.4 \times 10^5$.

The frequency percentage of isolated mould genera was given in table (2) which denotes that the most predominant mould genera were penicillium species (36.7%), *Mucor* species (19.2%), *Aspergillus* species (15.8%), followed by *Cladosporium* (8.5%), *Geotrichum* (6.2%), *alternaria* (4.6%) and unidentified species (9.0%).

Identification of penicillium species given in Table (4) revealed that penicillium species including *P. verrucosum* var *cyclopium*, *P. digitatum*, *P. capsulatum* and *P. roquefortum* were recovered from frozen meat with percentages of 42(11.9%), 30(8.5%), 21(5.9%), 17(1.9%), 9(2.6%) and 4(1.1%) respectively.

Identification of *Aspergillus* species revealed the detection of *A. niger*, *A. flavus*, *A. terreus* and *A. fumigatus* from the examined samples with the percentages of 24(6.8%),

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14(4%), 10(2.8%) and 8(2.3%) respectively.

Mucor attenuatus is considered as the most predominant mould species. It was isolated from 68(19.2%) of the examined frozen ground beef.

Other mould species including *Cladosporium herbarium*, *Geotrichum candidum* and *Alternaria alternaria* were detected in 30(8.5%), 22(6.2%) and 16(4.5%) respectively. The results obtained in this study are nearly similar with those reported by AYRES (1960); LEISTENER et al. (1965); FRANK (1967); HADLOCK (1970,1971 & 1972); HADLOCK and SCHIPPER (1974); LEISTENER and AYRES (1976); ABDEL-RAHMAN et al. (1984) and EL-KHATEIB & ABDEL RAHMAN (1989).

Torulopsis, *Rhodotorula*, *Candida*, *Debaryomyces*, *Saccharomyces*, *Trichosporon*, *Cryptococcus* and unidentified yeast species were recovered from 76(21%), 68(18.8%), 74(20.4%), 52(14.4%), 29(8.0%), 8(2.2%), 5(1.4%) and 50(13.8%) of the examined frozen ground beef respectively (Table 3). These findings are similar to those reported by LEISTNER & BEM (1970); HADLOCK (1972); HESSEL-SCHMALFUSS (1976); JAY (1977); ABDEL-RAHMAN et al. (1984) and EL-KHATEIB & ABDEL-RAHMAN (1989).

From the results obtained in this study it is obvious that, the mycoflora of the frozen ground beef consists mainly of species of the following mould and yeast genera, *Penicillium*, *Mucor*, *Aspergillus*, *Cladosporium*, *Geotrichum* and *Alternaria*, *Torulopsis*, *Rhodotorula*, *Candida*, *Debaryomyces*, *Saccharomyces*, *Trichosporon* and *Cryptococcus*. Most of the isolated mould and yeast species were discussed by various investigators as spoilage organisms of meat and meat products. Moreover, these microorganisms play a dangerous role in human mycosis and mycotoxicosis (BOSENBERG & EBERHARDT, 1969; MOSEL, 1977 and RIETH, 1973).

The ability of *Aspergillus flavus* to produce Aflatoxin in rice during fermentation was found to be 1.88 ug/gm rice. This means that, *Aspergillus flavus* can produce aflatoxins in frozen ground beef when the conditions are favourable. The existence of mould in nature under severe ecological environment as being able to withstand more unfavourable conditions than other microorganisms render their destruction or elimination a serious problem encountered by food scientists, consequently all meat products which are spoiled through mould and yeast must be totally condemned. Moreover, mould and yeast must be considered as coliforms and *Enterobacter* as indicators of meat sanitary quality, and of the hygienic status of meat processing plants.

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