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ESCHERICHIA COLI IN MEAT PRODUCTS

BY

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INTRODUCTION

Escherichia coli in food has been associated with outbreaks of gastrointestinal dince 1903 (Delepine, 1903).

The presence of different members of Enterobacteri-cease particulary Escherichia coli in meat products was attributed to the contamination of such products (El-Mossalami, 1958 and Kleeberger et al., 1980).

External contamination of raw meat is a constant possibility from the moment of bleeding until consumption. There are several potential sources of contamination by microorganisms. These include contact with hide, skin, feet, the gastrointestinal tract content, aqueous sources and the instruments used for dressing (Knives, saws, cleaners or hooks) and even air borne contamination in the processing and storage areas (Niskanen and Pohja 1977 Agres et al., 1980, Stolle, 1981 and Jawetz et al., 1982).

In addition, meat products may be contaminated with Escherichia coli from food handlers, food utensils, soils and water under incomplete hygienic circumstances during manufacturing, packing and marketing of these product (Frazier and Westhoff, 1978).

Escherichia coli in meat products.

The native habitat for Escherichia coli is the intestinal tract of man and animals; therefore its presence in foods generally indicates direct or indirect pollution of faecal origin. Escherichia coli is the classical indicator of the possible presence of enteric pathogenes in foods.

On the other hand, meat products constitute a public health hazard either due to the presence of spoilage bacteria responsible for unfavourable changes, or pathogenic bacteria like Escherichia oli leading to harmful effects as infection or intoxication in human consumers. i.e. food borne infections (Mastievskii et al., 1971; Anon, 1978; Mehlman and Bomero, 1982).

Enteropathogenic Escherichia coli (EPEC) of certain serovars are well recognized pathogens as caused of infantile diarrhoea and/or gastrointestinal illness in adult humans (Broy, 1945; Dupont et al., 1971; Edelman and Levine, 1983).

Escherichia coli may also cause peritonitis, meningitis, enteritis, cystitis, pyelitis, pylonephritis, angiocholitis, salpingoophoritis, appendicitis, optotis and purepearal sepsis (Pyathin and Krivoshein 1980).

The present work was planned to study the following:

1. Incidence of E.coli in meat products using two techniques; direct plate count technique and multiple tube fermentation technique.

2. Biochemical and serological identification of E.coli.

MATERIAL AND METHODS

100 samples, 25 each from fresh minced meat, fresh sausage, frozen beef burger and basterma slices were collected from Cairo and Giza markets, transported in cool cabinet and examined bacteriologically.

The samples were prepared according to the technique recommended by ICMSF (1978).

1. Determination of Eschirichia coli count by the surface spread plate method recommended by Barraud et al. (1967) as well as by the multiple tube fermentation technique recommended by MLG (1974).

2. Isolation, biochemical and seriological edentification of enteropathogenic strains of E.coli according to Cruickshank et al., 1975.

RESULTS AND DISCUSSION

From Table (1), it is evident that E.coli isolates were detected in 26 (26%) of the examined samples. The incidence of E.coli in minced meat, sausage, beef burger and basterma was 44%, 40%, 12% and 8% respectively.

Using the direct plate count technique (DPC) a total of 17 R.coli isolated (17/26 , 65.36%)were recovered from the examined meat products in the following manner, minced meat, 5/11, 45.45%) sausage (9/10, 90%), beef burger (2/3 66.66%) and basterma (0.5, 50%) were identified as E.coli biovar I. The other E.coli isolates (9.26, 34.61%) were proved to be biovar II, which recovered from minced meat (6 isolates) while in case of sausage, beef burger and basterma (one isolate each).

Escherichia coli in meat products.

By using multiple tube fermentation technique (MPN) E.coli could be detected in (30%) of the semples as compared with frequency isolation by the direct plate count technique (26%). 21 strains (70%) of 30 E.coli isolated from examined samples by MPN technique were proved to be E.coli biovar I.

The aforementioned results revealed that the incidence of E. coli was high in fresh minced meat & sausage. Similar findings were recorded by El-Khatab, (1982); Gobran, (1985); Abd El-Aziz, (1987) and Niazi and Refai (1988).

From Table (2) no marked differences in the enumeration of E.coli in different tested meat products samples were found when the two techniques were used, a direct plate technique (DPC) and multiple tube fermentation technique (MPN). The highest mean value of E. coli numbers (4.85 $\pm$ 0.46 $\log_{10}$ (DPC), 5.53 $\pm$ 0.39 $\log_{10}$ (MPN) per gram and (4.28 $\pm$ 0.16 $\log_{10}$ DPC, 366 $\pm$ 0.27 $\log_{10}$ (MPN) per gram was recorded in minced meat beef burger respectively. The lowest value (2.73 $\pm$ 0.18 $\log_{10}$ (DPC), 2.33 $\pm$ 0.27 $\log_{10}$ (MPN)/gm) was reported in basterma samples. Furthermore, statistical analysis of the enumeration of E. coli in tested meat products samples showed no significane difference between counts given by the two techniques. These findings confirms the previous findings reported by Andreson and Baird Parker (1975)

The results recorded in Table (3) reveal that out of 30 isolates of E. coli recovered from different tested meat products samples, only 12 isolates (40%) could be serologically typed as enteropathognic E. coli. These strains revealed 7 different classic EPEC serovars namely O_{124}:K_{12} (B_{17}) (4 strains, O_{44}: K_{74} (L) and O_{88} : K_{61} (87) (2 strains each) and one

Table (1): Incidence of E.coli (Biotype I and II) isolates among different meat products using direct plate count and Multiple tube fermentation technique

Samples	Technique	No. of examined samples	Positve samples		Escherichia coli (biotype) Biovar I		Biovar II	
			No.	%	No.	%	No.	%
Minced meat	A	25	11	44	5	45.45	6	54.54
	B	25	12	48	8	66.66	4	33.33
Suasage	A	25	10	40	9	90.0	1	10.00
	B	25	12	48	9	75.0	1	25.0
Beef burger	A	25	3	12	2	66.66	1	33.33
	B	25	4	10	3	75.0	1	25.0
Basterma	A	25	2	8	1	50.0	1	50
	B	25	2	8	1	50.0	1	50
Total	A	100	26	100	17	65.38	9	34.62
	B	100	30	100	21	70	9	30.0

A = Direct plate count technique

B = Multiple tube fermentation technique

Table (2): Statistical analysis of E.coli count (count/g $\log_{10}$) in different meat products

	Minced meat		Sausage		Beefburger		Basterma	
	A	B	A	B	A	B	A	B
Minimum	3.07	2.00	2.3	2.00	3.90	3.00	2.47	2.00
Maximum	7.44	7.00	6.81	8.00	4.47	4.00	3	3.00
Mean value	8.85	5.53	3.602	3.45	4.28	3.66	2.73	2.33
S.E. ±	±0.46	±0.39	±0.42	±0.51	±0.16	±0.27	±0.18	±0.27

A = Direct plate count technique

B = Multiple tube fermentation technique.

S.E. = Standard error.

Table (3): Enteropathogenic strains of E.coli (EPEC) isolated from meat product samples

Source	No. of (+)ve samples	Enteropathogenic serovars		
		O:K (B or L) serovar	No.	%
Minced meat	12	O_{44}: K_{74} (L)	2	16.66
		O_{124}: K_{72} (B_{17})	2	16.66
		O_{127}: K_{63} (B_8)	1	8.33
		Untypable	7	58.33
Sausage	12	O_{78}: K_{80} (B-)	1	8.33
		O_{86}: K_{61} (B_7)	2	16.66
		O_{111}: K_{58} (B_4)	1	8.33
		O_{124}: K_{72} (17)	2	16.66
		Untypable	6	50.00
Beef-burger	4	O_{25}: K_{11} (L)	1	25.00
		Untypable	3	75.00
Basterma	2	Untypable	2	100
Total	30	Typed	12	40.00
		Untypable	18	60.00

strain from each of O_{25} : K_{11} (L), O_{78} : K_{80} (B-), O_{111} : K_{58} (B_4) and O_{127} : K_{63} (B_8)

The serovar O_{124} : K_{72} (B_{17}) was recovered from fresh raw minced meat (2 strain) and fresh sausage (2 strain). The serovars O_{44} : K_{74} (L) (2) strain) and O_{127} : K_{63} (B_8) (one strain were isoalted only from raw minced meat, whereas serovars O_{78} : K_{80} (B-) , O_{86} : K_{61} (B_7) and O_{111} : K_{58} (B_4) were recovered from fresh raw sausage and the serover O_{25} : K_{111} (L) was obtained only from the frozen beef-burger.

None of E.coli strains recovered from basterma slices were enteropathogenic, these findings are nearly similar to those findings recorded by Gobran (1985),Niazi and Refai (1988) for E. coli serotypes isolated from raw minced meat, fresh sausage and beef burger.

Most of the detectalbe classic enteropathogenic E. coli isolated from meat, sausage and beef-burger were previously reported to be incriminated in different infantile diarrhoea and gastrointestinal outbreaks in adult human (Bray, 1945; Dupont et al., 1971; Dean et al., 1972; Levine et al., 1978 and Back et al., 1980).

SUMMARY

One hundred samples of raw meat products, fresh minced meat, fresh sausages, frozen beefburger and basterma slices, 25 each, were collected from different markets in Cairo.

The samples were examined for determination of the incidence and enumeration of E. coli by using direct

plate count technique (DPC) and multiple tube fermentation technique (MPN) as well as biochemical & serological identification of the enteropathogenic E.coli

The incidences of E.coli were 26% & 30% of the examined meat products by using DPC & MPN respectively.

The incidence of E. coli in minced meat sausage, frozen beef-burger and basterma slices was 44%, 40%, 12% and 8% by using DPC, and 48%,48%,16%, and 8% by using MPN respectively.

Of 30 E. coli isolates, 12 (40%) possessed the classic enteropathogenic E. coli serovars O_{124} : K_{72} (4 strain, O_{68} : K_{61}, O_{44} : K_{74} (2 strain each), O_{25} : K_{11}, O_{78} : K_{80}, O_{111}, K_{58} , O_{127} : K_{63} (one strain each).

Principles for production of meat products of good microbiological quality were disscussed as well as public health significance of EPEC.

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