Occurrence of Escherichia coli in some beef products at Alexandria markets

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Abstract
A total of one hundred samples, 25 of each of beef burger, frankfurter, kofta and sausage were collected from Alexandria markets as well as shops and examined bacteriologically for *Escherichia coli* and its Enteropathogenic serotypes. *Escherichia coli* was detected in 44 samples (44%) and their incidence were 14 (56%), 12 (48%), 10 (40%) and 8 (32%) in kofta, burger,sausage and frankfurter respectively.16 strains of these 44 isolates were Enteropathogenic (36.4%) and belonged to the following serotypes O_{55}(8), O_{125}(6), O_{111}(1) and O_{78}(1), moreover, the majority of them showed haemolytic activity. The public health significance of the isolated serogroups and consumer's safety were discussed.

Key words: *Escherichia coli , kofta, burger, sausage, frankfurter*

Introduction

Many people prefer beef burgers, sausages, kofta and other meat products. However, raw and improperly handled or cooked sausages, frankfurter, beef burgers or kofta can harbour harmful bacteria including *Escherichia coli*. The bacteria constituting the species *E.coli* are bacteria that normally live in intestines of humans and animals. Although most strains are harmless, several are known to produce toxins that can cause diarrhea. The pathogenic groups include enterotoxigenic *E. coli* (ETEC), enteropathogenic *E.coli* (EPEC), enterohemorrhagic *E.coli* (EHEC) and enteroinvasive *E. coli* (EIEC). These groups of E. coli were implicated in food or water borne diseases **(Levine, 1987 and Nataro and Kaper. 1998)**.

Meat products may be contaminated with microorganisms from meat handlers, improper cooking, refrigeration and storage which may lead to illness and deaths **(Fratmico *et al.*, 2005)**. Enteropathogenic *E. coli* usually lead to severe diarrhea in infants and it may also be the causal organisms of abscesses, peritonitis and cholecystitis **(Frazier, 1988; Mackie and Mecartney, 1989)**. Due to the rising incidence of food borne infection, there is an urgent need for control or prophylaxis for food poisoning outbreaks associated with meat products. It depends greatly on investigating the causative agents in meat products, eliminating them to ensure food safety and to protect public health from microbial contamination. Therefore the present study was planned to investigate the incidence of *Escherishia coli* and its enteropathogenic serotypes in some meat products.

Material and Methods

1-Sampling. A total of one hundred (100) samples of meat products 25 of each beef burger, frankfurter, kofta and sausage were collected randomly from different supermarket and shops at Alexandria Governorate, each sample was packed in sterile plastic bag and transferred immediately to the laboratory in an ice box with a minimum period of delay to be examined bacteriologically for isolation of *E. coli*.

2-Sample processing. sample were prepared according to the technique recommended by **ICMSF (1996).** Briefly, 10 gram from each sample were transferred under aseptic condition to a sterile polyethylene bag containing 90 ml of sterile Ringer's solution. The content of

the bag was then homogenized using stomacher (Lab. Blender 400, Seward Lab, London) to have a dilution of 10^{-1}. Such homogenate was used for all bacterial investigation.

3-Bacterial cultivation of samples (FDA, 2002). Further, dilutions of culture in tryptone phosphate broth with peptone water (0.1%) to 10^{-6} were prepared. About 0.1 ml obtained from appropriate dilution were inoculated in MacConkey sorbitol agar and Eosin methylene blue agar as double parallel by using spread-plating. The plates were incubated at 37°C for 24 hours. Randomly selected white and colourless sorbitol negative colonies were picked up from MacConkey sorbitol agar and streaked separately onto MacConkey sorbitol agar supplemented with cefixime-tellurite **(CT, Difco)** and onto Eosin methylene blue to purifly the colonies. The plates were incubated at 37°C for 24 hours **(FDA, 2002)**. Morphological and Biochemical tests were applied on colourless or neutral/gray with smoky center and 1-2 mm diameter sorbitol negative colonies on cefixime-tellurite-MacConkey sorbitol agar and to metallic green colored, smooth sided colonies on Eosin methylene blue according to **Quinn *et al*., (2002)**. The isolates were identified serologically by the slide agglutination test using diagnostic polyvalent and monovalent *E.coli* antisera, this done in serology department in Animal Health Research Institute. Dokki, Giza .

4-Hemolysin production (Beutin *et al.*, 1989) *E.coli* isolates were inoculated onto blood agar plates containing sheep blood (5%) and incubated at 37°C for 24 hours. The plates were examined for the presence of haemolysis.

Results

Table (1). Incidence of *E.coli* in the examined meat products samples (n=25 of each).

Meat products	Positive samples	% of positive samples
Kofta	14	56
Beef burger	12	48
Sausage	10	40
Frankfurter	8	32
Total	44	44

Percentage was calculated according to the number of each type of samples examined (25).

Table (2). Incidence of the isolated Enteropathogenic *Escherichia coli* from the examined samples (n= 25).

Type of sample	Isolated E.coli	Enteropathogenic E.coli	
		No.	%
Kofta	14	7	50.00
Beef burger	12	4	33.33
Sausage	10	3	30.00
Frankfurter	8	2	25.00
Total	44	16	36.36

Percentage was calculated according to the number of each type of samples examined (25).

Table (3). Serotyping of Enteropathogenic strains of *E.coli* isolated from some meat product samples.

Type of sample	No. of positive sample	Serovars	Enteropathogenic E.coli	
			No.	%
Kofta	7	$O_{125:K\ 70}$ O_{55}:k59 O_{78}:k80	4 2 1	57.14 28.57 14.28
Beef burger	4	O_{55}:k O_{125}:k O_{111}:k58	2 1 1	50.0 25.0 25.0
Sausage	3	O_{55}:k O_{125}:k	2 1	66.66 33.33
Frankfurter	2	O_{55}:k	2	100.0

Percentage was calculated according to the number of positive of E.coli isolates in each type of samples.

Table (4). Hemolytic activity of Enteropathogenic *E.coli* isolates recovered from some meat product samples.

E.coli	No. of isolates	Hemolytic activity	
		No.	%
O_{55}:k	8	8	100
O_{125}:k	6	6	100
O_{111}:k	1	0	0
O_{78}:k	1	0	0
Total	16	14	87.5

Percentage was calculated according to hemolytic activity related to each same isolates.

Discussion

Meat products are recognized as a major source of food born disease that cause food poisoning in humans. The source of infection is not determined in the majority of food born disease out breaks. Currently the most important pathogen associated with meat products is *Escherichia coli* has an epidemiological interest and importance as some of them are pathogenic and may cause serious infections and/or food poisoning **Al-Mutiri, 2011**).

Undercooked meat products have caused many food poisoning incidents associated with *E. coli* which is present in the faeces, intestines and hide of healthy cattle from where it can potentially contaminate meat during the slaughtering process **(Duffy *et al.*, 2003)**.

In the present study, examination of 100 samples of meat products, 25 each of burger, Frankfurter, kofta and sausage revealed that 44 isolates of *E.coli* (44%) were recorded. These results were in agreement with these reported by **Gad El-said *et al.*, (2005)** and **Al-Mutiri (2011)**.

The isolation of *E.coli* from the different examined samples was 14 (56%), 12 (48%), 10 (40%) and 8(32%)from Kofta, beef burger, sausage and frankfurter respectively (Table 1).

The Escherichia coli isolated in kofta samples were 14(56%) which is markedly higher than there reported by **Eman El-Mossalami (2003)** 40% and **Al-Mutiri (2011)** 28%. The incidence of *Escherichia coli* in the examined beef burger samples was 12 samples (48%), this

result was lower than reported by **Zienab and Azza (2006)** (56%).

Sausage samples were 10 (40%) was higher than reported by **Al-Mutiri (2011)** 12% and was lower than the findings recorded by **Zaki Emam (1990)** 48% and **El-Khatib *et al.*, (1994)** 47.37%.

Out of 25 examined frankforter samples 8 (32%) were Escherichia coli positive samples. This result was remarkably different from those previously reported by **Darwish *et al.*, (1991)** (12%) and **Zienab and Azza (2006)** (40%).

The variation in the results obtained by different investigators may be due to difference in manufacturing practices, handling and difference in time exposure of products. Enteropathogenic *E. coli* can be defined as any strain of *E. coli* that has the potential to cause diarrheal disease. The presence of *E.coli* as Enteropathogens in meat and its products provides an evidence of contamination of faecal or water origin. It also reflects the unsatisfactory hygienic condition during manufacturing and handling of these products by human carriers **(Al-Mutiri (2011)**.

From the results of (Table 2) it was found that out of 12 isolates of *E.coli* recovered from beef burger sample, 4 strains (33.33%) were serologically typed as Enteropathogenic *E. coli*, also 2 isolated strains from frankfurter samples (25%) were Enteropathogenic *E.coli*. Among 14 isolated *E. coli* strains from kofta samples, 7 strains were Enteropathogenic with an incidence of (50%) and finally out of 10 isolates of *E.coli* recovered from sausage sample, 3 strains were Enteropathogenic (30%).

Out of 44 isolated strains of *E. coli* recovered from meat product samples, 16 serovars strains were belonged to serovars O_{55}, O_{125}, O_{78} and O_{111} (Table 3). Similar *Escherichia coli* serovars were isolated from meat products were previously recorded by **Fahem (1993), Saad *et al.*, (1994), Zienab and Azza (2006)** and **Al-Mutiri (2011)**. The public health importance of isolated Enteropathogenic serovars had been attributed to its enterotoxin, which is implicated in causing gastroenteritis, epedimic children diarrhea, and sporadic diarrhea in children as well as food poisoning **Torkey, (2004).** The production of haemolysin have a potential role in virulence of haemolytic *E. coli*. Therefore, contamination of meat products with *E. coli* serotypes may results in problems for consumers. There is a close association between enterohaemolysin production and Shiga-like toxins production **(Beutin *et al.*, 1998)**. Moreover, the genes involved in enterohaemolysin production were carried on the Enterohemorrhagic plasmid **(Scotland *et al.*, 1990)**. To reduce the risk for contamination, consumers should use soap and hot water to wash hands, utensils and other things exposed to raw or undercooked beef or meat products and finally efficient cooking of meat products.

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