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SALMONELLAE AND ENTEROPATHOGENIC ESCHERICHIA COLI IN SOME LOCALLY MANUFACTURED MEAT PRODUCTS

(With 4 Tables)

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السالمونيلا والايشاريشياكولاي الممرضه فى بعض منتجات اللحوم المصنعه محليا

شوكيت فنحى ، طلعت الخطيب ، صباح مصطفى
خاله حسنين

سبعة وأربعون عينة عشوائية من بعض منتجات اللحوم المصنعه تم تجميعها من مخازن
السوبر ماركت بمدينة أسيوط لتقرير ما بها من السالمونيلا والايشاريشياكولاي الممرضه . شملت
العينات المأخوذه ١٩ عينة برجر ، ١٦ سجق ، ١٢ لانشون حيث كانت عترات السالمونيلا المعزوله
هى السالمونيلا تايفيموريوم (٢ عتره) ، السالمونيلا تايفاي (عتره واحده) ، السالمونيلا باراتيفاي
A (عتره واحده).

من عينات البرجر تم عزل السالمونيلا تايفيموريوم بواقع ٢ عتره ، السالمونيلا تايفاي عتره
واحد فى حين تم عزل السالمونيلا باراتيفاي A امكن اكتشافها فى عينات السجق المفحوصه ، فى
حين لم يمكن عزل أى من عترات السالمونيلا فى عينات اللانشون المفحوصه .

وكانت نسبة الايشاريشياكولاي فى عينات البرجر المفحوصه ، السجق والانشون هى
٩ (٣٧ ر ٤٧) % ، ٤ (٢٥) % ، ٥ (٦٧ ر ٤١) % فى حين كانت عترات الايشاريشياكولاي الممرضه هى
٧ (٧٨ ر ٧٧) % ، ٣ (٧٥) % ، ٤ (٨٠) % على التوالى .

كما نوقشت الأهميه الصحيه لتواجد هذه الميكروبات فى منتجات اللحوم وكذلك مصادر
التلوث لها .

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SUMMARY

Forty seven random meat products samples were collected from different retail stores and supermarkets in Assiut city for recovery of salmonella and Enteropathogenic E. coli (EPEC). The selected types of collected meat products were 19 burger, 16 sausage and 12 luncheon samples. The isolated serotypes of salmonellae were *S. typhimurium* (two strains), *S. typhi* (one strain) and *S. paratyphi A* (one strain). The serotypes isolated from examined burger samples were *S. typhimurium* (two strains) and *S. typhi* (one strain), while *S. paratyphi A* strain was detected in the examined sausage samples. Salmonellae Failed to be isolated from all examined luncheon samples. The incidence of *E. coli* isolated from examined burger, sausage and luncheon samples was 9(47.37%), 4(25%) and 5(41.67%), whereas the incidence of Enteropathogenic *E. coli* strains was 7(77.78%), 3(75%) and 4(80%), respectively. The public health hazard for the presence of such micro-organisms in meat products, and sources of contamination were discussed.

Keywords: Salmonellae, *E. coli*, meat products.

INTRODUCTION

The role of *Salmonella* as a causative agent of foodborne disease has attracted increasing attention all over the world and the prevalence of *Salmonellae* in animals, food, man and the environment has been studied extensively in many countries. Salmonellosis is commonly reported in developed countries. In these countries poultry, meat and meat products are considered the main source of infection for man (EDEL *et al.*, 1977; PASSMERE, 1979; HEPNER, 1980. and BARRELL, 1982). Meat contamination by *Salmonella* organisms occurs at abattoirs from subclinically infected animals or during preparing and manufacturing of meat products. Salmonellosis can be conveniently divided into two main groups, the first is typhoid and paratyphoid fevers caused by *S. typhi* and *S. paratyphi A, B* and *C.*, respectively, whereas the second group belong to enteric infections caused by the other *Salmonellae* (ICMSF, 1978).

Differents serotypes dominate in different parts of the world, but it seems that *S. typhimurium* is the type most

frequently encountered (LEE, 1974 and W.H.O., 1980). LABIE (1980) reported that Salmonellae food poisoning come mainly from meat and meat products, where the most frequent Salmonella serotypes encountered in these outbreaks was *S. typhimurium* (47.8% of identified strains). *S. typhimurium* were detected in sausage by SADEK (1963); PAINS and MANZINI (1966) and ROBERTS et al. (1975). Many investigators could not to isolate Salmonella from examined hamburger samples (KARIM, 1976; IBRAHIM, 1981; TOLBA, 1986; ABDEL-AZIZ, 1987 and Khalafalla, 1988). On the other hand, DARWISH et al. (1986); AHMED (1988) and EL-MOSSALAMI et al. (1989) found that the incidence of Salmonellae in examined beefburger samples was 5%, 6% and 6%, respectively. The incidence of Salmonellae in sausage recorded by SADEK (1963); PAINS and MANZINI (1966); KOOL and BES (1973); TOLBA (1986); ABDEL-AZIZ (1987); AHMED (1988); KHALAFALLA (1988) and NABBUT (1988) was 4%, 10%, 12%, 10%, 10%, 8%, 8% and 11.240, respectively, whereas ROBERTS et al. (1975) and ABDEL-AZIZ (1979) could isolate Salmonella in high incidence (29.65% and 28%, respectively) in the examined sausage samples. EL-MOSSALAMI et al. (1989) found Salmonella in fresh sausage in percent of 8%, while they could not detect the organism in 50 samples of frozen sausage samples.

Salmonellae could not be recovered from examined luncheon samples by some investigators (FURIN et al., 1978; PARADIS and STEEL, 1978; TIWARI and KADIS, 1981 and EL-MOSSALAMI et al., 1989).

The presence of *E. coli* in meat and meat products is not always closely correlated with the occurrence of Salmonellae or other pathogenic microorganisms. Enteropathogenic *E. coli* (EPEC) of certain serovars are well recognized pathogens as a cause of infantile diarrhoea and/ or gastrointestinal illness in adult humans (DUPONT et al., 1971; EDELMAN and LEVINE, 1983).

DUITSCHAEVER et al. (1977) and DARWISH et al. (1986) found that the incidence of *E. coli* in frozen hamburger was 27.72% and 30%, respectively, while in the examined sausage samples by EL-KHATEIB (1982) and GOBRAN (1985) it was 36.11% and 50%, respectively. TOLBA (1986) detected *E. coli* in 52.5% and 25% of the examined sausage and hamburger samples, respectively, while ABDEL-AZIZ (1987) and IMAN (1989) recorded that *E. coli* was found in high incidence 70% and 50%, and 60% and 48% in both examined hamburger and sausage samples, respectively. ZAKI (1990) and DARWISH et al. (1991) recovered *E. coli* from 16% and 12% of the examined hamburger, while they found the incidence in sausage samples was 48% and 40%, respectively.

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Definite *E. coli* serotypes are capable of causing various acute intestinal diseases in humans. From sausage samples, *GOBRAN* (1985) could isolate two strains of O55/Bs serovar, while *NIAZI* and *REFAI* (1988) could identified three strains of O26: K60 and two strains of O55: K59 serovars. The incidence of isolated Enteropathogenic *E. coli* strains in hamburger samples was 24% (O172: K86), 16% (O114:K90), 8% (O111: K58), 8% (O124: K72) and 4% (O126: K71), while in examined beefurger samples, it was 24%(O114: K90), 8% (O142: K86) and 4% (O44: K 74) (*IMAN*, 1989). *ZAKI* (1990) could identified two strains from each O124: K72 and O86: K61 and one strain from each of O78: K80 and O111: K58 serovars in examined sausage, while O25: K111 strain was the only serovar isolated from beefburger samples. *DARWISH et al.* (1991) isolated four different *E. coli* serotypes from sausage (O124: K72, O78: K80, O86: K61 and O111: K58), whereas, they detected only one strain (O25: K111) In beefburger samples.

Therefore, this survey was conducted to assess the extent of contamination by Salmonellae and Enteropathogenic *E. coli* in retail sampling of burger, sausage and luncheon purchased in Assiut city.

MATERIAL and METHODS

Forty seven random meat products samples (19 burger, 16 sausage and 12 luncheon) were collectaed from different supermarkets for detection of Salmonella and Enterpathogenic *E. coli* (E.P.E.C.). The samples were transfered as quickly as possible to laboratory and subjected to the following techniques:

1- Detection of Salmonella:

The method is recommended by ICMSF (1978) which based on giving the chance for the few numbers of normal or of stressed Salmonella organisms to grow first in a non-selective liquid medium (buffered peptone water) at 37°C as pre-enrichment, then subcultured into a liquid selective medium (selenite broth) as enrichment which incubated at 42°C for 48h. Plating out on selective medium (Brilliant green agar) was done from each enrichment flask and incubated at 37°C for 24h, then examined for typical colonies of Salmonella. Serological technique was applied according to *EDWARDS and EWING* (1972) in which pure colonies were examined for the presence of O and H antigens by slide agglutination test with polyvalent sera.

II- Isolation of Enteropathogenic E. coli (EPEC):

The method of isolation was applied according to ICMSF (1978), in which typical colonies on Levine's Eosin Methylene Blue Agar (EMB) were picked up and subjected to further morphological and biochemical confirmation. Serological identification of confirmed E. coli strains was done by using OB/K sera to detect Enteropathogenic E. coli serovars.

RESULTS

The results were recorded in Tables (1), (2), (3) and (4).

DISCUSSION

Practically any food of animal origin can be the vehicle for transmission of Salmonellae to man. Meat and meat products may be contaminated by human excreta at any step in the chain of meat handling from raw material to the preparation of meat and meat products in the kitchen. Consequently, it is generally accepted that the presence of any serotype of Salmonellae in a food should be regarded as a potential hazard for man.

It is evident from Table (1) that the incidence of Salmonella serotypes isolated from burger and sausage samples was 15.79% and 6.25%, respectively. The obtained results were higher than the findings outlined by DARWISH et al. (1986); AHMED, (1988) and EL-MOSSALMI et al. (1989) in case of burger samples, while they were lower than the results recorded by PAINS and MANZINI (1966), KOOL and BES (1973), ROBERT et al. (1975), TOLBA (1986), ABDEL-AZIZ (1987), AHMED (1988), KHALAFALLA (1988), NABBUT (1988) and EL-MOSSALAMI et al. (1989) in case of examined sausage samples. On the other hand KARIM (1976), IBRAHIM (1981), TOLBA (1986), ABDEL-AZIZ (1987) and KHALAFALLA (1988) could not detect salmonella from the examined hamburger.

The results reported in Table (2) pointed out that S. typhimurium and S. typhi strains could be isolated from burger samples, whereas the only S. paratyphi A strain was detected in the examined sausage samples. These findings were in agreement with the results recorded by SADEK (1963), PAINS and MANZINI (1966) ROBERTS et al. (1975), LABIE (1980) and AHMED (1992). Any salmonella serotypes could not be detected in the examined Luncheon samples, Table (1). These results were in acceptance to the findings reported by FURIN et al. (1978), PARADIS and STEEL (1978), TIWARI and KADIS (1981) and EL-MOSSALAMI et al. (1989).

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The native habitat for *Escherichia coli* is the enteric tract of man and animals, thus its presence in meat and meat products generally indicates direct or indirect faecal pollution. Enteropathogenic *E. coli* (EPEC) of certain serovars are well recognized pathogens as a cause of infantile diarrhoea and/or gastrointestinal illness in adult humans (DUPONT *et al.*, 1971; EDELMAN and LEVINE, 1983 and AHMED, 1992).

It is achieved from Table (3) that the incidence of *E. coli* in examined burger, sausage and Luncheon was 47.37%, 25% and 41.67%, whereas the incidence of enteropathogenic *E. coli* was 77.78%, 75% and 80%, respectively. The obtained data regarding the examined burger samples were lower than the results outlined by ABDEL-AZIZ (1987), IMAN (1989) and AHMED (1992), and higher than the findings recorded by DUISCHAEVER *et al.* (1977), DARWISH *et al.* (1986), TOLBA (1986), ZAKI (1990) and DARWISH *et al.* (1991). Concerning sausage samples, the present results were lower than the data reported by many investigators (EL-KHATEIB, 1982; GOBRAN, 1985; TOLBA, 1986; ABDEL-AZIZ, 1987; IMAN, 1989; ZAKI, 1990; DARWISH *et al.*, 1991 and AHMED, 1992).

The results recorded in Table (4) showed that out of 18 isolates of *E. coli* recovered from investigated burger, sausage and luncheon samples, 14 (77.78%) isolates could be serologically typed as Enteropathogenic *E. coli*. The typed strains revealed 4 different classic E.P.E.C. serovars namely O3s: K59(B5) 2 strains, O26: K60(B6) 5 strains, O111: K58(B4) 4 strains and O126: K71(B16) 3 strains. The identified strains of E.P.E.C. were in acceptance with those outlined by NIAZI and REFAI (1988), IMAN (1989), ZAKI (1990), DARWISH *et al.* (1991) and AHMED (1992).

The detectable classic Enteropathogenic *E. coli* isolated from the examined burger, sausage and luncheon samples were previously reported to be incriminated in different infantile diarrhoea and gastrointestinal outbreaks in adult human (LEVINE *et al.*, 1978; BACK *et al.*, 1980; EDELMAN and LEVINE, 1983 and AHMED 1992). There are two forms of the disease which differ clinically from each to some degree (SOJKA, 1973). The first, caused by toxigenic strains, is characterized by excessive loss of fluid from profuse diarrhoea (the cholera like syndrome). The second form, caused by invasive strains, produces a syndrome closely resembling dysentery (the dysentery like syndrome). There are also forms of the disease in which these two clinical pictures are intermixed.

The Enteropathogenic *E. coli* strains produce disease not only in man but also in a number of domesticated animals, such as calves, pigs, poultry and lambs (COOKE, 1974). However, the

detection of even low numbers of Enteropathogenic *E. coli* in food reveals a public health hazard as significant as the demonstration of *Salmonellae* in such foods (ICMSF, 1978).

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Table 1: Frequency of salmonellae serotypes isolated examined burger, sausage and luncheon samples.

Type of samples examined	No. of samples examined	Frequency	Percent
Burger	19	3	15.79
Sausage	16	1	6.25
Luncheon	12	-	-
Total	47	4	8.51

Table 2: Salmonellae serotypes isolated from examined burger, sausage and luncheon samples.

Serotypes	Antigenic Structure	Frequency of isolation			Total
		Burger	Sausage	Luncheon	
S. typhimurium	1, 4(5), 12: 1: 1, 2	2	-	-	2
S. typhi	9, 12(VI): d-	1	-	-	1
S. panatyphi A	1, 2, 12: a: (1, 5)	-	1	-	1

Table 3: Incidence of Enteropathogenic E. coli (EPEC) isolated from examined burger, sausage and luncheon samples.

Type of examined samples	No. of examined samples	E. coli Isolates		EPEC		Untypable	
		No.	%	No.	%	No.	%
Burger	19	9	47.37	7	77.78	2	22.2
Sausage	16	4	25.00	3	75.00	1	25.00
Luncheon	12	5	41.67	4	80.00	1	20.00
Total	47	18	38.30	14	77.78	4	22.22

Table 4: Enteropathogenic strains of E. coli isolated from burger, sausage and luncheon.

Type of examined samples	No. of positive samples	Enteropathogenic serovars	
		O:K (B) serovar	No. %
Burger	9	O35 : K59 (B5)	2 22.22
		O26 : K60 (B6)	3 33.33
		O111 : K58 (B4)	2 22.22
		Untypable	2 22.22
Sausage	4	O26 : K60 (B6)	2 50.00
		O125 : K71 (B16)	1 25.00
		Untypable	1 25.00
Luncheon	5	O111 : K58 (B4)	2 40.00
		O126 : K71 (B16)	2 40.00
		Untypable	1 20.00
Total	18	Typed	14 77.78
		Untypable	4 22.22