Incidence of *E. coli* and Salmonellae in ready to eat fast foods

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A B S T R A C T

A total of 100 random samples of ready- to – eat sandwiches of beef products represented by kofta, liver, shawerma and sausage products (25 samples of each) were collected from different fast food services in different districts at kaliobia Governorate to be examined bacteriologically for detection of *Salmonellae* and *Escherichia coli.* The perecentages of Salmonellae in the examined samples of kofta, liver, shawerma and sausage products were 32%, 60%, 8% and 40%, respectively. The obtained results indicated that the incidence of *E. coli* was 20%, 8% and 32% and 40% in the examined kofta, shawerma, sausage and liver samples, respectively.

KEY WORDS: ready- to – eat sandwiches, *E. coli*, Salmonellae, kofta, liver, shawerma, sausage.

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1. INTRODUCTION

Ready - to - eat meat (RTE) products are highly demanded due to their high biological value, reasonable price, agreeable taste and easily serving, as well as excellent sources of high quality protein, minerals and vitamins (Mosupy et al., 1998; World Health Organization "WHO", 1984). Also, RTE foods reflect consumer demand for convenient foods, consumer is looking for RTE foods that are fresh, healthy, safe, additive free and nutritious (Fang, 2005). Salmonellosis is a worldwide problem responsible for food poisoning outbreaks in human beings without indication of decline despite the traditional food hygiene efforts. In Egypt, several food poisoning outbreaks were reported due to consumption of meat and meat products contaminated with different strains of Salmonella organisms (Varnam and Evans, 1991). Therefore, the current study was applied to evaluate the bacteriological status of some ready to eat meat meals sold at different districts and restaurants in Benha city, Kaliobia Governorate.

2. MATERIAL AND METHODS

2.1. Collection of samples

A total of 100 random samples of ready to eat beef kofta, beef liver, shawerma and beef sausage (25 of each) were collected from different districts and restaurants in Benha city Kaliobia Governorate to be evaluated microbiologically. Each sample was kept in a separate sterile plastic bag and put in an ice box then transferred to the laboratory under complete aseptic conditions without undue delay and examined bacteriologically to evaluate the hygienic health hazard of contaminated with some food borne pathogens.

2.2. Bacteriological examination

2.2.1. Preparation of samples (American Public Health Association (APHA), 1992).

To 25 grams of the samples under examination were taken under aseptic condition to sterile Stomacher bag then add 225 ml sterile 0.1% peptone water, the contents were homogenized at Stomacher (M A 106402,France,450 to 640 strokes per minute) for 2 minutes, the mixture was allowed to stand for 5 minutes at room temperature .The contents were transferred into sterile flask and thoroughly mixed by shaking and 1 ml was transferred into separate tube each containing 9 ml sterile 0.1% peptone water, from which tenth- fold serial dilutions were prepared. The prepared samples were subjected to the following bacteriological examination.

2.3. Isolation and identification of E. coli (American Public Health Association "APHA", 1984).

From the original dilution, one ml was inoculated into MacConkey broth tubes supplemented with inverted Durham's tubes. Inoculated tubes were incubated at 37°C for 24 hours. Enrichment broth: One ml from positive MacConkey tube was inoculated into another MacConkey broth tubes and incubated at 44^{D}C for 24 hours. Planting media: Loopfuls from positive MacConkey broth tubes were separately streaked onto plates of Eosin Methylene Blue agar medium (EMB), which were then incubated at 37°C for24 hours. Identification of suspected E. coli isolates. Morphological identification according to Quinn et al. (2002). Motility test according to Quinn et al., (2002). Biochemical identification according to Quinn et al., (2002). Serological Identification: The isolates were serologically identified according to Kok et al. (1996) by using rapid diagnostic *E. coli* antisera sets *(DENKA SEIKEN Co., Japan)* for diagnosis of the Enteropathogenic types.

2.4. Isolation and identification of Salmonellae (International Organization of Standardization "ISO", 2002)

Pre-enrichment in non-selective broth: Twenty-five grams of examined samples were homogenized in 225 ml of sterile buffered peptone water (0.1%) in sterile blender jar and incubated at 37°C for 24 hours. Enrichment in selective broth: One ml of the inoculated Pre-enrichment culture was inoculated into 10 ml Rappaport Vassilidis broth tube, then the tube was incubated at 43°C for 24 hours (Vassiliadis et al., 1978). Selective Plating: A loopful from selective enriched broth was streaked onto the surface of previously prepared Xylose lysine Desoxychoclate (XLD) agar and Brilliant Green agar. The plates were incubated at 37°C for 24hours. Plates were examined for suspected Salmonella colonies which appeared as red with black centers on XLD agar and pink on Brilliant Green agar. Morphological identification according to Quinn et al., (2002). 3.2.5.5. Motility test: according to Quinn et al., (2002). Biochemical identification: The purified isolates of Salmonella were examined by different biochemical reactions according to Koneman et al. (1997) and Quinn et al., (2002). Serological identification of Salmonellae: Isolates proved biochemically to be Salmonella microorganisms were subjected to serological identification according to Kauffman white scheme (Kauffman, 1974).

3. RESULTS

3.1. Salmonellae in ready to eat sandwiches of beef Samples:

The results recorded in tables (1) revealed that the incidences of Salmonellae. In the examined ready to eat samples were32%, 60%, 8%, 40 % for the examined sandwiches of beef products of kofta, liver, shawerma and sausage. Data in table (2) revealed that the serologically identified *salmonella* isolates in the examined samples of liver sandwiches were *S. Typhimurium* (20%), *S. Dublin (*12%) and *S. Enteritidis (28*%), while in examined samples of kofta sandwiches S. *Typhimurium* (12%), *S. Enteritidis (8%) and S. Haifa (12%)* were identified. Moreover, in the examined samples of beef shawerma sandwiches *S. Typhimurium* (4%) and *S. Enteritidis* (4%) were identified, moreover in the examined samples of sausage sandwiches were *S. typhimurium* (20%) and *S. Enteritidis* (20%) were identified.

3.2. Escherichia coli in Ready to eat sandwiches of beef samples:

The results recorded in tables (3) revealed that the incidence of *E. coli* in the examined ready to eat samples were 20%, 8%, 32% and 40% for sandwiches of kofta, shawerma, sausage and liver, respectively.

Table (1): Incidence of Salmonellae in the examined samples of ready to eat sandwiches of beef products

Beef products	Positive samples	
	No	%
Kofta	8	32
Liver	15	60
Shawerma	2	8
Sausage	10	40
Total	25	25

Table (2): Serotyping of Salmonellae isolated from the examined samples of ready to eat sandwiches of beef products (n = 25).

Identified strains	Kofta		Liver		Shawerma		Sausage		Total	
	No	%	No	%	No	%	No	%	No	%
S. Dubbin	-	-	3	12	-	-	-	-	3	3
S. Haifa	3	12	-	-	-	-	-	-	3	3
S. Enteritidis	2	8	7	28	1	4	5	20	15	60
S. Typhimurium	3	12	5	20	1	4	5	20	14	56
Total	8	32	15	60	2	8	10	40	35	35

Table (3): Incidence of Enteropathogenic *E. coli* in the examined ready to eat food samples.

Products	No. of Samples	Positive samples	
		No	%
Kofta	25	5	20
Shawerma	25	2	8
Sausage	25	8	32
Liver	25	10	40
Total	100	25	25

4. DISCUSSION

The results recorded in tables (1) revealed that the incidences of *Salmonellae.* in the examined ready to eat samples were 32%, 60%, 8%, 40 % for the examined sandwiches of beef products of kofta, liver, shawerma and sausage. The current results for kofta sandwiches were higher than those reported by Al-Mutairi (2011)) (0%) and Al-Tawwab (2004) (4%). *Salmonellae* were recovered from meat products by many investigators such as Abd El-Aziz (1987) (10%), Ahmed (1988) (8%), El-Mossalami et al. (1989) (6%), El-Mossalami (2003) (5%), Torky (2004) (5%), and Siriken et al. (2006) (7%).

Data in table (2) revealed that the serologically identified *salmonella* isolates in the examined samples of liver sandwiches were *S. Typhimurium* (20%), *S. Dublin (12%) and S. Enteritidis (28%),* while in examined samples of kofta sandwiches S. *Typhimurium* (12%), *S. Enteritidis (8%) and S. Haifa (12%)* were identified. *Moreover,* in the examined samples of beef shawerma sandwiches *S. Typhimurium* (4%) and *S. Enteritidis* (4%) were identified, moreover in the examined samples of sausage sandwiches were *S. Typhimurium* (20%) and *S. Enteritidis* (20%) were identified.

The presence of *Salmonella* spp. in cooked foods is often attributed to inadequate sanitation, poor personal hygiene during food handling, processing and storage, presence of waste close to food preparation and food premises, and inadequate refrigeration. Proliferation of this organism in foods may, therefore, result from handling cooked foods by workers who are carriers of *Salmonella.* Historically, *S. Typhimurium* has been the most frequent serotype and *S. Enteritidis* acts as a causative agent of human gastroenteritis throughout the world. An annual average of 186 cases was recorded during 1982-1986 in Norway (Sharma et al., 1996). Also *S. Typhimurium* is the commonest *Salmonellae* isolated from cases of food poisoning and represents about 50-60% of such cases (World Health Organization (WHO), 1967).

In Egypt *S. Typhimurium* was involved for several times in i food poisoning outbreaks due to consumption of meat and meat products (Ramadan and Sadek, 1971). Generally, the contamination of different meat products with *Salmonellae* may reflect insufficient hygienic measures.

The results recorded in tables (3) revealed that the incidence of *E. coli* in the examined ready to eat samples were 20%, 8%, 32% and 40% for sandwiches of kofta, shawerma, sausage and liver, respectively. *E. coli* was previously isolated by Al-Mutairi (2011); El-Mossalami (2003); El-Rayes (2008); El-Taher-Omyma (1998); Hassan (1991); Ibrahim-Ghada (2001); Soliman and El-Tabiy (2006) from the examined kofta samples, by Al-Mutairi (2011); El-Gohary (1993); Ibrahim-Ghada (2001); Vazgecer et al. (2004) from the examined sandwiches of beef shawerma samples. While the current results for the examined samples of koftasandwiches were higher than those obtained by Hassan (1991) (0%) and lower than those obtained by Al-Tawwab (2004) (64%) , but similar to those obtained by El-Rayes (2008) (20%), El-Taher-Omyma (1998) (25%), Al-Mutairi (2011) (28%) and El-Mossalami (2003) (40%). Moreover, the current results for the examined sandwiches of beef shawerma samples were lower than those obtained by Vazgecer et al. (2004) (31%), Al-Mutairi (2011) (20%), El-Gohary (1993) (78%) and Al-Tawwab (2004) (48%).The variation in the results may be due to the differences in manufacture practices, handling from producers to consumers and the effectiveness of hygienic measures applied during production. The presence of *E. coli* in food of animal origin is considered as indicator of faults during preparation, handling, storage or service (Tabbut, 1999). Although *E. coli* is readily killed by temperature above 55°C, serious incidents occurred in such products, which reflect high level of abusing even to fecal contamination, cross contamination between raw foods and cooked one (Varnam and Evans, 1991). So, *E. coli* is considered as an indicator of fecal contamination, besides, it may induce severe diarrhea in infants and young children, as well as food poisoning and gastroenteritis among the adults (Synge, 2000). Detection or even low number of *E. coli* in foods constitutes a public health hazard as significant as the demonstration of Salmonellae (International Commission on Microbiological

Specification for Foods "ICMSF", 1980). The pathogenic strains of *E. coli* associated with food borne illness were classified into 4 categories, Enteropathogenic *E. coli* (EPEC), Entero-invasive E. coli (EIEC), Enterotoxigenic *E. coli* (ETEC) and Enterohaemorrhagic *E. coli* (EHEC) (Doyle, 1990).

In general, EPEC strains are the major cause for many infantile diarrhea in typical cases, symptoms appear within 12 to 36 hours. Clinically, EPEC illness is characterized by fever, nausea, vomition and watery stools, which occasionally contain mucous, but without gross blood (Toledo et al., 1983). Furthermore, EPEC was implicated in cases of gastroenteritis, cystitis, colitis, pyelonephritis, peritonitis and puerperal sepsis as well as food poisoning outbreaks (Doyle, 1990). Therefore, EPEC showed to be the first bacterial cause of diarrhea in infants: and its proportion may reach 54% (Varnam and Evans, 1991).

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